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Multipurpose Transit Payment Media

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Report 32

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TRANSIT COOPERATIVE RESEARCH PROGRAM

The nation's growth and the need to meet mobility, environmental, and energy objectives place demands on public transit systems. Current systems, some of which are old and in need of upgrading, must expand service area, increase service frequency, and improve efficiency to serve these demands. Research is necessary to solve operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the transit industry. The Transit Cooperative Research Program (TCRP) serves as one of the principal means by which the transit industry can develop innovative near-term solutions to meet demands placed on it.

The need for TCRP was originally identified in *TRB Special Report 213—Research for Public Transit: New Directions,* published in 1987 and based on a study sponsored by the Urban Mass Transportation Administration—now the Federal Transit Administration (FTA). A report by the American Public Transit Association (APTA), *Transportation 2000,* also recognized the need for local, problem-solving research. TCRP, modeled after the longstanding and successful National Cooperative Highway Research Program, undertakes research and other technical activities in response to the needs of transit service providers. The scope of TCRP includes a variety of transit research fields including planning, service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.

TCRP was established under FTA sponsorship in July 1992. Proposed by the U.S. Department of Transportation, TCRP was authorized as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). On May 13, 1992, a memorandum agreement outlining TCRP operating procedures was executed by the three cooperating organizations: FTA; the National Academy of Sciences, acting through the Transportation Research Board (TRB); and the Transit Development Corporation, Inc. (TDC), a nonprofit educational and research organization established by APTA. TDC is responsible for forming the independent governing board, designated as the TCRP Oversight and Project Selection (TOPS) Committee.

Research problem statements for TCRP are solicited periodically but may be submitted to TRB by anyone at any time It is the responsibility of the TOPS Committee to formulate the research program by identifying the highest priority projects. As part of the evaluation, the TOPS Committee defines funding levels and expected products.

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The TCRP provides a forum where transit agencies can cooperatively address common operational problems. The TCRP results support and complement other ongoing transit research and training programs.

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FOREWORD

By Staff
Transportation Research Board

This report will be of interest to transit managers, transit operations personnel involved with fare collection, parking professionals, and the financial services community. *TCRP Report 32*, "Multipurpose Transit Payment Media," examines the potential for introducing multipurpose payment "smart cards" that can be used to purchase transit services from multiple operators, and, potentially, other goods and services (e.g., parking and retail products). This report examines smart card technology, legal and institutional issues associated with introducing multipurpose card programs, cost and revenue impacts, and customer attitudes. On the basis of experiences around the world, guidelines are provided for development of multipurpose fare payment programs.

The use of cash in transit fare payment has long been seen as a problem, both for the rider and the operator, and many transit agencies have tried to minimize the use of cash in favor of prepaid media (e.g., tokens, tickets, passes, and stored-value farecards). Cash fares can be inconvenient for the rider, and the need for exact fare can be a barrier to the use of transit. In cities with multiple transit operators, exact fare must often be paid on each leg of a trip, and transfers between buses or trains operated by different agencies are generally difficult or nonexistent. The combination of these factors constitutes a major barrier to the "seamless," intermodal transportation system envisioned in the 1991 Intermodal Surface Transportation Efficiency Act.

Operationally, it is expensive to administer the collection of cash fares. For every dollar a transit agency receives in passenger revenue, it spends approximately 6 cents on fare collection and processing. Most of the cost is associated with collecting, transporting, counting, and guarding cash. Dollar bill processing is particularly difficult and costly. Reducing the use of cash for fare payment provides a clear benefit for transit operators.

Electronic transit fare payment in the form of magnetically encoded farecards has been in use since the 1970s. In the 1990s, technological advances in electronic payment in transit and other areas (e.g., banking and retail) are beginning to converge in the form of the smart card. A productive convergence of transit and commercial banking, for example, would be the acceptance of standardized, financial media (i.e., stored-values cards or "cash cards") for payment of transit fares.

TCRP Project A-14, conducted by a team of firms led by Multisystems, Inc., examined the potential for developing multipurpose media linking the payment of transit fares to other payment applications. The report provides information on more than 30 current and planned multipurpose transit fare projects from around the world. Descriptive information includes the size of the trial program, the card supplier or system integrator, and the degree of fare integration (e.g., regional transit fares; combined transit, parking, and tolls; or multiple use). Thirteen stored-value/electronic purse programs from around the world, initiated by financial services companies and not involving transit at this time, are also described. The report examines issues and concerns from the

point of view of transit agencies and financial institutions, including a discussion of stored-value cards technologies (i.e., "contactless," "contact," and "combi-cards"). The report provides transit and financial services professionals with an understanding of the costs and potential benefits, identifies issues that must be addressed in creating new alliances, and describes the steps that must be taken to develop and implement effective multipurpose programs.

This report expands on *TCRP Report 10*, "Fare Policies, Structures, and Technologies," which contains a comprehensive assessment of current policies and emerging developments related to the establishment of transit pricing parameters and the selection and application of fare collection technologies. *TCRP Research Results Digest 14*, "Coordinated Intermodal Transportation Pricing and Funding Strategies," presents a framework for transit agencies and their partners to use in developing a coordinated, intermodal pricing strategy. Multipurpose transit fare media can be an integral part of and can facilitate the implementation of flexible transit fare policies and coordinated pricing structures.

MULTIPURPOSE TRANSIT PAYMENT MEDIA

SUMMARY

Advances in payment technology, particularly "smart cards" and the use of stored value, have created opportunities for reaching more than one market with a single card. Multipurpose payment media can be used to purchase transportation from multiple transit operators and can be used for various nontransit functions. TCRP Project A-14 was designed to assess the issues related to—and the potential for—development and use of multipurpose media. The study included the following key elements:

- A comprehensive review of current practices and developments related to multipurpose payment arrangements and emerging stored-value payment programs in general;
- Identification of the issues and concerns facing transit agencies, financial institutions (and other types of card issuers), and customers related to development and use of multipurpose media;
- A 1-day workshop that brought together senior managers from various transit agencies, financial institutions, government agencies, industry trade groups, consulting firms, and equipment and card vendors to discuss issues and directions for multipurpose media programs; and
- The development of guidelines on developing and implementing multipurpose arrangements.

TYPES OF ISSUES AND PARAMETERS

A multipurpose payment program can be established in a "closed" transit-only environment (i.e., the transit agency, or group of agencies, issues and accepts the card) or a broader "open" environment (i.e., the transit agency accepts a card issued by one or more nontransit entities, such as a bank or a university). The institutional setting and arrangements will depend largely on who is initiating the program (e.g., transit agency or financial institution) and the capabilities or constraints (e.g., financial, administrative, legal, and technological) and goals (e.g., reduce costs and increase revenues) of the entity initiating the program. In establishing any multipurpose program, it is necessary to address a range of issues and design parameters. These issues and parameters can generally be categorized as follows:

- **Institutional and financial** (Who are the participants in the program? How is it organized and operated? What are the expected costs and revenues for each participant? What is the nature of financial arrangements among the participants?);
- **Legal and regulatory** (What state and federal legal and regulatory requirements or restrictions must be addressed?);
- **Operational and administrative** (How are the different applications on a card priced, and how are cards distributed and reloaded?);
- **Technological** (What type of card will form the basis for the program, what are the design requirements, and how will the new technology be integrated into the existing system?); and
- **Customer-related** (To what extent will customers participate in the program, and how will their concerns be addressed?).

EMERGING DEVELOPMENTS AND INTEREST IN MULTIPURPOSE MEDIA

Projects and Programs

The last few years have witnessed extensive activity related to the development of multipurpose payment programs. Programs are either in widespread use, in limited trial, in the planning stage, or temporarily or permanently derailed. As of mid-1997, more than 25 projects involving transit were in place on either a trial or ongoing basis, with several others in advanced planning stages. These projects and programs can be generally divided into transit-initiated multipurpose programs and financial, postal, or telecommunications industry-initiated stored-value programs.

Key transit-initiated multipurpose programs include TransLink (San Francisco area), Central Puget Sound (Seattle region), MARTA/VisaCash (Atlanta), WMATA (Washington [DC]), Ventura County (CA), Ann Arbor (MI), Cleveland (OH), Wilmington (DE), Phoenix (AZ), MetroCard (NYMTA), Toronto (Canada), Manchester (Great Britain), Sydney (Australia), Hong Kong, Seoul (South Korea), and Paris (France). Financial, postal, or telecommunications industry-initiated stored-value programs include VisaCash, MasterCard/Visa (U.S.), Mondex, Banksys/Proton, Quicklink (Australia), Danmont (Denmark), GeldKarte (Germany), PayCard (Germany), PTT Postcard (Switzerland), Europay Clip, Chipper (Netherlands), ChipKnip (Netherlands), Postchecque (Belgium), SEMP (Spain), and Quick (Austria).

Transit Agency Interest

The major reasons for transit agencies to consider a multipurpose program are that the program offers some combination of the following:

- Seamless regional transit travel;
- Reduced fare collection costs;
- Additional revenues;
- Improved customer convenience;
- An expanded market base for transit (e.g., by accepting commercial payment media or by increasing employer participation) and increased ridership (e.g., through the institution of loyalty tie-ins with merchants or frequent rider bonuses);
- Improved data collection and reporting capabilities;
- Improved equity and timeliness of the reconciliation and distribution of revenues collected in a multioperator system;
- Improved ability to modify fare policies and structures (e.g., to better target specific markets); and

- Gets out of the "payments and settlements" business (i.e., uses the capabilities of financial institutions).

The specific type of multipurpose arrangement pursued will depend, at least in part, on which of these goals the agency considers most important.

Financial Institution Interest

When considering stored-value cards in general, banks and other institutions see a significant potential market in capturing small cash purchases through prepaid media. These institutions hope to generate revenues through transaction fees (and possibly card-use fees) and to reduce costs by requiring fewer bank tellers. The move toward stored-value media has also largely been driven by the growing interest in smart cards for various payment applications. Another goal in offering stored-value cards is to expand the range of services provided to consumers—banks, in particular, seek to improve their status in the increasingly competitive payments environment.

A tie-in with a large transit agency offers a financial institution several potential benefits, including the following:

- The opportunity to quickly establish a critical mass of users of the bank's prepaid media;
- Access to potential customers for its other products and services (e.g., bank accounts);
- Access to transit facilities (particularly rail stations) for possible installation of bank ATMs—to dispense the prepaid media and to provide other banking functions; and
- Access to merchants closely affiliated with transit (e.g., vending machine operators and newsstands).

In addition to considering transit as a potential participant in a card program, financial institutions see opportunities to contract or to partner with transit agencies to establish and administer their own stored-value programs. Banks and other institutions can offer their expertise in managing the various elements of the payments business, including back-end reconciliation, settlement functions, and the production and distribution of the media.

ISSUES RELATED TO THE DEVELOPMENT OF MULTIPURPOSE ARRANGEMENTS

There is considerable interest around the world in multipurpose payment programs. The various efforts in place and under development demonstrate their potential and highlight the issues that must be addressed. These programs entail fundamental institutional and technological changes in transit and other organizations; therefore, barriers must be overcome and a broad range of issues must be addressed.

Institutional and Financial Issues and Concerns

The major challenge facing prospective participants in any type of multipurpose program is to develop a reasonable and realistic business structure that adequately distributes program responsibilities, financial risk, and benefits among the participants. Multipurpose arrangements typically involve the establishment of some form of public-private partnership. However, given that there is minimal experience in establishing such partnerships, there are few proven models for structuring agreements. Partners need to

believe that they will each benefit from the arrangement, but the uncertainties of the risks and benefits can make it difficult to develop a mutually acceptable agreement.

In estimating the costs for a new system, a transit agency must consider both changes to existing fare collection elements and new items associated with the multipurpose program and the use of smart cards. Potential changes in existing elements include automating certain sales, distribution, and processing functions, as well as automating maintenance requirements. Potential sources of cost savings include reduction in personnel, sales commissions, maintenance costs, and data collection.

The use of smart cards in general is expected to generate a range of benefits to a transit agency. Some of these are financial; others relate to more general goals. Participation in multipurpose programs, coupled with the use of smart cards, can generate additional revenues from the following:

- Increased ridership,
- Reduced fare abuse or evasion,
- The float on prepayment or card balances,
- Unused or expired value; and
- Transaction fees from merchants, if it is a multiple-use program.

Financial institutions issuing stored-value cards or involved in settlement or other clearinghouse functions can expect some of the following benefits:

- Reduced card fraud and abuse;
- Float on card balances;
- Unused or expired card value (or maintenance fees on expired cards);
- Transaction fees from merchants; and
- Other types of fees for reloading, settlement, reporting, and so forth.

The specific revenue sources will depend on the parameters of the payment system and the specific agreements developed.

A transit agency may be reluctant to enter into a closed multiple-use arrangement because of concerns about becoming a sort of "bank," and the additional administrative responsibilities related to collecting fees from merchants and being subject to regulations governing such activities are also concerns. Some agencies may, in fact, be legally prohibited from collecting such fees. Agencies that do establish such programs will likely try to assign responsibility for conducting business with merchants to a private partner.

The biggest challenge of integrated regional programs is dealing with a possibly large number of transit agencies, each having its own requirements and constraints. Some agencies may resist participation altogether and feel that they have been forced into a new program. The challenge for project planners is to address each agency's needs and concerns and create a technologically realistic solution.

Legal/Regulatory Issues and Concerns

Depending on the program and the specific roles of the various participants, there may be legal or regulatory issues associated with the establishment of a multipurpose payment program. The legal and regulatory status of stored-value products has not been fully resolved. Preliminary rulings have exempted stored-value cards from Regulation E (which deals with consumer protection related to electronic funds transfer) and possibly from the need for deposit insurance. These and other regulations have not been finalized, however, leaving their ultimate implications unclear. Transit has been using

stored-value media for more than 25 years. Most of these regulations are not likely to apply directly to stored-value media in a transit-only setting, but multiple-use media could be subject to more general financial considerations.

Transit agencies and other prospective smart card issuers will have to address privacy concerns of cardholders. Cardholders may not want issuers to be able to track their ridership patterns or to maintain other information about them. Card issuers will have to be proactive in addressing these concerns and may have to offer cardholders a choice as to how much card use information is reported (e.g., in exchange for giving up the ability to get refunds for lost cards).

Abandoned property ("escheatment") laws may stipulate that stored-value card issuers must turn over expired or unused value to the state; this would eliminate a significant potential revenue source from such programs. The laws vary from state to state; transit agencies may be exempted or may be considered part of the state government.

Other legal and regulatory issues that have to be addressed in developing multiple-use programs include the authority of banks and nonbanks to issue prepaid (i.e., stored-value) cards and responsibility for lost cards, card and equipment malfunction, and issuer insolvency.

Operational and Administrative Issues and Concerns

An important consideration in a multipurpose payment program is the need to accommodate different pricing structures and policies on a single card. At issue is whether the card contains a single "electronic purse" (EP) that can be used to pay for various items or services (e.g., transit use, vending items, or fast food) or is a "multi-application" card. With the latter, a transit agency's fare structure (e.g., including any use discount or purchase bonus) is added to a card, along with a bank's credit or stored-value application and perhaps other functions as well. In this case, each application retains its own pricing structure. The single EP card, however, poses a problem in that every expenditure—transit or otherwise—will be subject to the same discount or bonus.

One of the most important concerns in developing a multipurpose program is ensuring sufficient availability of cards and ease of reloading value and checking remaining value on them. This has been found to be a crucial concern to potential card users, particularly bus riders. Many agencies will not want to issue or to reload cards aboard buses, and many transit riders may not have access to an ATM. Employer distribution and purchase from home (via computer, telephone, or mail) are also important potential distribution options.

Technology Issues and Concerns

Selection of an appropriate card technology is a key issue in developing a multipurpose program. Financial institutions have selected contact cards as the preferred medium for their new payment instruments while transit agencies generally prefer contactless cards. The development of combined contact-contactless cards (combi-cards) could solve this conflict, but several issues related to the provision and distribution of these cards remain (e.g., who will provide and distribute combi-cards and who will receive them).

Both transit agencies and their potential partners have indicated the need for functional requirements standards for multipurpose cards and for smart cards in general. The transit industry is beginning to develop guidelines in this area, but input is needed from the financial sector. Coordination of the various efforts to define requirements for different aspects of the electronic payment process is also needed.

Another important issue is the integration of the new technology into an existing fare collection system. For pilot projects aimed primarily at demonstrating a new technology or institutional framework, integrating the test equipment may be unnecessary. Over the long term, however, full integration of the smart card system with fare collection and other onboard (or in-station) systems should be the goal.

Customer-Related Issues and Concerns

General market stored-value media have not been widely tested in the United States—and acceptance by the general public has, therefore, not been established. Market research on potential use indicates a generally positive response to stored-value media (and smart cards in general) for transit use; however, the size of the potential market for multiple-use media is not clear yet. Among general market consumers, multiple-use cards—and smart cards in general—are accepted positively, although stored value is not considered among the more important applications. The market research suggests that there is a need for effective consumer education in the introduction of any new fare payment technology, especially a multiple-use card.

In summary, considerable interest has developed in multipurpose payment strategies that combine transit media with those used for other purposes and that facilitate regional transit fare integration. Such approaches have been made possible by advances in electronic media—particularly the development of smart cards—coupled with the growing interest in prepayment and stored-value applications in the financial, retail, and service sectors. Transit agencies see in multipurpose arrangements the ability to increase customer convenience (by offering seamless regional trip-making and by accepting general market stored-value cards) and other potential benefits associated with integrating fare payment into the broader payments environment. In particular, some agencies see the potential to expand their markets and generate new revenues through nontransit acceptance of their fare cards. Financial and other institutions are interested in the transit market because it provides a ready-made customer base for introducing stored-value media.

Although prospective participants in multipurpose programs see benefits in the concepts, development efforts to date have revealed the unexpected complexity of the arrangements and the range of issues that must be addressed. Development of any type of multipurpose payment program will result in fundamental changes in the way participants operate. Some concerns will be specific to each type of participating entity and each type of program; other concerns will be common to all participants in all programs. Current multipurpose development efforts are beginning to address many of the issues, but prospective participants must still grapple with the uncertainties surrounding any major change to their usual ways of doing business. The absence of successful operating models presents significant barriers to implementing mutually acceptable partnership agreements. Although these barriers are not insurmountable, each participating entity must address the full range of issues and must seek to understand the concerns and motivations of its would-be partners.

As additional projects are developed and implemented, various types of arrangements will be tested, and reasonable approaches will be identified for each type of program and institutional setting. Now, those pursuing multipurpose arrangements must understand the issues and the options that should be considered at each point in the development process. This report identifies and explores the various issues and presents guidelines for addressing these concerns and for selecting appropriate strategies in developing multipurpose programs.

CHAPTER 1

INTRODUCTION AND RESEARCH APPROACH

INTRODUCTION

Electronic fare payment technology offers transit operators a new type of fare media. This technology, particularly the development of integrated-circuit (smart) cards and the use of stored value, has created opportunities for reaching more than one market with a single payment option. Multipurpose fare media can be used to purchase transportation from multiple transit operators and for various other functions, such as parking and retail purchases and other transactions. These multipurpose media can take two basic forms:

- Multiple-use media that can be used in several applications (e.g., transit, retail purchases, and banking) and
- Integrated regional fare media that can be used at multiple transit agencies within an area (i.e., a "universal ticket") and for other transportation modes (e.g., parking and tolls)

The Transit Cooperative Research Program (TCRP) sponsored Project A-14, *Potential of Multipurpose Fare Media*, to examine the issues related to developing and implementing multipurpose media. The purpose of this project was to provide a comprehensive study of the potential of multipurpose media programs and the implications of these programs for transit agencies, financial and other institutions, and customers.

BACKGROUND

Moving Toward Cashless Transactions

The use of cash in transit fare payment has long been seen as a problem—both for the rider and the operator, and many agencies have long sought to minimize cash fares in favor of prepaid options. Cash fares can be inconvenient for the rider, and the need for exact fares often is a barrier to the use of transit. This inconvenience is magnified in a multioperator trip, where the rider usually must have exact fares at each boarding.

From the transit agency's point of view, cash payment of fares is also the most expensive option to administer—requiring a disproportionately high share of available resources. For every dollar a transit agency receives in passenger revenue, it spends approximately $0.06 on fare collection and processing. Most of this expense is associated with the high cost of counting and processing coins and dollar bills and the potential for employee theft. The operator must maintain a secure location and must have procedures for retrieving fare revenues from the vehicle, sorting and counting money, and transporting it to the bank. The costs also include onboard coin and currency collection equipment (i.e., fareboxes), staff, and specialized equipment for processing revenue. The use of dollar bills presents its own set of operational and maintenance problems, particularly in agencies with older nonregistering fareboxes.

Aware of this situation, transit agencies for many years have offered riders the opportunity to use various prepaid, multiple-ride fare options rather than cash. Prepaid media (e.g., monthly and weekly passes, tickets, and tokens) are typically priced at a discount, because transit agencies recognize that the fare collection costs associated with prepaid media are significantly less than those for cash. The discounted price and the convenience of use of prepaid media benefit the frequent transit patron; the nascent "multipurpose" electronic fare media promise to offer even more convenience to current and potential transit users.

The Use of Stored-Value Media

Although prepaid fares have been marketed successfully to many riders—some agencies have even succeeded in converting most of their riders to some form of prepayment—the single-ride cash option remains the most common form of fare payment. There are several reasons for riders to select cash even though it may be more expensive than prepayment on a per-ride basis. Some patrons may believe that they simply cannot afford the initial cash outlay associated with prepaid media; others may be occasional riders who either do not travel enough to warrant buying a pass or are afraid they will lose extra tokens or tickets. One-time riders, such as visitors, may not deem prepayment a worthwhile investment.

In the move toward minimizing the use of cash, stored-value media should be able to play a significant role in attracting such riders; stored value obviates the need for someone to buy either a high-priced pass or bulk tokens and tickets to obtain a convenient—and perhaps discounted—payment option. Meanwhile, from the agency's point of

view, research indicates that prepayment and discounting influence occasional riders to use transit more frequently than does paying for each ride individually or at full price. In such a case, transit use becomes a more spontaneous activity. This suggests that the introduction of multipurpose cards could create new marketing opportunities and enhance the public perception of transit.

In addition to its ridership and convenience benefits, the use of electronic stored-value fare media can allow integration of payments with other transit agencies, with nontransit functions, or both. An electronic universal ticket can allow seamless travel among the various transit systems in a region. As the transit industry is beginning to recognize the benefits of the smart card in facilitating such fare integration, other industries (particularly financial services and telecommunications) are introducing stored-value smart cards for their own customers. In both cases, the goal is to replace the use of cash for small transactions. This common goal has resulted in moves by both transit and financial services (and other) institutions toward establishment of a single medium that can be used for multiple uses (i.e., for transit as well as other small purchases). This development will move transit fare payment into the realm of broader commercial markets.

The Intersection of Financial and Transit Payment Developments

Transit fare payment developments in general are increasingly intersecting with developments in the commercial banking industry, as exemplified by the growing use of electronic funds transfer (EFT) methods for purchase of fare media (i.e., acceptance of credit/debit card payments in automatic ticket vending machines). The ultimate convergence of transit and commercial banking is essentially the acceptance of standardized cashless financial media (such as credit, debit, or stored-value cards) that are in wide use outside of the transit environment for direct fare payment. This technique is being used on buses in Phoenix, where credit cards (MasterCard and Visa) can be used directly in the farebox swipe readers. In such an arrangement, the control of the system is in the hands of those organizations now managing online credit and automated teller machine (ATM) financial card processes. The advantage for the transit industry in such a payment arrangement would be playing a participatory rather than a management role in the payment system. Consequently, it would be relieved of the major costs, responsibilities, and liabilities connected with issuing the card and with the transaction processing. The major disadvantage would be that the long-term revenue collection goals of the transit agency will differ from those of the financial institution responsible for the cards, and these may be difficult to reconcile. The selection of a compatible card technology (contact versus contactless smart card versus magnetic stripe) in transit's consideration of joint public-private media also needs to be addressed.

Although the acceptance of credit cards may not appeal to many transit agencies (postpayment eliminates some of the key advantages associated with prepayment), the basic idea of transit participating in an "open" payments system should have widespread appeal. However, such a system is a fundamentally new way of doing business for transit agencies, and the transit industry needs to assess the key issues that must be addressed and needs to define the procedures for establishing appropriate public-private partnerships.

RESEARCH STUDY

TCRP Project A-14 was designed to identify issues and concerns on the part of transit agencies and financial (and other nontransportation) institutions, assess how various approaches will affect customers and financial institutions, monitor developments, and assess the potential of increasing the role of financial institutions in transit fare payment and collection. This research was intended to provide transit and financial services professionals with an understanding of the costs and potential benefits of such arrangements and the issues that must be addressed in forging new alliances and to provide guidelines on developing and implementing effective, efficient multipurpose programs. Project A-14 follows up TCRP Project A-1, *Fare Policies, Structures and Technologies.* That study, completed in the spring of 1996, involved a comprehensive assessment of current practices and emerging developments related to the establishment of transit pricing parameters and the selection and application of fare collection technologies.

Project A-14 included the following key elements:

- A comprehensive review of current practices and developments related to multipurpose arrangements and emerging stored-value payment programs in general;
- The identification of the issues and concerns facing transit agencies, financial institutions (and other types of card issuers), and customers related to the integration of transit and nontransit payment media; these issues and concerns can be categorized as institutional, financial, operational, legal, and technological; and
- The development of guidelines on developing and implementing multipurpose arrangements.

In compiling the information used in this study, the research team used various sources. The issues addressed in this study are under review by several transit agencies and financial institutions and thus have been the subject of several comprehensive local studies and several specialized workshops and meetings. Besides reviewing reports and analyses prepared by transit agencies, financial institutions, and other researchers, key sources have included the following:

- Discussions with other researchers and representatives of transit agencies, financial institutions, technical orga-

nizations, equipment vendors, and other companies involved in developing media technology;
- Attendance at conferences and workshops focused on these issues;
- A survey of transit agencies' fare collection practices, costs, and concerns (conducted as part of this study); and
- A workshop, held as part of the study, that brought together senior managers from transit/planning agencies, financial institutions, federal agencies, industry trade groups, research institutes, consulting firms, and technology vendors.

This report identifies and addresses the full range of concerns and issues pertaining to multipurpose payment arrangements. The remainder of the report is organized as follows:

- **Chapter 2** identifies the various multipurpose media concepts and potential institutional arrangements and discusses examples of the emerging development and applications of these concepts.
- **Chapter 3** identifies and discusses the various types of institutional arrangements and related issues facing transit agencies and other entities with a possible interest in multipurpose programs; these issues can be classified as institutional, operational/administrative, and legal/regulatory.
- **Chapter 4** discusses issues related to the selection of card technologies and integration of technologies into existing fare collection systems.
- **Chapter 5** reviews the financial issues associated with multipurpose payment media programs and joint transit-financial service arrangements.
- **Chapter 6** discusses issues related to customer acceptance of stored-value and multiple-use payment options.
- **Chapter 7** presents guidelines for the consideration, development, and implementation of multipurpose programs.
- **Chapter 8** summarizes the key findings from the study.
- **Appendix A** presents the results of a survey of transit agencies undertaken as part of this study; the survey elicited information on current fare practices and technologies, planned use of new technologies, costs, goals, and concerns regarding multipurpose arrangements.
- **Appendix B** presents expanded (i.e., compared to the summaries in Chapter 2) descriptions of several transit and other multipurpose payment projects from around the world.
- **Appendix C** presents the results of a survey of financial institutions regarding views on and potential use of smart cards.
- **Appendix D** presents the results of the Multi-Use Workshop held in April 1997.

CHAPTER 2

MULTIPURPOSE FARE PAYMENT: OVERVIEW

DEFINITION OF TERMS

In discussing multipurpose media, it is useful to define the terms being used. "Multipurpose media" is used here to describe any payment option that can be used for more than one agency (but a single application, such as transit) or for multiple applications. Multiple-use media and integrated fare media are subsets of multipurpose media; the multiple-use concept has sometimes been referred to as "expanded utility." One of the key functions of such cards is an electronic purse (EP), which is essentially the stored-value portion of the card. A card may be dedicated to an EP function (and a card may contain more than one purse) or may also provide other functions (e.g., identification or information); the latter is known as a "multiapplication card." There is a fundamental difference between a card that can be used for several different types of applications (e.g., banking services, health care records, and vending) and one that has a single application (e.g., stored value) and can be used for multiple merchants and services; the technology implications of the different types of media are discussed in Chapter 4. An EP-only card may also be called a prepaid or cash card. Finally, integrated fare media have been called universal tickets in some locations.

All of these terms have come to refer primarily to variations of smart cards, although other technologies (e.g., magnetic-stripe cards) may also be able to support multipurpose applications. The memory, processing, and security capabilities of smart cards have made them the technology of choice for virtually all recent multipurpose efforts. "Smart card" technically refers to an integrated circuit (or chip) card that has an onboard microprocessor and built-in logic. However, the term has come to be used generally to describe a range of automated types of card technologies, including memory cards (without microprocessors) and radio frequency identification (RFID) cards and tags (also often without microprocessors). In this study, smart card is used in this more general sense.

There are two major classifications of smart cards: contact and contactless cards. Contact cards require a physical contact between the card and the read-write unit and must be inserted into a slot. Contactless cards do not have to be inserted into a slot, but can be read by passing the card close to (i.e., within a few inches or some other specified distance of) the read-write unit. Contactless—or proximity—cards commonly refer to cards using two different communication techniques. One type uses a contactless interface to provide power to the card and transfer data using inductive and capacitive techniques; these cards are of two basic forms: remote coupling or close coupling, depending on the particular interface and data transfer process. RFID cards, meanwhile, transfer data between the card and the read-write unit using radio frequency techniques; power is supplied using a battery or by means of received magnetic energy. Finally, a new class of cards combines the attributes of contact and contactless cards—either using two separate chips (generally called a hybrid card) or a single chip capable of being accessed in either fashion (generally called either a combi-card or a dual-interface card). Any type of smart card may also include a magnetic stripe. (The characteristics and uses of the different types of cards are discussed in Chapter 4.)

The above discussion refers specifically to chip-based cards. However, another type of electronic card recently developed to accommodate prepayment is the "capacitive card" (known commercially as the CoinCard), an inexpensive, disposable memory card. The card does not require physical contact with the reader, but must be inserted into a slot. Stored-value information is encoded in the form of units (e.g., rides or other uses) in a laser-etched polyester film, rather than on a chip or magnetic stripe. The technology makes the card very secure and inexpensive to produce. The card is being tested in a transit system (BC Transit in Vancouver) and in several other applications (e.g., for parking payment, for electronic benefits transfer, and in Japanese "pachinko" gaming arcades). The capacitive card looks promising for stand-alone prepaid functions, including transit, and may be feasible for certain types of multiapplication programs.

With regard to the environment in which a multipurpose card is issued and used, one of the fundamental issues is whether it is an "open" or "closed" system. "Open system" is defined in different ways, although a truly open system is one in which there are multiple card issuers and multiple service providers or merchants; for instance, credit and debit cards operate in an open system. However, the term "open" is also frequently used, particularly in the transit industry, to describe a payment system in which an outside entity's card (e.g., that of a bank or a university) is accepted for use by a transit agency (or other type of entity). A closed system is one in which the card is issued by a single entity and can be used

only for that entity's services. Transit fare payment has traditionally operated in a closed system; other examples include a university campus card or a prepaid telephone card. What is beginning to emerge with the development of various types of multipurpose cards, however, is a closed multipurpose system, in which a transit agency's card can be used for more than one service. The integrated farecard or the expanded utility or multiple-use transit card represents such a system.

There is something of a continuum between open and closed; moreover, a system may well evolve from closed to open. For a transit agency, however, the key distinction is whether it is issuing its own card or accepting a card issued by one or more nontransit entities. Therefore, to simplify the discussion of what is a complex set of arrangements, this report uses "closed" to refer to the former and "open" to refer to the latter. In other words, if a rider can use a card issued by a local bank to ride transit, this is considered an open system.

The implications of the system operating environment, as well as the characteristics and requirements of each type of system, are discussed in the next chapter. The types of issues and concerns that must be addressed in establishing any form of multipurpose arrangement are reviewed below.

TYPES OF ISSUES AND CONCERNS

Development of any type of multipurpose payment system likely represents a fundamental change in the way the participants operate. These changes apply to the customer, the transit agency, the financial institution, the participating merchant, the equipment vendor, and any other entities considering involvement in the venture. Issues and concerns may be related to the integration of multiple service providers and card issuers, as well as to the development and implementation of advanced payment media in general. Some concerns will be specific to each type of participating entity; others will be common to all participants. The issues and concerns that will need to be addressed can generally be categorized as follows:

- **Institutional and legal:** Who are the participants in the program, how is it organized and operated, and what are the legal and regulatory requirements that must be addressed?
- **Technological:** What type(s) of card will form the basis for the program, what are the design requirements, how will the new technology be integrated into the existing system, and how can compatibility with future technological advancements be ensured?
- **Financial:** What are the expected costs and benefits of the program to each potential participant?
- **Customer-related:** To what extent will customers participate in the program, and how will their concerns be addressed (e.g., related to privacy)?

Because multipurpose payment systems are in their infancy, there is limited experience in addressing these issues. Various types of programs have been developed overseas, but even many of these examples are still in trial or pilot phases. In North America, development of several multipurpose programs has begun, but in-service applications are of limited scope to date. The remainder of this chapter presents descriptions of the programs now in place and under development; the following chapters discuss the various issues and concerns.

EXAMPLES OF MULTIPURPOSE DEVELOPMENTS

The last few years have witnessed extensive developments in all types of multipurpose payment programs. Advances in electronic payment media have spurred the development of stored-value and prepayment approaches and multiple-use arrangements in the transit and other (e.g., financial, postal, telecommunications, campus, and retail) sectors, and this parallel interest has led to consideration of joint payment structures. Efforts are in various stages at this point: some programs are in widespread use, some are in limited trial, some are in the planning stage, and some have been derailed (at least temporarily). This section reviews several of the key projects and programs from around the world. These have been divided into two categories as follows:

- **Transit-initiated multipurpose programs:** MARTA/VisaCash (Atlanta), TransLink (San Francisco area), Central Puget Sound (Seattle region), WMATA (Washington [DC]), Ventura County (CA), Ann Arbor (MI), Cleveland (OH), Wilmington (DE), Phoenix (AZ), MetroCard (NYMTA), Toronto (Canada), Manchester (England), Sydney (Australia), Hong Kong, Seoul (South Korea), and Paris (France) and
- **Financial, postal, or telecommunications industry-initiated stored-value and EP programs:** VisaCash, MasterCard/Visa (United States), Mondex, Banksys/Proton, Quicklink (Australia), Danmont (Denmark), GeldKarte (Germany), PayCard (Germany), PTT Postcard (Switzerland), Europay Clip, Chipper (Netherlands), ChipKnip (Netherlands), Postchecque (Belgium), SEMP (Spain), and Quick (Austria).

The latter group represents examples of programs (e.g., VisaCash, Mondex, and Proton) that have been—or will be—introduced in multiple locations in different parts of the world, as well as single-nation (or city) projects; the transit projects are in individual cities or regions. These programs and projects are briefly discussed here; several are reviewed further in Appendix B.

Transit Multipurpose Programs

Multipurpose fare programs are a relatively new phenomenon in the transit industry. However, there is a growing number of regional fare integration and multiple-use efforts throughout the world. In North America alone, there are

smart-card-based regional integration projects under development—or partially in place—in northern and southern California, Seattle, Toronto, and Montreal. Washington, DC, is the site of a multipurpose transportation project (involving transit and parking) and is also pursuing regional integration. Multiple-use projects (with banks or universities) have been implemented in Atlanta (GA), Ann Arbor (MI), and Guelph (ON) and are under consideration in Cleveland (OH) and Wilmington (DE). In other parts of the world, multipurpose transit projects have been initiated in the United Kingdom, Germany, France, Australia, the Netherlands, South Korea, Hong Kong, and elsewhere. Table 1 summarizes many of the multipurpose projects involving transit; as indicated, most of these projects use (or plan to use) smart cards. Examples of several multipurpose transit projects in place or planned are summarized below.

Atlanta MARTA/VisaCash Project

The Metropolitan Atlanta Rapid Transit Authority (MARTA) participated, with Visa and three banks (NationsBank, First Union Bank, and Wachovia Bank), in the VisaCash stored-value (contact) card roll-out initiated at the Olympic Games in 1996. Visa covered the cost of installing card read-write units in two turnstiles in each MARTA station in mid-1996, and the VisaCash card (initially issued as a prepaid disposable card, later to be issued as a reloadable card) was accepted for direct fare payment; the system went live in May 1996. Card-vending machines (initially selling only the NationsBank card, but later First Union as well) were installed in key stations. This pilot project has tested the institutional and operational feasibility of an arrangement in which the transit agency does not produce the payment media, but rather participates as a "merchant" in a multiple-use card/EP program. MARTA represented the single largest use of the VisaCash cards during the Olympics, accounting for 25 percent of all VisaCash transactions. As of mid-1997, MARTA had extended the pilot through an agreement with one of the banks (First Union). (The overall VisaCash program is summarized under Financial Services and Other Programs and is discussed in greater depth in Appendix B.)

TABLE 1 Current and planned multipurpose transit projects

Location	Type of Program	Type of Card	Integrator/ Card/Supplier	Status (Start Date)	Size of Trial or Program
Newcastle, Australia	M	contact	AES/Fujitsu	trial (June 1996)	160 buses
Sydney, Australia	M	contactless	CTA/Mikron/Gemplus	in use	1 million+ cards ordered
Leuven, Belgium	M	contact	Banksys (Proton)	in use	terminals on buses
Montreal, Quebec	R	contactless	NA	planned (1997)	integrated system - 3 agencies
Guelph, Ontario	M	contact	Mondex/Royal Bank	trial (1997)	multiple use (Mondex)
Toronto/Ajax/Burlington, Ontario	R	contactless	Precursor/Mikron	trial	bus rtes, 2800 cards (Ajax); plan for comm. rail
Copenhagen, Den.	M	contact	DANMONT	trial (late 1995)	18 TVM's at rail stations
Chambery, France	M	contactless	NA	1 yr. trial (early 1995)	2000 student cards
Paris, France	R	contactless	Monetel/Innovatron	18-mo. trial (1997)	testing cards on bus, rail, railroad
Valence, France	R	contactless	Monetel	trial (1997)	1300 buses, 7 operators
Valenciennes, France	M,R	dual *	AES/Bull/Racom	trial planned (1997)	French Railroad and buses, multiple use planned
Marseilles, France	M	contactless	AES/various	trial (1994)	(E.C. GAUDI program)
Munich/Frankfurt/Hamburg,Germany	M,R	contact	Schlumberger	trial (1996), rollout (1997)	telephone/rail/bus card ("PayCard")
Germany	M	contact	Gemplus, G&D, ODS	in use (March 1996)	nationwide bank card ("GeldKarte")
Hong Kong	R	contactless	AES/SONY	trial (1996)	20,000 cards, plan for 3 million cards (by 1997)
Dublin, Ireland	M	contact	Schlumberger	3-mo. trial (Feb. 94)	25 buses, 2000 cards
Rotterdam, Netherlands	M	contact	Chipper	trial (1997)	regional transit (PTT/Postbank Chipper)
Netherlands	M	contact	Thomson, Bull, Philips	in use (Oct. 1996)	nationwide bank card ("ChipKnip")
Oslo, Norway	R,T	contactless	Scanpoint/Mikron	trial (1995)	1200 bus, 108 LRT, 69 rail
Seoul, S. Korea	M,R	contactless	Intec/Mikron/Gemplus	in use (Feb. 1996)	8700 buses, 1.2 million cards, plan for multi-use
Biel, Switzerland	M	contact	Bull	in use (3+ yrs.)	30,000 cards
Manchester, UK	M	contactless	AES/GEC, SONY	trial (1996)	5000 cards, 2700 bus
Phoenix, AZ	M	magnetic	MasterCard/VISA	in use (May 1995)	(accept credit cards on bus)
Culver City,Foothill, Montebello, CA	R	magnetic	GFI	in use (March 1994)	280 buses (Metrocard)
San Francisco, CA	R	contactless	TBD	trial planned (1998)	26 transit agencies
Ventura Co., CA	R	contactless	Echelon/Racom	in use (March 1996)	7 agencies, 3500 cards
Washington, DC	T	contactless	Cubic	1 yr.trial (Dec. 94)	19 stations,22 buses, 5 pkg lots, 1000 cards
Wilmington, DE	M	contact	TBD	trial planned (on hold)	150 buses (Wilmington Trust)
Atlanta, GA	M	contact	Gemplus, G&D	trial (May 1996)	33 rail stations (First Union/VISACash)
Ann Arbor, MI	M	contact	Schlumberger	trial completed (1997)	80 buses; 35000 campus cards
New York, NY	M, R, T	TBD	TBD	planned (on hold)	(plan for multiple use)
Cleveland, OH	M	dual*	TBD	trial planned (1998)	bus/rail & other (EBT, bank, retail, campus, etc.)
Seattle, WA	R	contactless	AES/SONY (trial)	trial completed (1997)	5 transit agencies, ferry

* contact & contactless
NA= data not available
TBD=to be determined

Type of Program: R=regional integration
T=transit and parking or tolls
M=multiple use

San Francisco Bay Area TransLink Program

This project involves development of a regional integrated stored-value card system for 29 transit operators in the Bay Area. It was initially intended that the project would use magnetic tickets, similar to the existing Bay Area Rapid Transit (BART) ticket, and the original TransLink ticket was tested at BART and two bus systems (BART Express and Central Contra Costa County) in 1994 and 1995. However, following a trial period, it was decided not to proceed with the original plan. The Metropolitan Transportation Commission (MTC), the lead agency, commissioned a study to determine the most appropriate technology. This study, completed in late 1995, evaluated technology and clearinghouse options, including the potential for private sector involvement. This study led to a recommendation for a regional integrated system based on contactless smart cards; it was also recommended that private entities be invited to participate in a range of system management and operational elements, particularly related to clearinghouse and equipment maintenance functions.

Seattle/Central Puget Sound Area Regional Fare Integration

The transportation agencies (i.e., bus, railroad, and ferry) in the Central Puget Sound region recently completed a Regional Fare and Technology Integration Feasibility study. This study recommended development of a contactless smart-card-based system that would facilitate easy transfers between the different systems and modes. Other key goals are to improve the operating efficiency of each individual agency and to expand market opportunities within the region. On the basis of the results of the feasibility study (completed in mid-1995), a detailed analysis of smart cards was undertaken, involving a business needs assessment and feasibility analysis for the recommended regionwide fare payment system. Concomitant to this analysis, three related efforts have been initiated: (1) the Washington State Ferries system is developing a fare collection system intended to be compatible with the regionwide system; (2) the Transportation Operators Committee is identifying policy issues associated with regional fare integration; and (3) the participating agencies are undertaking an assessment of issues and opportunities related to establishment of a regional revenue clearinghouse. On the basis of the findings of these efforts, the agencies in the region initiated a trial of contactless smart cards; the technology was tested for half a year (beginning in October 1996) on bus routes at King County Metro and Pierce Transit. The plan is now to proceed with implementation throughout the region over the next several years. (This project is discussed further in Appendix B.)

Washington Metro SmarTrip Project

In December 1994, the Washington Metropolitan Area Transit Authority (WMATA) began testing the feasibility of a contactless card (the Go-Card) for use on rail and bus, as well as at park-and-ride lots. The project included installation of read-write units in 24 rail mezzanines, 21 buses (on three routes), 1 bus depot, and 5 park-and-ride facilities, and tested the ability to use the Go-Card as a common payment instrument. Automated vending machines (AVMs) can read and display the value remaining on a Go-Card and add value to the card when payment is made in the AVM. The Go-Cards are used in the faregates to enter and exit the Metro system. On the bus, the maximum fare is deducted on entry by the "target reader" (3-zone fare, for example). The passenger must check out on leaving, using either the front or rear door; if a 1- or 2-zone ride is taken, the appropriate value is restored. The same concept is used to pay for parking fee collection. Data from rail, bus, and parking subsystems is transmitted by modem to WMATA's central computer system to apportion revenue. The test began with 5,000 Go-Cards given to Metro employees and 1,000 to selected Metro riders. Based on the successful completion of the demonstration, WMATA has decided to proceed with use of smart cards on the entire rail system. As of mid-1997, the agency was seeking interest on the part of financial services companies in some type of multiple-use arrangement. WMATA has also actively sought regional fare integration with other transit operators as part of the new fare program.

Ventura County (California) Passport Program

As part of Phase III of the Advanced Fare Payment Media Study (funded by FTA and California Department of Transportation), the contractor, Echelon Industries, installed contactless smart card read-write units on buses at the seven transit operators in Ventura County. The Passport is a monthly pass and stored-value card (smart card) that can be used on any bus in the County. All but one of the participating operators (South Coast Transit, the largest operator in the County) allows on-board recharging of the smart cards; after notifying the agency in advance, a card is activated for the month on the first use that month. The program went into service in March 1996. In the previous phase of the project, Echelon had tested these units (at three agencies: Gardena, Torrance, and LA DOT) with contact cards on some buses and contactless cards on others, in order to evaluate the user acceptance and performance of the two types of cards.

Ann Arbor Transportation Authority Smart Card Project

In conjunction with a multifaceted FTA-funded Advanced Public Transportation System (APTS) project, the Ann Arbor Transportation Authority (AATA) has tested a smart card system for use on its bus system. University of Michigan campus cards (a contact card known as the M-Card) now being provided on the Ann Arbor campus were accepted for fare

payment during a trial period. A total of 35,000 campus cards have been issued to date. The trial tested the feasibility of using the cards on buses and found the transaction time (nearly 4 sec) too long for the bus environment. AATA is now studying potential fare equipment, but would like to be able to accept the M-Card as well as transit-issued contactless cards.

Cleveland Multi-Use Smart Card Program

The Greater Cleveland Regional Transit Authority (GCRTA) is developing a multiple-use smart card program. GCRTA has explored possible multiple-use arrangements with a range of potential partners in the area; discussions have been held or are planned with banks, colleges, retail establishments, hospitals, sports teams, museums, other transit agencies, and the Ohio Department of Human Services. GCRTA envisions ultimately using a combination contact-contactless card. The agency began system design activities in the Fall of 1997. (This project is discussed further in Appendix B.)

Phoenix Credit Card Program

Valley Metro in Phoenix, Arizona, has been accepting commercial credit cards (MasterCard and Visa) for fare payment on its 400 buses since May 1995. On each boarding using a credit card, a single full-fare ($1.25 for local service, $1.75 for express service) is recorded in the database under the credit card account number. The cards are swiped through the same card readers used for the passes. At the end of each week, all trips for each card are "batched" and submitted to the credit card clearinghouse; the cardholders are then billed for their trips as part of their normal monthly bill. The clearinghouse reimburses the transit agency the next day for the trips submitted. The key to making the use of commercial credit cards viable was the decision to (1) not perform on-line verification of each account and (2) not issue a receipt with each boarding. Valley Metro accepts the risk of fraudulent cards, but only for a maximum of 1 week's worth of trips per card; the clearinghouse informs the agency if any of the cards used are stolen or otherwise invalid, and Valley Metro then enters the fraudulent account numbers into the card reader database. Thus, a subsequent attempt to use a bad card will be rejected. Valley Metro claims that there have been no problems with the program, as of its 6th month. The agency also reports that the program has been well received by users, although use has been limited to date. There were approximately 1,100 uses during the initial month of the program (May 1995), and this had risen to roughly 1,900 in the next month. Valley Metro has not yet actively marketed the program.

New York Metropolitan Transportation Authority MetroCard Program

The New York Metropolitan Transportation Authority (NYMTA) has implemented an automated fare collection system. The fare medium for the new system, MetroCard, is a magnetic-stripe stored-value card. Read-write ticket processing units have been installed on all buses and in all rail stations. The cards can be purchased at stations and nearby retail units in specific denominations and can be recharged as value is used. The project was designed with the intent of expanding the use of the card to the other transit operators in the region as well as for tolls and other uses such as telephone and retail. The MTA established a subsidiary, the MTA Card Company, to carry out the "expanded utility" plan by entering into a joint venture with a private company; the joint venture was to be responsible for implementing and administering the multiple-use arrangements—and for distributing the MetroCard in general. The MTA selected a prospective partner (Chase Manhattan Bank) and entered into negotiations over the terms of the partnership agreement. Unfortunately, the two sides were unable to agree on the financial terms of the deal (i.e., the nature of the transaction fees the NYMTA would pay to Chase), and negotiations were terminated in May 1996. The NYMTA would still like to proceed with integration with other transportation services in the region and is still considering multiple-use options, but the mechanism for administering these functions had not been decided as of this writing. (This project is discussed further in Appendix B.)

Wilmington (DE) SMART DART Project

This multiple-use project is intended to use a smart card (issued by the Wilmington Trust Bank) on Delaware DOT buses in Wilmington. The plan is for the 135 Wilmington buses to be equipped with smart card readers (attached to the existing fareboxes). The stored-value cards would be provided to bank customers and would also be made available to noncustomers (i.e., for use on the transit system, as well as for other services at specific locations). The U.S. DOT is funding the cost of the farebox modification on the bus fleet. The project is designed to demonstrate the use of smart cards on buses, the bank/transit institutional arrangement, and also the potential for employer involvement. Participating employers would provide cards to interested employees and would place funds (i.e., stored value) directly on the cards—probably through on-site add-value machines or ATMs. Because of delays in starting the overall smart card program, the project has been on hold since mid-1995; however, a renewed effort began in mid-1997.

Guelph Mondex Project

As part of the Mondex pilot project in Guelph, Ontario, Guelph city buses have been equipped to accept the card for fare payment. Initiated by the Royal Bank of Canada and Canadian Imperial Bank of Commerce (CIBC) in early 1997, this pilot represents the first transit use of Mondex. Mondex began testing a terminal for bus use in February 1997, and the

system went live on the city's 47 buses in April 1997. The initial results are considered positive, although Mondex has found that the transaction time with the current contact card (2 to 3 sec) is too slow for the transit environment; the organization is now looking at improving the contact card transaction speed or perhaps using contactless (or combi-) cards for use in transit applications. (The Mondex program in general is discussed in Financial Services and Other Programs—as well as in Appendix B. The Guelph pilot also is described in greater detail in Appendix B).

Toronto Regional Fare Integration

The Ministry of Transportation of Ontario has, for several years, been considering various approaches to introduce fare integration among the agencies serving the Greater Toronto Region. Early initiatives involved the introduction of integrated passes (paper and magnetic) for use on multiple operators. The most recent effort involves tests of integrated smart cards on buses and commuter rail. Contactless smart cards are used on buses in Ajax and Burlington and are planned for use in Mississauga as well. Equipment will also be installed at GO Transit commuter rail stations interfacing with these routes. These trials are part of the region's long-range development effort (i.e., to test different technologies and arrangements and determine the best regional integration approach). As of mid-1997, the overall project was on hold because of funding constraints in Ontario.

Manchester (England) One-Card Project

This contactless smart card system, which was tested on buses, was developed with the intention of expansion to a wide variety of purchase applications ranging from transit, commuter rail and taxi fares and parking charges to supermarket purchases and telephone calls. The project was financed by a joint venture (Payment Card Manchester Limited) owned by the transit agency, the Greater Manchester Public Transportation Executive (GMPTE), and the fare system integrator (AES Prodata); each partner owned 50 percent of the system. AES provided the equipment at no charge, and the transit agency paid a transaction fee for full-fare rides; there was no fee for "concessionary" (half-fare) rides. The card was used to pay *for* the fare, rather than for direct fare payment; in other words, on buses, the rider would tell the operator his or her destination (this is a zonal system) and the operator would enter the appropriate fare, which was then deducted from the farecard. It was planned to offer unlimited ride passes on the cards as well. The system was initially tested by 5,000 people who are entitled to concessionary fares (i.e., reduced fare for seniors and disabled.) This testing phase began in February 1994 in a single suburb of Manchester. The plan was to extend the test to more than 3,000 buses (operated by several different agencies), schools, and retail businesses throughout the greater Manchester area. The project was on hold (as of mid-1997) because of privatization of the transit operations; the operator had not yet agreed to accept and use the smart card system.

Sydney, Australia Integrated Card System

Another joint public-private multiple-use venture is being implemented in Sydney, Australia. This program has been developed by system integrator Card Technologies Australia Limited (CTA) in conjunction with Transcard Australia, a consortium of taxi and private transit operators; participants in the pilot project include the transit operators, Cabcharge Australia, McDonald's, Shell, Coca Cola, and leading banks. The initial 9-month trial was conducted in a major transit corridor in St. Mary's in western Sydney beginning in March 1995 with 2,500 cardholders; a full rollout was subsequently launched in western Sydney in May 1996, with an order for more than 1 million cards. Although the system (i.e., WICS) is based on a contactless card, it is designed as an "open system" to allow any transit operator or retail outlet to acquire the terminal and accept the card. Several entities have integrated WICS into terminals designed to accept contact or magnetic-stripe cards. A range of terminals (i.e., read-write units) is being developed and will be tested in the system; these include bus ticket issue machines with integrated validators, rail validators, taxi terminals, retail agent terminals (with bank certification), retail purchase terminals, vending machine integrated readers, toll booth integrated readers, and fast food outlet driveway integrated readers. One of the features of the system will be the ability to use the existing banking systems for adding value to cards; clearing and settlements will also be done through the banking system.

Hong Kong Contactless Card Project

The Mass Transit Railway (MTR), Kowloon Canton Railway (KCR), and three other transportation operators in Hong Kong have established a joint venture company—Creative Star Ltd.—for the purpose of introducing a common fare medium (contactless card) encompassing all major forms of public transport in Hong Kong: both heavy and light rail, bus, and ferry. The contract to install the system was awarded to AES Prodata (using SONY cards) in late 1994. The system trial began in early 1996, and more than 20,000 cards had been issued as of September 1996. The full system will involve approximately 3 million cards and 4,000 pieces of processing equipment. System rollout is scheduled to begin in mid-1997. A great deal of interest has also been shown by many non-transport organizations for potential future card applications.

Seoul (South Korea) Contactless Card Project

In what is currently the largest multipurpose transit application, contactless card terminals have been installed on all of

the 8,700 buses operated by the 86 bus companies (serving 449 routes) that make up the Seoul Bus Union. Intec Ltd., a Korean system integrator, built and installed the bus units and is handling the clearinghouse function; the cards, produced by Gemplus using Mikron's MIFARE system, are actually issued by a financial institution, Lucky Goldstar Credit Card Corp. More than 3 million cards have been issued (as of mid-1997), accounting for more than 2 million transactions per day. The system installation was completed in July 1996. Intec has been awarded a contract to place terminals on an additional 4,300 buses outside of Seoul, and the plan is to issue a total of 4 million cards in Korea by early 1998. In addition, operational tests on the Seoul subways were scheduled to begin in the Fall of 1997, and other (no-transit) applications for the cards are planned as well; these uses include ID cards for city officials, customer loyalty cards, and EP (in conjunction with Lucky Goldstar Credit Card Corp.)

Paris Contactless Card Project

The Parisian transportation authority (STP) and public transportation operators in the region, including RATP (the operator of subway and bus service in Paris), SNCF (French National Railway), and private bus operators, are developing a regional contactless card program. Cards are initially being tested in three suburban Paris communities, with an RFP for the full system expected to be issued in mid-1998. The cards and readers are being developed by a consortium of RATP and the card company, Innovatron; the consortium has developed a range of contactless (and combi-) card products, targeted to different markets. RATP has also licensed the technology to several equipment vendors and has formed an international association (ContactLess User Board, or CLUB) of transit operators interested in testing the technology and collaborating on the development of system standards; 12 agencies across Europe have joined CLUB at this point.

Several other transit agencies and regions are also considering multipurpose options, but the above are the farthest along (as of mid-1997). Programs initiated by financial or telecommunications institutions are discussed below.

Financial Services and Other Programs

Several banks and other types of institutions (e.g., telecommunications and postal companies) are developing, testing, and rolling out stored-value/EP programs in various parts of the world. These include international EP systems (i.e., Mondex, VisaCash, Proton, Europay Clip, and SEMP), nationwide programs (e.g., GeldKarte and PayCard in Germany, Danmont in Denmark, Postcard in Switzerland, Postchecque in Belgium, Chipper and ChipKnip in the Netherlands, and Quick in Austria), and regional or local programs initiated by banks or other entities. The last category includes stored-value campus cards (using smart cards) issued by several universities; current U.S. examples include five branches of the University of Michigan system, Florida State University, Oklahoma State University, and Washington University (St. Louis). Another type of local program is the stadium stored-value card; as of mid-1997, smart cards had been introduced for purchases in sports stadiums in Charlotte (NC), Jacksonville (FL), and Chicago, with plans underway for several others, including Philadelphia and San Francisco. The United States is actually behind Europe and Australia in seeing trials of general-purpose stored-value programs, but one public trial is now in place (Atlanta) and there are several others being tested by individual banks (e.g., at their own headquarters). Other trials are planned, including the joint Visa/MasterCard project in New York City. In all, there are more than 50 EP projects in place or planned around the world. Key examples, either already in use or in or near the testing stage, are described briefly below; more extensive summaries of several of these programs are presented in Appendix B.

VisaCash

VisaCash was the first stored-value smart card open system program to be launched in the United States. As indicated above, Visa formed an alliance with three banks to develop and implement the program: First Union, Wachovia, and NationsBank. The initial VisaCash card operating system was licensed from Danmont, the Danish EP system. Visa is serving as the network operator, performing transaction clearing and settlement for all the financial institutions. Financial institutions are responsible for card management functions, merchant solicitation and servicing, and transaction processing and settlement. Because merchants transmit individual transactions as part of the settlement process, the VisaCash system should be regarded as an "off-line, accountable" under the original definitions proposed by the Federal Reserve Bank.

Visa and the three banks worked aggressively to recruit merchants and customers. First Union projected that it would sign 5,000 merchant locations before the Olympic Summer Games. First Union planned ultimately to issue 1 million disposable and 300,000 reloadable cards; the bank planned to introduce a reloadable card to its customers later in 1996. NationsBank sought to appeal to the card collector market with 18 different cards and was the only bank allowing telephone orders with payment by check, money order, or Visa credit card. The banks targeted the standard cash-intensive merchants (i.e., fast food, gasoline, and telephone) to accept the card. It is estimated that, during the Olympics, VisaCash was used for more than 200,000 transactions, accounting for more than $1 million; this translates into an average of 11,000 transactions per day, with an average value of approximately $5.50 per transaction. By August, 4,200 terminals had been installed. VisaCash trials are also planned or under-

way in three locations in Canada (Vancouver, Toronto, and the Province of Quebec), as well as cities in Australia, Norway, Japan, and Taiwan. VisaCash will also be used in the forthcoming trial in New York City, as described below.

MasterCard/Visa Project

MasterCard and Visa, along with Chase Manhattan Bank and CitiBank, announced in April 1996 that they would be jointly implementing a stored-value pilot program in New York City. The pilot will be conducted in an area on the Upper West Side of Manhattan in late 1997. The program is expected to include 50,000 cardholders and about 500 merchants and is projected to run for 6 months. The commitment of both card associations to develop a single merchant terminal capable of accepting multiple cards is a significant step toward interoperability. Visa has indicated that the same system being used in Atlanta will be used in New York City (through CitiBank); MasterCard recently announced plans to use the Mondex system (through Chase) in the project, rather than its own MasterCash system, which had been demonstrated in Australia. Although disposable cards will not be used in the pilot program, they may be required in a full rollout to reach those consumers who bank at a financial institution that is not participating or who are unbanked.

Mondex

Mondex is a smart card EP program developed by Midland Bank, National Westminster Bank, and British Telecom (BT) in 1990. The initial pilot for the card was implemented in Swindon, England, and trials are in place or planned for several other parts of the world, including the United States (in the MasterCard/Visa New York project and at Wells Fargo Bank's San Francisco headquarters), Canada (the aforementioned Royal Bank and CIBC pilot in Guelph, Ontario), Hong Kong (Hong Kong Bank has begun two pilots), and New Zealand. In Canada, Mondex is now supported by the nine largest banks, and a pilot that had originated as a test of the Proton system (called Exact in Canada) was converted to Mondex in 1997. Following the purchase of 51 percent of Mondex by MasterCard International, seven American companies (Chase, Wells Fargo, Dean Witter/Discover, AT&T, First Chicago NBD, Michigan National Bank, and MasterCard) formed a company (Mondex USA) to market Mondex in the United States. Mondex is seeking to make the card issuance process more efficient and will market the program to nonissuing institutions promoting the fact that the consumer does not have to switch banks to participate.

As evidenced by the Guelph pilot, Mondex is very interested in transit applications and has been involved in discussions with many transit agencies in North America. With regard to the stored-value operating system, Mondex seeks to become a worldwide "branded" stored-value product; this is in contrast to Proton, for instance, which licenses its technology, but not its name, to issuers. Mondex has been developed to represent a "true" form of electronic money. The basic Mondex products are a smart card (card balance can be checked with a reader the size of a key fob) and a "wallet" the size of a small handheld calculator; the wallet can be used to check card balances, view the last ten transactions of a card that is inserted in the wallet, or transfer value from a card and either temporarily store it in the wallet or transfer it to another card. Value can also be added to a card at an ATM, a designated screenphone, or through the Internet using a personal computer with a card reader. Because merchants will transmit only a total amount during the settlement process, the Mondex system would be regarded as "off-line, unaccountable" under the definitions proposed by the Federal Reserve Bank.

Banksys/Proton

The Proton EP program, developed by the Belgian banking association Banksys, is the largest such program in the world. Banksys, owned by the major Belgian financial institutions, owns all of the 1,000 ATMs in Belgium. The Proton EP program was launched in February 1995 in two cities, Leuven and Wavre, located outside of Brussels. Cards are loaded through ATMs or through the approximately 300 reload terminals located at bank branches; approximately 3,000 reload locations are available in Belgium, with the expectation that this will reach 13,000 by the end of 1998. The Proton program has a terminal base of approximately 14,000. A national rollout of the program in Belgium was initiated in February 1996; as of early 1997, there were roughly 800,000 cards in circulation in Belgium, with plans for 7 million by the year 2000. In January 1997, Banksys began issuing cards combining debit functions with EP, and the ultimate plan is that all existing debit and credit cards will have a chip added to the card and will support the EP. Banksys has also licensed the Proton operating system to EP programs in other parts of the world, including the Netherlands, Switzerland, Australia (e.g., in the QuickLink project, described below), Brazil, Sweden, and Canada. American Express has licensed the Proton system for use in the United States.

In terms of transit applications, Banksys has stand-alone terminals on several buses operating in Leuven and hopes to integrate this process into the farebox at a later date. Banksys also planned to install automated ticketing machines at several bus terminals in 1997. Banksys recently announced a joint venture with ERG (parent of AESProdata) to introduce transit/EP projects in 11 countries in southeast Asia; a key aim of this venture is to introduce combi-cards for the transit market in 1998. With regard to the Proton operating system, although Banksys receives a record of all transactions performed by a card, it only retains the transaction record to verify the card balance and then discards the specific transaction information. This procedure was implemented to

avoid any concerns by cardholders that a record of their cash purchases would be maintained.

New South Wales (Australia) QuickLink

The QuickLink Card System, a stored-value pilot program, has been operating in Newcastle, New South Wales, Australia, since late 1995. QuickLink uses the Proton system. Approximately 20,000 reloadable cards have been distributed to consumers, and more than 500 terminals and 100 reload points are available. Cards can be reloaded either on or off line through point-of-sale (POS) terminals. The plan is ultimately to make the cards available at any location at which they can be used. There is an annual fee to the cardholder. The card can be used in various applications, including payphones, POS terminals, more than 300 retailers (including BP and McDonald's), and the New South Wales state bus and rail systems. For the transit uses, tickets are purchased with cash on the card. University of Newcastle Union students can use the card in the dining halls, and vending machine applications are also now being considered.

Danmont A/S

In 1991, the Danish banks and telephone companies agreed to establish an independent company called Danmont A/S as the "system operator" of their central clearinghouse for a national payment card. The objective was to introduce a nationwide prepaid smart card which could be used for purchases from vending machines, telephones, trains, buses, and parking meters. Cards are sold in denominations of DKK 100, 250, and 300 (the equivalent of between $20 and $50.) One-time cards (i.e., there is no capacity to add value) are used primarily to simplify the electronic money tracking logistics; the cost of the one-time cards is borne largely by advertising revenue. It is, however, expected that, in Phase II, rechargeable cards and add-value machines will be introduced. The system is off line, and the user remains anonymous. The system is managed by Danmont A/S, which provides the sole link between the card issuers, card and equipment suppliers, and service providers. This allows even small retailers to join the system as service providers, even if they do not have the requisite size to become an independent card issuer. Seven different manufacturers have invested in and now operate different services. Eight banks and a telephone company issue cards, and other manufacturers and card issuers have begun to express interest in the system. National implementation was begun in March 1993. The program is operational in 39 cities in Denmark and is expected to be available throughout the country (in 104 cities) by the end of 1997.

GeldKarte

The GeldKarte is a nationwide multifunction/EP smart card that will eventually be issued by all banks and savings banks in Germany. Initiated by the ZKA (Central Bank Association), the first trial of the card was March–September 1996 in Ravensburg/Weingarten. The circulation is expected to reach 55 million by the end of 1997, making it the largest existing national EP program. The card is already accepted at various locations, including retailers, vending machines, and small shops and kiosks, and for purchase of transit tickets. As of early 1997, there were more than 25,000 terminals accepting the card and more than 6,000 reload locations.

PayCard

A consortium of the German Railways (DB AG), Deutsche Telecom (DT), and VDV (representing approximately 350 public transit operators across Germany) developed the PayCard as a reloadable multiapplication smart card (with integrated EP). The card was introduced in pilot tests—with 3,000 users—beginning in April 1996 in five cities: Dresden, Hamburg, Munich, Stuttgart, and Frankfurt. Following successful completion of the initial test—98 percent of the test users expressed the intention to use them permanently—a decision was made to roll out the card nationwide beginning in 1997. As of mid-1997, there were 50,000 cards in circulation, and the intended circulation by the end of 1997 was 600,000. A key attraction of the card is the ability to reload it at any of DT's nearly 90,000 card-operated public telephones; funds can be directly debited from the user's bank account through these units.

Swiss PTT Postcard

The Swiss Post, Telegraph and Telephone (PTT) implemented a smart card EP program in Biel/Bienne, Switzerland, in 1991. Initially, 13,000 consumers were given the Postcard, which is a contact smart card; more than 1.3 million Swiss consumers now carry the Postcard. For almost the last 2 years, the Postcard has been co-branded with the MasterCard logo, giving the card wider acceptance than it had originally received. The Postcard can be used to purchase various items and services, including telephone calls and farecards from terminals at rail and bus stations throughout Biel/Bienne. The pilot project has shown the Postcard program to be profitable as well as technologically feasible. The system has been operated at costs lower than originally expected, indicating that such a system could be run at a profit. Vendor acceptance of the card product has been varied. Service providers have given mixed reviews—vending providers found the Postcard to be a relief from dealing with high coin volumes; other POS vendors felt the card was not flexible enough to accommodate high-value transactions.

Europay Clip

Europay International, the European payments association, in June 1996 announced creation of the first multi-

national, multicurrency smart card EP system. The card product, called Clip, incorporates EMV interoperability specifications. Trials of Clip have been underway in Spain, Italy, Iceland, and the Czech Republic since early 1997. The plan is to launch the EP product internationally in mid-1997 in combination with either debit or credit cards. Clip is intended primarily for low-value transactions such as ticket machines, parking meters, or Internet access.

Chipper

PTT Telecom and Postbank in the Netherlands have introduced the Chipper multiapplication EP system. The system is open to a broad range of card issuers. Several different functions can be combined on a card; these include reloadable purse, home banking, ID, Internet access, retail loyalty programs, parking charges, and transit. Cardholders can load value onto the cards from bank accounts via the 20,000 public telephones. The system also offers the Telechipper, a low-cost card reader that can be attached to a private telephone or personal computer; the Telechipper allows remote access to retailers or other providers—through the transmission of audio signals. The plan was to issue a million cards in 1997, with as many as 10 million in circulation by 1999. There are several trials underway, including use by retail chains, provincial authorities, and transit operators (e.g., the regional transit authority in Rotterdam).

ChipKnip

The Dutch banks have collaborated to offer a multifunction smart card, ChipKnip ("chip wallet"); besides EP, the card can be used for loyalty programs, identification, and ticketing. Interpay Nederland is responsible for the EP; a separate company, Easychip, handles the other functions. This card, to be available nationwide, was first tested in Holland beginning in October 1995. The national rollout began a year later. Current circulation is approximately 2.5 million, but is projected to reach nearly 12 million by the end of 1997—out of a national population of 15.6 million. As of early 1997, there were more than 35,000 terminals; this is expected to grow to 100,000 by the end of the year. Reloading is possible in about 5,000 locations or can be done at home. The card can be used at more than 1,200 retailers, including McDonald's, and can be used to buy transit tickets and pay for parking.

Postchecque

La Poste, the Belgian Post Office, has developed a multifunction, multiclient EP called Postchecque; the card is considered competition to the other Belgian purse, Proton. Postchecque is available for use by any interested entity. As of 1997, agreements had been signed with several major retailers and were being negotiated with Belgian Telecom, oil companies, and transit operators in Belgium.

SEMP

Sociedad Espanol de Medios de Pago (SEMP) and Visa Espana have introduced a stored-value card that is designed to be licensed to other entities around the world. The card was initially tested in 1994 on a university campus in Barcelona. As of early 1997, the card, which supports multiple currencies, was in use in Argentina, Colombia, and Brazil, as well as in Spain; nearly 3 million cards were in circulation at that time, with a plan for more than 5 million by the year 2000. The SEMP card can be used at 55,000 POS terminals; 45,000 public telephones; and 4,500 ATMs; in certain transit applications. Reloading is possible at the 4,500 ATM locations.

Quick

The Austrian Quick stored-value scheme was developed and is issued by Austria Card in conjunction with EPA/APSS. The card was first tested in Eisenstadt in 1994 and, as of early 1997, was used by approximately 4 million Austrians; the goal for late 1999 is 5 million. About 10,000 terminals were in use in 1997, with 350 reloading locations. The Quick card can be used in vending machines, on the Internet, and at various retailers (including large chains).

EPS/TTI

Electronic Payment Systems (EPS) was established in 1992 to provide transaction processing support for the MAC ATM network and to develop additional card- and banking-related products and services. EPS is owned by five banks: Banc One Corporation, CoreStates Financial Corporation, KeyCorp, National City Corporation, and PNC Bank Corporation. In 1995, EPS announced plans for a nationwide stored-value smart card. The technology for this system was developed by Touch Technology, Inc. (TTI). The system was designed to allow card issuers flexibility in how they structure their own stored-value programs and is compatible with multiple smart cards and terminals. EPS began demonstrating the smart card system for member financial institutions in late 1996. In August 1997, TTI acquired the system from EPS and will market it along with its own closed stored-value system.

Summary

As can be seen from the number of projects reviewed here, there is a great deal of activity in the development and implementation of multipurpose payment programs. In transit, electronic payment media, particularly smart cards, have facilitated the consideration of new approaches to regional fare integration, as well as integration of transit and other payment methods. Various models are being considered for

each type of multipurpose arrangement. Efforts to date have been marked by both successes and setbacks. For example, in one case (MARTA/VisaCash), a joint transit and financial institution program was successfully implemented in a very short time, while another joint effort (NYMTA/Chase) failed to come to fruition. However, the two programs differ in scale, complexity, and level of expectation and risk (on both the transit and financial sides). Furthermore, the background and settings are very different in the two projects. Thus, there is no reason to conclude on the basis of these limited results that one approach works and the other does not. We must consider the details underlying both efforts and look at the lessons from each. By and large, transit-oriented multipurpose projects of all types represent very recent developments. Thus, they have tended to raise more questions than to provide answers at this point.

As in the transit arena, the multipurpose program focused on financial transactions (i.e., the stored-value or EP system) is in its infancy. Unlike transit, developments in the financial arena, with global effects at stake, have been marked by both fierce competition and new alliances—often involving the same parties. With basic EP systems taking several different forms (e.g., the Mondex cash substitute model versus the VisaCash credit/debit card model), the major system operators are vying for the allegiances of new programs. Probably there will be a shakeout among the competing systems, as the desire for interoperability—coupled with preferences expressed by the marketplace—reduces the number of competing operating systems.

The degree of acceptance, first by individual card issuers, then by merchants, and finally by consumers, will also affect the success of specific programs, as well as many of their operating parameters (e.g., the pricing of transactions and card use). This acceptance has only recently begun to be tested in many parts of the world (including North America), although a few programs have now been in place for several years. The early results from these efforts have been generally positive, but use has generally grown more slowly than had been anticipated. All prospective participants (i.e., issuers, merchants, and consumers) have questions about stored-value smart card programs.

Issuers will want to know the following:

- How will their organizations benefit from issuing these cards?
- How much will it cost them to issue these cards?
- What are the institutional, legal, and technological issues that they will face in instituting such a program?
- Will merchants and consumers accept this program?

Merchants will want to know the following:

- How will they benefit from accepting these cards?
- How much will it cost them to accept these cards?
- Will their customers use the card?

Finally, consumers will want to know the following:

- How convenient will it be for them to use the card (where can they get it, where can they refill it, and where can they use it)?
- What happens if they lose the card, or if the reader does not work?
- Will their privacy be compromised by using the card?
- How will they benefit from using the card?
- How much will it cost them to use the card?

As different types of programs continue to roll out and the industry gains additional experience, these questions will start to be answered. The full answers will not be available until this new concept becomes sufficiently understood and tried on a broad scale. The following chapters discuss the issues raised by these questions in an attempt to provide at least a framework for addressing them.

CHAPTER 3

INSTITUTIONAL, OPERATIONAL, AND LEGAL ISSUES

INTRODUCTION

As discussed in the previous chapter, a multipurpose payment program can be established in a range of institutional settings, including a transit-only environment, a more general public transportation setting, or a broader "open" environment. The institutional setting and arrangements will depend largely on who is initiating the program (e.g., a transit agency or a financial institution) and the capabilities and constraints (e.g., financial, administrative, legal, and technological) and goals (e.g., reduce costs and increase revenues) of that entity. This chapter reviews the alternative institutional arrangements, including advantages and disadvantages, as well as operational and administrative and legal and regulatory issues that must be addressed in establishing a multipurpose payment program.

INSTITUTIONAL ARRANGEMENTS AND ISSUES

The key institutional parameters that need to be established in a multipurpose payment program include

- Whether the system will be closed or open,
- Whether the system will be administered by the transit agency (or group of agencies) or by a financial or other private entity, and
- The types of entities involved, their roles, and their legal and organizational relationship.

Roles in a Multipurpose System

Generally, a multipurpose program will involve the following basic roles:

- User—anyone who uses the payment media to purchase services or products from merchants;
- Merchant—an entity (e.g., a transit agency or a retailer) that will accept the media as payment for the provision of a service or a product;
- Issuer—the entity (e.g., the transit agency or a bank) that provides the media (and is identified on the media) and pays the merchants on the basis of the stored value they have received from users;
- Distributor—a POS and recharge location of the media; media are received from the issuer, and records of transactions are sent to the issuer; a distributor can be a bank ATM, a transit ticket vending machine, a transit agency ticket agent, an outside vendor, or a participating merchant;
- Acquirer—an entity that obtains card transaction information from merchants and transmits it to the appropriate issuer; acquirers may not be needed in a closed system; and
- Clearinghouse—an entity or organization responsible for managing many of the support functions for the multipurpose program (e.g., card management [consisting of issuance, distribution, and so forth], revenue management [consisting of collection, reconciliation, and settlement], customer service, and marketing).

The clearinghouse concept tends to differ in scope from one project to the next, but is key to any multipurpose transit fare program. In a closed system in particular, the clearinghouse may well carry out the requirements associated with issuer, distributor, and acquirer. In the MTC (San Francisco) TransLink project, for instance, the consultants have defined the clearinghouse quite broadly: "The TransLink ClearingHouse has the mission and the responsibility to manage the TransLink services and to provide, either using its own resources or through purchased services, all of the functional support necessary for the operation of TransLink within the Region, with the exception of the provision of the actual transportation services and the procurement and maintenance of the fare collection and related equipment at the individual Operators." (*1*) The functions envisioned as falling within the purview of the TransLink ClearingHouse include (*1*):

- Fare media distribution, consisting of
  - –Media procurement,
  - –Inventory control,
  - –Encoding (of value and discounts),
  - –Third-party vendor sales and vendor recruitment,
  - –Distribution of fare media,
  - –Fare media funds collection,
  - –Replacements for lost media,
  - –Marketing, and
  - –Customer service;

- Ridership tracking, consisting of
  - –Data capture and collection,
  - –Data reconciliation,
  - –Settlement among participating operators and making of adjustments, and
  - –Reports and record-keeping; and

- Treasury and cash management, consisting of
  - –Funds pool accounting,
  - –Billing and collection (third-party vendors),
  - –Annual audit,
  - –Management information system support,
  - –Fraud control,
  - –Ensuring system integration,
  - –Maintaining security and data integrity, and
  - –Ancillary services (e.g., maintenance services for TransLink equipment and training on TransLink processes).

The Seattle/Central Puget Sound Regional Fare & Technology Coordination study has identified a similarly comprehensive clearinghouse operation, with responsibility for largely the same functional areas as listed above; the general categories identified there are service management, fare media distribution, revenue collection and management, data management, and customer service. (2) In both cases, all multipurpose fare-related requirements are assigned to a comprehensive clearinghouse organization.

With respect to the settlement aspects of the clearinghouse, a multipurpose transit payment program may consider using the existing Automated Clearing House (ACH) infrastructure linking U.S. banks. The ACH system provides processes, operations, and systems for the electronic exchange of financial transactions. Funds for payables and receivables between banks authorized to use the ACH system are transmitted through regional automated clearinghouses administered by the National Automated Clearing House Association (NACHA). Each clearinghouse, in turn, directs the funds to the appropriate regional Federal Reserve Bank for settlement. All banks belong to the Federal Reserve system; however, a bank must apply for participation in the ACH to be able to initiate an ACH transaction. Those participating in the ACH must maintain an account with the clearinghouse either directly or indirectly through another financial institution (called a correspondent bank).

Basic Institutional Approaches: Open Versus Closed Systems

The decision to pursue an open or a closed system (or something in-between) for multipurpose media reflects several factors, including who is initiating the program, the goals of the initiating entity, and the capabilities of this entity. From a transit agency's point of view, the options for a multipurpose program can be categorized as follows:

- Closed (Transportation-Only) system (See Figure 1)—In this option, a transit agency or a group of agencies (possibly including other nontransit, transportation providers) issues fare media usable on any of the agency's (or member agencies') services. Individual functions (e.g., card production and distribution, revenue settlement, equipment procurement, and perhaps maintenance) can be provided directly by one or more of the member agencies, by a private integrator or vendor, under contract to—or in partnership with—the agency or agencies, or by a newly created entity established by the agency or agencies. Examples of this approach include the Hong Kong Creative Star project, the Ventura County Smart Passport project, and the regional integration project being developed in the Seattle area.

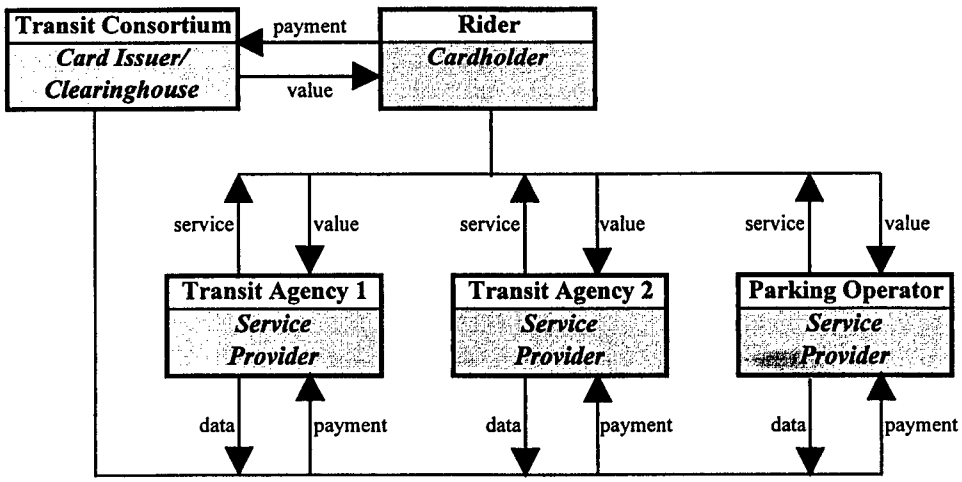
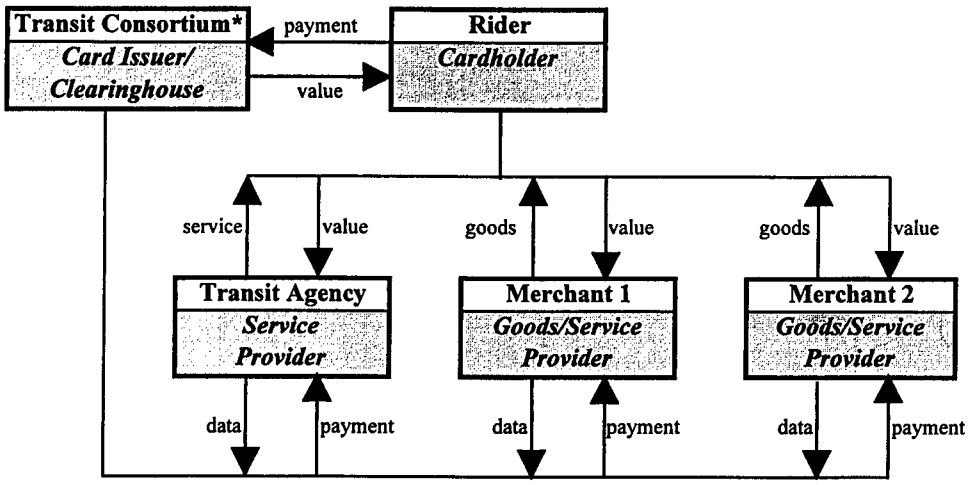


Figure 1. Closed payment system (transportation-only, multi-operator).

- Closed multipurpose system (See Figure 2)—In this option, the transit agency-issued fare media can be used for certain other purposes (e.g., vending, telephones, newsstands) in addition to transportation. Again, the support functions can be provided by the agency, by a private contractor, or through a partnership with a financial institution, integrator or vendor, or other private entity. Examples of this approach include the Sydney WICS project, the original NYMTA/Chase "expanded utility" project, and the Manchester (GB) smart card project.
- Open system (See Figure 3)—In this approach, the transit agency or group of agencies accepts media from one or more outside issuers. There are several possible models for a transit agency's participation in an open system. For example, the agency can become a participating "merchant" in a general EP/stored-value card program or an application in a multiapplication program (but will probably have to pay transaction fees); the agency can become a formal partner in the arrangement (sharing both the benefits and the financial risk involved in the venture); or the agency (or consortium) can administer its own program (but allows outside issuers' cards to be used—provided they meet the program's requirements). In the first arrangement, the transit agency does not issue cards itself. In the second scenario, the agency may be one of the multiple card issuers or may "co-brand" the cards issued by others (i.e., the card would carry the transit agency's name as well as the issuer's name). In the third scenario, the agency or group of agencies issues the cards. Examples of the general open system approach include the MARTA/VisaCash, Ann Arbor Transit Authority/Univ. of Michigan, and Guelph Transit/Mondex projects, as well as the nationwide EP projects in Denmark, Germany, and the Netherlands. Finally, although not involving stored-value cards, Valley Metro's (Phoenix) acceptance of commercial credit cards is an example of transit's participation in an open system.

The closed system option expands the current fare collection system in place at every transit agency to incorporate neighboring transit services—and perhaps other modes (e.g., parking and ferries) as well. As shown in Figure 2, the second option is essentially an extension of the first, with the farecard's use being expanded to include functions beyond transportation services. In New York, for instance, the NYMTA began by introducing the stored-value MetroCard for transit use only, but planned to add the expanded utility capabilities through a partnership with a private firm. The third approach—the open system—represents a fundamental change from the way transit agencies currently manage fare collection activities. Although some transit agencies will have an interest in participating in such a program and not issuing their own electronic fare media, others will prefer to retain full control over their fare systems and will not wish to participate as a merchant in an open program.

What may occur is an evolution from a fully closed system to a closed multipurpose system to an open system. This would likely occur over several years, given that an agency (or integrated regional program) might want to wait until bank-issued cash cards are well established. Another possibility would be for a transit agency to enlist in a bank-initiated multiple-use or multiapplication program but provide its own multipurpose media as well. For the foreseeable future, most transit agencies will need to remain in the fare collection business to some extent, because they will have to continue to collect cash fares (at least on buses) or tokens and



* may be partnership with financial institution or equipment vendor/integrator

Figure 2. Closed multipurpose payment system.

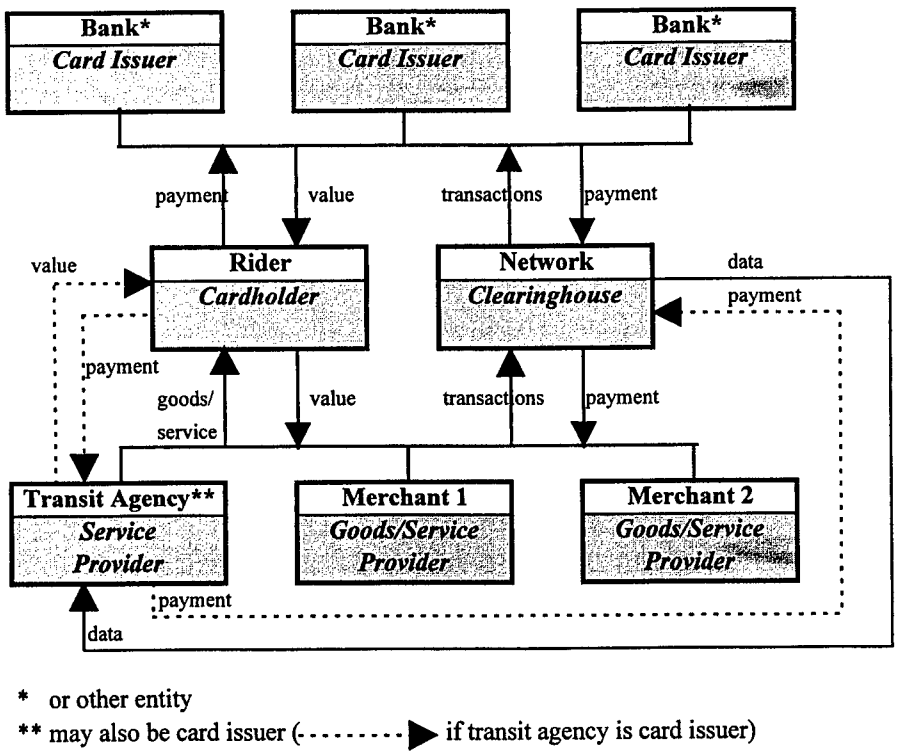


Figure 3. Open payment system.

tickets to accommodate occasional riders. Thus, agencies may decide that the benefits of administering their own multipurpose programs outweigh the benefits of participating in an open system. For example, in the Seattle regional fare integration project, it has been recommended that the multipurpose fare system be administered by the consortia of transit agencies in a relatively closed system initially, with possible expansion to a more open system once smart cards become more widespread as a general payment method.

The San Francisco TransLink project, although being developed essentially as a closed multipurpose system, is envisioned as being open to compatible media issued by outside entities. The TransLink Program Plan calls for the system to "accept for payment of transit services cards issued by any entity provided: 1) the cards meet the TransLink standards, 2) the issuing entity has been properly investigated to ensure its legitimacy, and 3) a satisfactory business arrangement is reached between the issuing entity and operators (individually or collectively)." (*3*) This plan also recommends that the TransLink program maintain maximum flexibility in terms of media technology—the system should be designed to be able to accept contact as well as contactless cards in the future; the card-reading devices should thus be able to accommodate readers for both types of cards, although it was originally suggested that only the contactless readers be installed initially. The introduction of combi-cards (i.e., combination contact-contactless cards) will now mean that such flexibility can be achieved without the need for contact card readers.

As reflected in both the Seattle and San Francisco plans, the availability of a viable alternative (i.e., to an agency developing and administering its own program) is an important consideration for the transit agency in choosing an approach. In Atlanta, for instance, the rollout of the VisaCash card by the three banks enabled MARTA to take advantage of the opportunity to accept the cards for fare payment. Until such programs are introduced in other locations, transit agencies do not have a similar option available to them. The opportunity for transit agency entry into the multipurpose payment world can dovetail with the implementation of EP programs by financial institutions. However, those agencies unwilling to wait for the arrival of EP and multiapplication cards must initiate their own efforts—although several financial institutions and other entities involved in payments products and services have expressed interest in assisting agencies with this process, through partnership or contracting arrangements.

Advantages and Disadvantages of Open Versus Closed Systems

Assuming that an open system option is feasible, the transit agency should examine the advantages and disadvantages of the alternative approaches. These generally relate to the following issues:

- Degree of financial risk involved versus the potential financial benefit. In an open system, the transit agency has lower expenses and may have little financial risk, but

will be less likely to receive the potential financial benefit of the system. In a closed system, the transit agency must assume the full expense and risk associated with introducing a multipurpose system, but will be able to retain all (or part of) the financial benefits—the share of the financial benefit the transit agency receives will depend on the specific financial arrangement it has with the system integrator.

- Control over the fare collection system. In an open system, the transit agency may have to yield direct control over part of its fare collection process, in contrast to the situation in a closed system, in which the agency has complete authority over all fare-related decisions.
- Relative appeal of the media to the customer. That the payment media in an open system can be used for a broader range of functions and can be purchased more widely should appeal to the transit rider more than a closed system's transit-only card. This could translate into higher ridership in the open system.
- Card distribution and revenue reconciliation and settlement. In an open system, the transit agency probably does not have primary responsibility for these functions. In a closed system, the agency must maintain overall responsibility for media distribution and settlement of revenues (among the program participants), although in most cases those functions will be directly handled by the system integrator.
- Exposure to fraud (related to use of "bad" cards). An open system will result in greater exposure for the transit agency to possible fraudulent card use than will a closed system—because of the wider distribution of cards and lower ability of the agency to maintain lists of bad cards.
- Flexibility in pricing. With a card having a single EP, a transit agency will have less flexibility in an open system than in a closed system in setting the card purchase price (i.e., if discounts or purchase bonuses are desired). On the other hand, a multiapplication card, in which there is a separate transit purse, will preserve this flexibility even in an open system.

Thus, an agency or group of agencies considering an appropriate approach must weigh these advantages and disadvantages against its own goals and constraints. Each potential program initiator and participant has its own reasons for pursuing a program (e.g., reduce costs or improve customer convenience) and has its own constraints (e.g., limited funds). The following section summarizes the types of goals and capabilities and constraints that may influence an agency's strategy. This is followed by a discussion of the impetus for financial institutions' interest in multipurpose media programs and joint payment arrangements.

Transit Agency Goals and Constraints

For transit agencies, the major reasons for considering multipurpose programs include the following (these potential benefits are discussed further in Chapter 5):

- To institute seamless regional transit travel through use of a universal ticket (i.e., in a multioperator region), while allowing individual operators the ability to retain their own fare structures and promotional programs;
- To reduce fare collection costs (e.g., by having a bank or other private entity provide media, by introducing economies of scale in the implementation and management of fare collection activities, or by using lower maintenance fare collection technology);
- To generate additional revenues (e.g., through reduced fare abuse and evasion, expanded utility arrangements, float, expired card value, and advertising on media);
- To improve customer convenience (e.g., through the use of prepaid/stored-value media in general or through the use of easier-to-use media and through expanding the distribution network for prepaid media);
- To expand the market base for transit (e.g., by accepting commercial payment media or by increasing employer participation) and increase ridership (e.g., through the institution of loyalty tie-ins with merchants or frequent rider-type bonuses);
- To improve data collection and reporting capabilities;
- To improve equity and timeliness of the reconciliation and distribution of revenues collected in a multioperator system;
- To improve the ability to modify fare policies and structures (e.g., to better target specific markets); and
- To get out of the "payments and settlements" business (i.e., to use the capabilities of financial institutions).

The specific goals and objectives of the agency or group of agencies will influence the type of program to be pursued. For instance, if regional fare integration is a key motivating factor (at least initially), as it is in the San Francisco and Seattle areas, then some type of closed system administered by one or more transit agencies is the likely approach. If, on the other hand, the reduction of fare media distribution and processing costs is of greater importance, then the transit agency may prefer to participate in an open multiple-use or multiapplication program initiated by a financial institution.

Several other factors will influence the type of program initiated. These include the following:

- Besides the transit agency's goals, its capabilities and constraints will be key factors. For instance, some agencies may be legally prohibited from entering into partnership-type agreements with private entities (legal and regulatory issues are addressed later in this chapter). In other cases, an agency may simply be unwilling to yield direct control over its fare payment system.
- The availability of resources will also influence the decision; an agency (or group of agencies) with insufficient funds to acquire and implement a new fare system will obviously be more interested in a scheme that reduces its own financial requirements. The consortia of transit agencies in both Seattle and San Francisco have each

established capital funds large enough to fund at least the initial portions of new regionwide fare programs. The NYMTA, on the other hand, sought to develop an agreement with a major bank to act as a partner in instituting and administering its expanded utility program, rather than attempting to fund the entire project on its own.

- The availability of a commercial stored-value or multiapplication card program in a particular region is also an important factor. Stored-value programs are just beginning to be tested in limited trials, and it will probably be a few years before cash cards are available on a widespread basis in many locations. In the meantime, however, financial institutions are interested in developments in the transit industry, and several seek to participate as a partner or contractor in transit-initiated multipurpose efforts.

The Impetus for Multipurpose Media Programs: Financial Institutions

As suggested by the examples described earlier, the growing interest in multipurpose payment arrangements in the transit industry has been paralleled by increasing consideration and testing of prepaid/stored-value media by financial institutions. Banks and other financial institutions see a significant potential market in capturing small cash purchases through prepaid media. The banks hope to generate revenues through fees on transactions (and possibly card use fees) and to reduce costs by requiring fewer bank tellers.

It is estimated that, worldwide, there are more than $8 trillion worth of cash expenditures each year; nearly a quarter of this is in expenditures of $10 or less. In the United States alone, there are roughly 340 million cash transactions per year, accounting for about $1.7 trillion; more than one-third of this total is on transactions less than $20. Regarding the possible market penetration, the U.S. Congressional Budget Office (CBO) has estimated that, "If consumers eventually use stored-value cards in even a small fraction of all cash or targeted transactions, then the potential market for stored-value cards could be roughly $20 billion per year, similar to the market for traveler's checks." (*4*) Although the CBO notes that it could take many years to reach such a level, the report acknowledges that "The number of small cash transactions is so large that even a modest penetration by stored-value cards could create a substantial market for them." (*4*)

The interest in stored-value media has also been driven to a large extent by the growing consideration of smart cards for various payment applications. (See, for example, Appendix C, which presents the results of a survey of financial institutions.) Beyond their advanced processing and memory capabilities, smart cards are thought to offer more security and resistance to fraud than magnetic stripe cards. The financial services industry sees smart cards as the future standard technology for all payment-related media (e.g., credit cards, electronic benefits transfer, medical claims processing, and retail loyalty programs) as well as access and identification media for on-line transactions in the near future. Stored value is considered one of several key applications in a multiapplication environment and is the first smart card application that will be rolled out by banks in the United States, as evidenced by the VisaCash pilot in Atlanta and the joint MasterCard/Visa/Citibank/Chase project planned for trial in New York in late 1997.

Another goal in offering stored-value cards is to expand the range of services provided to consumers, as banks seek to improve their status in the increasingly competitive payments environment. Nonbanks now provide a range of services and products formerly offered primarily by banks; these include credit cards, travelers checks, money market funds, and payroll processing, among other services. Meanwhile, in line with the dispersion of functions among a range of service and product providers, banks and other financial institutions are broadening their activities as well. For instance, several banks are seeking to become "information processors" as well as payment processors for client companies. In both of these areas of development—the direct provision of stored-value cards and the move toward providing a greater range of processing services—several financial institutions see transit agencies as a key potential partner.

Transit represents a natural market for prepaid media and offers significant potential benefits to financial institutions seeking to introduce stored-value cards. The number of transit users and transactions—particularly in larger metropolitan areas—is quite large and thus offers a ready-made market for the introduction of bank-issued prepaid media. It is estimated that, worldwide, there are on the order of 25 billion transit transactions per year, roughly 2 billion of these are in North America. Thus, tying in with a large transit agency offers a bank several potential benefits, including

- The opportunity to quickly establish a critical mass of users of the bank's prepaid media;
- Access to new potential customers for its other products and services (e.g., bank accounts), perhaps through co-branding of fare media;
- Access to transit facilities (particularly rail stations) for possible installation of bank ATMs—to dispense the prepaid media and to provide for other banking functions; and
- Access to merchants closely affiliated with transit (e.g., vending machine operators and newsstands).

Moreover, transit use is particularly well suited to the use of prepaid media and stored value in particular: transit involves a high number of low-value transactions and requires rapid transactions (i.e., on-line authorization for payments is infeasible). Furthermore, transit agencies typically require exact payment and do not give change. Most transit agencies offer some type of prepayment, typically in

the form of unlimited-ride passes or multiple tokens or tickets. Of particular relevance, the transit industry has been using stored-value media for more than 25 years. Although the concept of stored value has spread slowly among U.S. transit agencies, the approach has been used effectively in several agencies and is now being implemented in several others. Thus, the transit industry has experience with this approach, and its riders are accustomed to the general notion of prepayment.

As the financial sector begins to introduce prepaid media for general purposes, it should therefore be looking at transit as an important early participant (i.e., as a merchant). Meanwhile, there are also emerging opportunities to assist transit agencies through partnership and contracting arrangements in the establishment and administration of their own stored-value programs. Financial institutions can offer their expertise in managing the various elements of the payments business, including the back-end reconciliation and settlement functions as well as the production and distribution of the media themselves.

That the EP/stored-value concept has not been proven in the general U.S. commercial marketplace means that financial institutions see certain risks associated with investing in infrastructure to support it. The aforementioned CBO study points out, for instance, that stored value and other new forms of electronic payment ". . . face significant technical, marketing, and policy uncertainties." (*4*) Although financial and other institutions see potential in joining with transit agencies to introduce the new payment media, the benefits and risks—and how both should be apportioned among the potential partners—have not yet been demonstrated. Thus, there are many details to be worked out in establishing relationships considered to be mutually beneficial. Efforts such as the bank-transit collaboration initiated in Atlanta and the unsuccessful negotiations in New York will be studied closely as both the financial and transit industries begin to consider appropriate types of agreements.

Management and Financing Strategies

Clearinghouse Management Options

Besides addressing the question of how open the payment system will be, the transit agency or consortium must identify the various management and operational functions required, who will be responsible for these functions in administering the payment system, and how the system will be financed. In a fully open system, the transit agency or consortium plays the role of merchant and possibly co-issuer/distributor. In a closed system, however, several options can be considered, depending on the management functions required and the capabilities of the transit agency or agencies. For instance, the transit agency or consortium initiating the program can retain direct responsibility for all or most functions, or it can involve the private sector (through a contacting or partnership arrangement); these options are discussed below.

The types of functions required in the implementation, management, and operation of the payment system will depend largely on the complexity of the system, including the number and range of services that can be accessed using the farecard. A closed system may be less complex and may have fewer functions than an open system; however, the transit agency or consortium will likely face a greater range of requirements in a closed system, because it is responsible for the overall program. In a closed system, adding eligible services (i.e., beyond transportation) increases the complexity—although it also presumably increases the benefit to the transit agency or agencies. The basic management and operational options for the clearinghouse are as follows:

- Direct transit agency responsibility for all functions, with contracts for certain specific functions;
- Third-party contracting for overall operation of clearinghouse, with possible subcontracts for certain functions; and
- Partnership with a private company, with the responsibilities divided between the partners or formation of a new entity (essentially a "joint venture") that is responsible for all functions.

The selection of the most appropriate option will depend on a combination of factors, including the transit agency's or consortium's primary goals, capabilities, and available resources, as well as any legal constraints (e.g., related to private involvement in managing public funds). The interest on the part of private entities must also be considered; although a range of financial and other private institutions have indicated considerable interest in participating in transit projects in general, a preference for partnership or contract arrangements will depend on their perceptions of the potential rewards—and risks—in each particular case.

Financing Approaches

With regard to financing implementation and operation of the system, the private contracting options would most likely involve a traditional procurement approach, in which the transit agency issues a request for bids (or proposals) and negotiates a contract. An alternative would be a turnkey/lease partnership approach, in which the system integrator implements the system—and perhaps manages the clearinghouse and maintenance elements—on a turnkey basis and leases the equipment to the agency. In other words, the leasing arrangement represents a means for the agency to finance both the capital and operating costs without having to make large one-time payments. Depending on the partnership arrangement, the transit agency could retain all system revenues, or revenues could be shared with the integrator.

In the third basic financing arrangement, the integrator would finance the system in return for a transaction fee from the transit agency; again, the specific partnership agreement would dictate who receives auxiliary revenues (e.g., from float and merchant fees). The key issue in this last arrangement is the nature and level of the transaction fee; details that must be resolved include which transactions are involved (e.g., all fare transactions versus only those made using the smart card), what expense items does the fee cover (e.g., equipment installation as well as maintenance, clearinghouse operation, and other), and is there a guaranteed minimum fee. Thus, such agreements will depend largely on assumptions regarding the potential benefits as well as the potential risks. (Issues associated with transaction fees are discussed further in Chapter 5.)

The advantages and disadvantages of the three basic management and financing options are summarized in Table 2. The major issues concern the degree of day-to-day administrative responsibility for all functions, the cost and financial benefits to the transit agency or consortium (including the need for significant additional staff), and the transit agency's ability to use the financial sector's capabilities and expertise and existing transactions processing infrastructure. Given that many clearinghouse functions are complicated, the last issue may be especially important to consider. Because financial institutions are already engaged in conducting complex daily reconciliation and settlement processes, a transit agency would likely benefit from tying into this system and taking advantage of the high level of experience in these and the related processes. As suggested in the table, contracting for management of the overall clearinghouse operation will also obviate the need to add a significant number of staff positions; some staff time would still be required to monitor the contractor's—and perhaps the subcontractors'—performance, but considerably less than if the agency managed these functions directly.

Barriers to Developing Public-Private Agreements

An important consideration in pursuing a public-private partnership is the potential difficulty in developing and implementing a mutually acceptable agreement between a transit agency and a private entity, particularly a financial institution. First, there may be regulatory barriers. In Seattle, it was noted in the regional fare integration feasibility study that a third party cannot currently be used to manage state funds; this had not been resolved as of this writing, although study participants thought that recent legislation affecting public-private partnerships might modify the situation. Perhaps more significantly, developing a partnership agreement is complicated by the following key factors:

- General market stored-value media have not yet been widely tested in the United States—and acceptance by

TABLE 2 Clearinghouse management and operation options—advantages and disadvantages

	Management Option		
	Public Control	**Contract Management**	**Public-Private Partnership**
Advantages	transit agency retains direct responsibility over all functions (but has ability to contract for specific functions) transit agency keeps all benefits	transit agency able to reduce day-to-day administrative responsibility transit agency avoids need to hire significant additional staff transit agency able to take advantage of private sector expertise and existing financial infrastructure transit agency keeps all benefits	transit agency able to share risk and costs transit agency able to take advantage of private sector expertise and existing financial infrastructure
Disadvantages	transit agency assumes full risk and costs transit agency may need to hire significant additional staff transit agency unable to take advantage of private sector expertise and existing financial infrastructure	transit agency assumes full risk and costs transit agency must yield day to day control of customer service functions; contractor may not have same level of concern	transit agency must share benefits implementation may be difficult and take long time (agreement will be complicated, and there may be legal restrictions on such arrangements)

the general public has, therefore, not yet been established (i.e., outside of a handful of transit agencies), creating a sense of risk in such a venture.

- The underlying motivations for public and private institutions are fundamentally different: a private company's interest in any such venture will be driven primarily by the desire to generate a profit—or at least minimizing its risk while gaining access to a new customer base; a public agency, although interested in generating additional revenues, is likely to be at least as concerned with such goals as improving the quality and efficiency of its service and increasing ridership.
- Financial institutions have selected contact cards as the preferred medium for their new payment instruments, while transit agencies generally prefer contactless cards.

Given these factors, the development of a partnership agreement with a financial institution is likely to be difficult and may well be time consuming. For instance, the NYMTA had been involved in negotiations with Chase for more than a year before the negotiations were halted. The barriers to establishing such partnerships should be eased once one or more such agreements have been completed; however, it will be some time before any partnerships now under consideration are demonstrated to be reasonable for both parties. With regard to the technology issue, the type of card proposed or used in multipurpose programs has thus far been driven by who is initiating and providing most of the funding for the program, by an interest in opening up fare payment to an existing outside medium, or by both. In Atlanta, for instance, a contact card is being used because the program was launched by financial institutions; Seattle and San Francisco, on the other hand, have selected contactless technology for their integrated payment systems. In Ann Arbor, initially, contact cards were used because of the desire to accept the existing contact campus cards available at the University of Michigan; the plan is to install equipment that will support both contact and contactless cards. The development of combination cards should solve this conflict. (Technology issues are discussed further in Chapter 4.)

Developing a partnership with an equipment vendor or system integrator may be less complicated than with a financial institution, given that these vendors are already quite familiar with the types of requirements and constraints facing transit agencies. What is beginning to occur is the formation of multidisciplinary teams involving consortia of firms interested in different aspects of a smart card system. In several cases, an equipment vendor or integrator has joined forces with a smart card manufacturer and a bank or other financial institution in seeking to provide a full turnkey system. This approach is likely to grow as more multipurpose systems are developed.

There are several models for partnership arrangement around the world at this point. For example, as described earlier, the Manchester program represents an example of a public-private joint venture involving the local transit agency (GMPTE) and the system integrator (AESProdata). The proposed NYMTA/Chase effort is a variation on that model, as the transit agency sought to create a joint venture with a major bank. The Sydney Integrated Card System is being implemented by an integrator (Card Technologies Australia) in conjunction with service provider Transcard Australia; the latter is a consortium of private taxi and bus operators in Sydney. In Seoul, the integrator (Intec) installed the equipment and is operating the clearinghouse functions, while the cards are issued by a financial institution (Lucky Goldstar Credit Card Corp.). In the London Prestige project (a privately financed smart card system for the London buses and Underground), the consortium now in negotiations to implement the system includes integrator and equipment vendors (Cubic Corp. and Wayfarer Transit Systems), as well as specialists in information technology, communications, and financing (EDS, ICL Enterprise, and W.S. Atkins Consultants).

Regardless of the specific arrangement, private sector involvement of some sort is likely in most multipurpose programs. The more complex the clearinghouse requirements, the more beneficial it will be to transit agencies to take advantage of private capabilities in dealing with such transactions. Furthermore, there is pressure on transit agencies across the country to reduce operating costs in general and even to "privatize" various functions wherever possible; thus, it will be difficult for most agencies to justify adding significant staff in conjunction with the introduction of new fare programs. Although many agencies would prefer to retain overall control over any new fare systems, they may find it necessary to contract out specific functions, if not overall management of all clearinghouse functions.

OPERATIONAL AND ADMINISTRATIVE ISSUES

Within the different institutional arrangements identified previously, there are several operational and administrative issues related to multipurpose media programs. These issues must be addressed in establishing and managing a program; however, in light of the limited experience to date with multipurpose arrangements, most have not yet been resolved in a practical application. Moreover, additional issues will doubtless arise as such programs are developed and implemented.

The issues discussed in this section relate to the following areas:

- Pricing of media (e.g., related to discounts and bonuses for purchase or use) and
- Sale and distribution of media (e.g., related to initial availability and ease of reloading media).

Pricing and Subsidy of Media

Transit Pricing in Multipurpose Programs

One of the key issues in establishing a multipurpose payment program is related to the need to accommodate differ-

ent pricing structures and policies on a single card. For instance, in a multiple transit agency integrated farecard system, each participating agency will probably want to retain its own fare structure. In an open multiple-use stored-value arrangement, the question is, can the card accommodate the transit agency's fare policy requirements (e.g., discounts or bonuses on purchase or recharging of stored-value cards)? A second issue generally falling under this category is the ability to ensure that subsidies for transit use (e.g., from employers to individual employees) are actually used for transit in a multiple-use program. In a multiapplication card, where transit represents a separate application, these concerns are avoided; thus, this section discusses only single-purse/single-application stored-value types of multiple use (i.e., where transit is simply an eligible merchant).

In an integrated fare program, electronic fare technology will allow each agency to keep its own fare structure while accepting a universal card. In other words, each agency's card processing units will be programmed to deduct the correct amount from a card or accept the card as a pass or transfer mechanism, where appropriate. This is an important factor in developing an integrated fare system, because, in most regions, most rides are intraagency; although the actual number of interagency trips can be significant, the percentage of such trips compared to the overall number of transit trips in a region tends to be relatively small. For this reason, the TransLink program plan, for instance, places the emphasis of the project on meeting the internal needs of the participating agencies while creating a common medium for the region.

Thus, maintaining individual agencies' fare structures should not be a significant problem (i.e., it is simply a software or programming issue). However, the provision of discounts and bonuses on purchase (or reloading) of stored-value cards can significantly complicate a multiple-use arrangement; this is because every expenditure—transit or other—will be subject to the same discount. Although the transit agency may be interested in offering some type of purchase or add-value discount or bonus, other entities (e.g., retailers and vending machine operators) may have no interest in offering a similar discount. The prepaid stored-value concept makes it difficult to allocate the discount just to transit: in a closed multiple-use arrangement, for instance, the nontransit merchants may have to accept a discounted reimbursement that is based on the average value of cards sold in the program. Many transit agencies use initial purchase discounts for prepaid fare media (e.g., weekly or monthly passes or multiride instruments). However, as shown in Table 3, electronic media can facilitate a range of discount and bonus options, including those based on the use of the card rather than on purchase or adding value. Offering a discount on rides taken, rather than a bonus on amount of purchase, will obviate this issue. In other words, if a farecard is sold for face value, but $1.35 is deducted for each boarding using a farecard—compared with the $1.50 cash fare, the discount can be restricted to transit use. A "loyalty" program based on frequency of transit use (i.e., akin to an airline's frequent flyer program) is also an option that transit agencies might consider. For instance, a rider could be awarded a certain amount of free transit use or free merchandise at a participating merchant after using the card for a specified number of trips.

A multiple-use stored-value arrangement will be simpler if no discount or bonus is offered. However, many transit

TABLE 3 Transit stored-value discount and bonus options

Option	Basis/When Received	Example*	Transit/Card Usage Impact	Multiple Use Impact**
no discount or bonus	equivalent to multiple single rides	$30 for 20 rides	only incentive to buy card is convenience for riders	no problem with multiple use
initial purchase bonus	fixed % bonus, at time of purchase	$11 value for $10 payment (10%)	encourages prepayment	requires merchants to accept discounted reimbursement
add-value bonus	% bonus when value added (not on initial purchase)	$5 value for initial $5; $11 value for additional $10	encourages retention of cards	requires merchants to accept discounted reimbursement
per ride discount (for all rides)	lower fare deducted if using card than if paying cash	$1.60 with cash, $1.50 with farecard	encourages card use, but gives discount even if only 1 ride	no problem with multiple use
per ride discount (above threshold)	reduced price per ride above minimum no. of rides	$1.50/ride for first 10 rides; $1.35/ride for rest of rides	encourages higher transit use	no problem with multiple use
frequent use bonus	free rides (or merchandise) after certain no. of rides	3 free rides for every every 30 rides with card	encourages higher transit use and card use	no prob. w/ multiple use; may involve merchant agreements

* assumes cash (or single ride) fare=$1.50

**this applies to a closed multiple use arrangement, in which the transit agency (or partnership) issues cards

agencies have found discounts to be useful in general in encouraging transit use among cost-sensitive riders. Moreover, the use of a discount or bonus—particularly when adding value—can be an important mechanism for encouraging a transit rider to keep the same card for an extended period of time. As is explained in Chapter 5, the high cost of the cards themselves makes card retention a key factor in maintaining a cost-effective smart-card-based system. A transit agency will thus have to decide how important it is to offer a discount or bonus, and, if so, what type of discount makes the most sense. In an open system in which the transit agency is accepting cards from outside issuers, the agency will have no control over the type of discount or bonus the card user receives.

Subsidy Mechanisms in Multipurpose Programs

A similar issue relates to the use of transit vouchers (e.g., New York's TransitChek or CommuterChek in other cities) to purchase multiple-use stored-value cards—or direct employer provision of cards (i.e., in lieu of monthly flash passes). Because there is no requirement that a multiple-use card be used for transit, an employer providing vouchers or actual farecards could be effectively subsidizing retail purchases or telephone calls rather than transit use for some employees. One way to deal with this problem would be to prevent the use of subsidized vouchers in purchasing multiple-use stored-value farecards; in such a case, the vouchers would be restricted to buying transit-only fare media (e.g., passes, tokens, or tickets—or perhaps "restricted" stored-value cards). Similarly, subsidized fare media provided directly to employees would have to be restricted to transit use in some fashion. This could take the form of a post payment/employer billing option, for instance. Another possibility is to offer unlimited ride passes (on farecards) that can only be used for transit.

Thus, although the important transit fare concepts of bulk purchase discounting and employer subsidization are somewhat incompatible with multiple-use stored-value cards, electronic payment technologies have the capabilities to allow their coexistence with stored-value options (i.e., through the discounting of trips rather than initial purchase value and the provision of fare media that cannot be used outside the transit setting). Moreover, if transit is treated as a separate application, transit agencies can offer whatever type of discount or bonus they choose. These issues must be considered carefully in pursuing multiple-use arrangements.

Sale, Reloading, and Distribution of Media

One of the most important factors in determining the success of any stored-value program is the availability of the cards and the ease of reloading and checking remaining value on them. This has been found to be a crucial concern to potential card users, as is discussed in Chapter 6. The issue is particularly important for bus riders, either those who do not use rail in multimodal systems or riders in bus-only systems. In rail stations, cards can be sold and reloaded by "ticket" agents, through automated vending machines, or possibly through bank ATMs (e.g., in an open system). In New York, the stored-value (magnetic) MetroCard is sold or reloaded by ticket agents, as well as through a series of remote vendor locations. In Atlanta, the First Union VisaCash card is sold through in-station vending machines. VisaCash cards are also available from First Union tellers; the cards will eventually be sold through ATMs as well. Card readers can also be provided in stations to allow users to check remaining value; New York uses such devices. Thus, card availability in general should not be a major issue for rail riders, although there can be delays and resulting frustrations if there are insufficient numbers of vending machines in high-volume stations. In an open system, the transit agency can obviously maximize the availability of cards to its riders by arranging for the issuing entity or entities to install vending machines or ATMs in the stations. This becomes less important if the stations are near ATMs or other sales locations.

Ensuring sufficient availability of cards for bus riders is more problematic. One option is to establish a widespread remote sales network (e.g., sell cards through ATMs and at common remote sales locations, such as drug stores, supermarkets, and newsstands). However, this will still result in availability problems for some riders (e.g., those boarding in suburban areas and those not having ready access to a sales point or the "unbanked") as is discussed below. Other possibilities include the following:

- Employer distribution,
- Purchase at home (i.e., via telephone, mail, or computer),
- Purchase via specially equipped public telephones, and
- Sale on board buses.

Although there may be problems related to restricting subsidies to transit use, as mentioned above, employer distribution remains an option for any prepaid (or post-paid) fare medium; in some cases, the smart card may actually be a monthly pass, as is the case in the Ventura County program.

The sale of payment media at home represents one of the key emerging developments in banking. The concept of "virtual banking" is being facilitated by the development of home banking services (e.g., using software such as Intuit's *Quicken*, Microsoft's *Money*, or Meca Software's *Managing Your Money*) and electronic commerce over the Internet in general. Some banks have also made available remote "terminals" that use the telephone lines to provide direct access to the bank and to one's account. Regarding a stored-value application of this approach, Mondex users can load value onto their cards through special Mondex telephones in their homes or offices. Mondex cards can also be loaded at cash

machines, through specially equipped public telephones, and from a cardholder's own Mondex "Wallet"; the wallet contains stored value and allows the owner to transfer value (i.e., enough for that day) onto his or her Mondex card. Also along these lines are products such as the Verifone "Personal ATM"; this is a low-cost, palm-sized card-accepting device that can be connected to a telephone line. It allows the user to download value to a smart card, as well as to transfer funds from one account to another and to perform other banking functions in a secure environment. The ability to load value at home could be a key factor in successfully introducing stored-value cards in general and will be especially useful for bus riders.

Finally, another option for remote loading of card value is through commercial telephones. For instance, the transit agencies in Seattle have discussed the possibility of using US West's telephones for reloading the transit cards. Telephone company-issued smart cards, such as Germany's PayCard and the Netherlands' Chipper, can be reloaded from bank accounts via card-accepting telephones.

Another potential option for reloading—if not initially purchasing—cards is on board the buses. In Ventura County, for instance, all but one of the participating transit agencies permits on-board recharging of the smart cards; these cards are monthly passes at present, and they are activated for the month on the first use that month (i.e., after notifying the agency in advance of a desire to do so). Cards can also be loaded on board in London. A similar approach has been suggested for consideration in the smart card program in the Seattle region: once the cardholder has established an account with the transit agency, he or she would be able to request via telephone or personal computer that a certain amount of value be added to the card; the requests for value would then be downloaded to the buses each day, and the cardholder's card would be loaded with the requested amount of value the next time he or she boarded a bus. Although such an approach resolves the problem of where to reload cards, it also introduces certain complications to the fare collection system. Beyond the significant communications and processing requirements, many agencies will not want to permit on-board loading because of operational considerations such as the negative effect on overall boarding times, the limited space available at the front of a bus for an additional piece of equipment, the additional maintenance requirements associated with that equipment, and/or the possibility that the operator would have additional responsibilities (i.e., if he or she had to handle reloading). The level of interest in on-board reloading thus remains to be determined.

In an open system, distribution and reloading through ATMs (or any other bank-related source) is a problem for riders who do not have bank accounts; given that many transit riders are quite poor, this number can be significant. Addressing this problem will require the transit agency to provide cards through its own sales mechanisms or facilities (i.e., AVMs, ticket agents, outside vendors, employers, on board buses, or via telephone or mail). Alternatively, cards could be sold or reloaded through bank ATMs if cash were accepted (i.e., as opposed to requiring users to transfer value from their own bank accounts). The emerging consideration of linking electronic benefits (EBT) cards and transit applications will facilitate the distribution of media to recipients of food stamps and other government-issued benefits.

In summary, the pricing and availability of cards must be addressed in establishing multiple-use programs. The transit agency must consider the effect on its revenue and ridership if it is unable to incorporate key elements of its fare structure on a multiple-use card; this may be a factor in deciding either to issue its own card or to simply not participate in such a program. The ready availability of cards—and the convenience of reloading them—is vital to the success of any prepaid program. Emerging developments in at-home banking may represent an important breakthrough in promoting the use of stored-value cards both for transit and for general commercial use.

LEGAL AND REGULATORY ISSUES

The creation of stored-value/prepaid card applications raises several legal and regulatory questions. Because prepaid applications are new to the financial services industry, many of the legal issues are in areas where the existing statutory and regulatory authority and case law are scant or nonexistent. The legal treatment of stored-value media is now under review (e.g., by the Federal Reserve Board and the Federal Deposit Insurance Corporation). Although many of these issues may not apply specifically to transit-only media, the move toward open payment systems necessitates their consideration by transit agencies. The key legal and regulatory issues dealing with prepaid card products include the following:

- Authority of banks and nonbanks to issue prepaid cards;
- EFT regulations (i.e., Regulations E and Z);
- Record-keeping and reporting requirements (i.e., Bank Secrecy Act);
- Abandoned property and escheatment laws;
- Responsibility for lost cards, card and equipment malfunction, or issuer insolvency; and
- Privacy issues.

Authority of Banks and Other Institutions to Issue Prepaid Cards

One of the key issue areas concerns the legal authority of banks to issue prepaid media, as well as the authority of nonbanking institutions to issue payment instruments. These questions center on both banking regulations and general business law. In the United States at present, there is no clear authority for either national or state-chartered financial insti-

tutions to sell a prepaid card, as such activity is not expressly empowered in the Banking Act of 1933. On the other hand, no legal challenge has ever been made, and the Comptroller of Currency has upheld the ability to sell traveler's checks. A key difference between traveler's checks and prepaid cards is that the former are redeemable in currency, while the latter can be used only for the purchase of goods and services. The regulations potentially affecting banks' issuance of prepaid cards (e.g., Regulations E and Z) are discussed below.

The issuance of prepaid media by nonbanking entities, such as telephone carriers and transportation (transit, toll, and parking) agencies, has begun to raise certain legal questions as well. In general, the courts have often recognized that businesses engage in operations similar to banking functions without constituting banking. One of the fundamental issues concerning prepaid cards relates to whether the issuing body is "receiving deposits" in selling the cards. States generally prohibit nonbank entities from engaging in the business of banking by receiving deposits. A deposit is considered a loan from the depositor to the bank, thereby establishing a debtor/creditor relationship. However, with a prepaid card, the issuer is not holding the funds for the purpose of repaying its customers, but rather for paying others for the delivery of goods and services to the cardholder. Thus, the sale of a prepaid card by a nonbank business should not be deemed a receipt of deposits—particularly when used in a closed system.

The FDIC has essentially supported this argument—has issued a ruling that stored-value card balances are not considered deposits and, therefore, will not qualify for deposit insurance. It is expected, however, that there will be an exception for certain stored-value programs, allowing banks to offer deposit insurance for cards in those programs. Thus, banks will essentially be able to decide which type of card to offer to customers and whether to stress the benefit to the consumer of having the insurance or, alternatively, the benefit of confidentiality; on insured cards, every transaction will have to be recorded. It could turn out that cards intended for use on very small purchases only will be uninsured, while cards that are insured will be marketed to consumers who will likely maintain larger amounts on their cards.

Both banks and nonbanks must also address general business law issues in establishing prepaid card programs. Card issuers and acquirers should ensure that state and local laws incorporate or exclude the coverage of prepaid cards under general business laws as deemed beneficial. For instance, a problem was encountered 15 years ago when it was realized that the definitions of card accounts were originally developed for credit cards and did not cover debit cards. Law enforcement officials were powerless to prosecute criminal actions related to debit cards because they were not covered under the law. With regard to laws affecting nonbanks in particular, states often require licenses and/or posting of bonds before allowing a nonbank to sell traveler's checks or money orders; whether this extends to the issuance of prepaid cards has yet to be resolved.

EFT Regulations

The key Federal Reserve Board regulations that deal with EFT and thus might affect prepaid card issuance are Regulations E and Z. Regulation E provides consumers protection in disputes arising from EFT transactions; its implications for stored value are discussed below. Regulation Z governs the use of credit cards and is meant "to promote the informed use of consumer credit by requiring disclosures about its terms and costs." Because the sale of a prepaid card does not involve the extension of credit, Regulation Z does not specifically apply to the use of a prepaid card. However, if a credit card is used to purchase a prepaid card, the purchase side of the transaction would be covered by Regulation Z.

The framework that identified basic responsibilities and consumer protection rights in EFT systems was established by the Electronic Funds Transfer Act (EFTA) of 1978; the Federal Reserve Board then instituted Regulation E in 1979. In 1994, the Federal Reserve solicited comments regarding the potential coverage of "smart cards" by Regulation E and suggested that "a similar analysis might be applied to value added or prepaid cards." Federal legislation essentially exempting stored-value cards from Regulation E is now pending in both the House and Senate. In response to the proposed legislation, the Federal Reserve in early 1996 recommended that certain types of stored-value cards be subject to certain portions of Regulation E. In April of that year, the Board published for comment its recommendations as to which sections of Regulation E, if any, should be applicable to stored-value media.

The Board at that time divided prepaid cards into the following categories:

- Off-line unaccountable systems, where the transaction takes place in an off-line mode and a record of the transaction is maintained on the card itself rather than in a central database; the balance of funds available to the cardholder is thus recorded on the card;
- Off-line accountable systems, where the transaction takes place in an off-line mode but a record of the transaction is maintained in a central database; the balance of funds available to the cardholder is recorded on the card, as well as in the database; and
- On-line accountable systems, where the transaction is authorized on line and a record is maintained in a central database; the balance of funds available to the cardholder is not maintained on the card.

The Board recommended that, as a general rule, off-line card systems should be exempt as long as the card value does not exceed $100, but that on-line card systems should be subject to several provisions of Regulation E. The general preliminary recommendations are summarized in Table 4. These

TABLE 4 Preliminary recommendations for Regulation E treatment of stored-value cards

Application of Reg. E Section	Off-line Unacct. Any Amount	Off-line Acct. <$100	Off-line Acct. >$100	Online Acct. <$100	Online Acct. >$100
Unsolicited Card Issuance	NO	NO	NO	NO	NO
Initial Disclosure	NO	NO	**YES**	NO	**YES**
Change in Terms Notice	NO	NO	NO	NO	NO
Transaction Receipts	NO	NO	NO	NO	NO
Periodic Statements	NO	NO	NO	NO	**NO**[1]
Liability Limitations	NO	NO	NO	NO	NO
Error Resolution	NO	NO	NO	NO	NO

[1] Exempt only if cardholders are provided a means to check their balance and a summary of recent transactions is provided upon request.

preliminary recommendations left several questions unanswered, including the following:

- Will the Federal Reserve Board's contention that a consumer purchasing a stored-value card has established an "account" stand up to a legal challenge? If this facet of the card system is not validated, the Federal Reserve Board's right to issue regulations is revoked.
- How will the Federal Reserve Board categorize an off-line system that can maintain a central database, but operationally chooses not to maintain a transaction record after the transaction is validated?
- How will the Federal Reserve Board categorize prepaid card programs that use value in units other than currency, such as a transit pass that is valid for a certain period of time or for a fixed number of rides?

In light of such questions and other concerns expressed by entities with an interest in stored-value developments, the Federal Reserve Board subsequently decided (in early 1997) not to apply Regulation E to any stored-value products at the present time. It was argued—by the Smart Card Forum and other groups—that Regulation E could slow development and introduction of stored-value cards and that the regulations should not be considered further at least until the products have a chance to be fully tested in the marketplace and the need for Regulation E protection can be reasonably evaluated.

Thus, Regulation E does not appear to be an immediate issue in rolling out stored-value programs. However, there continues to be some concern within the financial and transit industries regarding the eventual effect of the regulations, as voiced during the Multi-Use Workshop (see Appendix D). How the above questions are ultimately resolved—and indeed the exact final Regulation E statutes affecting stored-value/prepaid media—may well affect the specific types of stored-value systems that are pursued and the operating rules that will have to be established for these programs.

Record-Keeping and Reporting Requirements

The Bank Secrecy Act (BSA) authorizes the Secretary of the Treasury to require financial institutions to keep records and file reports that it determines to have a high degree of usefulness in criminal, tax, and regulatory matters—as well as to detect and deter money laundering programs and tax evasion schemes. The Treasury Department has delegated the regulatory development and compliance enforcement to the Financial Crimes Enforcement Network (FinCEN). The BSA grants broad authority to require financial institutions to report domestic transactions conducted in coins or currency. Financial institutions are required to report transactions in currency in excess of $10,000 and wire transfers in excess of $3,000, where "financial institutions" are defined as an individual or business "engaged in the business of transmitting funds."

In 1994, the BSA was amended to require the registration of money services businesses as another way of combating money laundering operations. At that time, a money services business was defined as a business, other than a bank or the U.S. Postal Service, that provided check cashing, currency exchange, or money transmitting services or issued or redeemed money orders, traveler's checks, and similar instruments. Banks were excluded from this definition, because their compliance was covered by other sections of the Act. The BSA requires a money service business to register and provide a list of all its agents to FinCEN.

FinCEN has proposed new regulations that would specifically include stored-value products within the scope of the BSA by expanding the definition of a money service business. These regulations were proposed in early 1997 and expand the definition of a money service business to include the following groups (and could conceivably encompass a transit agency):

- Issuers of traveler's checks, money orders, or stored value—if such an instrument is issued in an amount greater than $500 to any person in a day.
- Money transmitter, defined as any person, whether or not licensed or required to be licensed, who accepts currency, or funds denominated in currency, and transmits the currency or funds, or the value of the currency or funds, by any means through a financial agency or institution . . . or an electronic funds transfer network; or any other person engaged as a business in the transfer of funds.

Although banks are exempt from these proposed regulations, many banks are structuring their stored-value programs through operating subsidiaries, which would be subject to the proposed regulations. It would also appear that a transit agency (or any merchant) would be included in the definition of a money transmitter, because it would be transmitting the value of transactions captured at its fare collection equipment. Additionally, if a transit agency were issuing cards, it would presumably be considered an issuer. Because most agencies are looking to use anonymous, self-service automated devices for card issuance and value loading, it would be extremely difficult to track issuance of cards to a single individual—although it is unlikely that a single person would receive transit stored value totaling more than $500 in a day.

FinCEN has requested comments from interested parties about the proposed regulations and is expected to issue a final set of regulations later in 1997. Groups such as the Smart Card Forum and the American Bankers Association have expressed concerns that the regulations will dampen the ability to develop stored-value business programs in general.

Expired Value and Abandoned Property Laws

One of the key issues underlying the success of prepaid card programs is the treatment of expired or unused card value—the dollar value that remains on a card after it has expired or that is never used (e.g., because the card is thrown away or kept as a collectible). As discussed further in Chapter 5, the revenue potential associated with expired card value makes this issue an important component of the card issuer's overall business case. The possible regulatory barriers to the issuer being able to retain the expired card value are that the expired value may have to be turned over to the state, and/or the cardholder may be able to apply for a refund of the expired value. The applicability of the abandoned property law (commonly referred to as "escheatment") to prepaid cards, especially those that do not have cardholder registration features, is uncertain at present. Most states have enacted abandoned property laws that dictate that "unclaimed property" be given to the state after a specified period of time. In some cases, transit agencies planning to institute stored-value card programs are seeking exemptions to the state law so as to enable them to keep the expired value. Elsewhere, transit agencies may be considered a part of the state government. This was the case in New York, for instance, where the MTA was ruled to be an arm of the state government and was thus allowed to retain all expired value on the stored-value MetroCard. Thus, escheatment is a state-by-state issue, and each agency considering introduction of a stored-value card should investigate the laws in its own state.

The related issue is the cardholder's rights to a refund of expired value. If the purchase of the card is considered a contract, many lawyers argue that the value to a cardholder of an expired prepaid card would terminate by agreement, rather than becoming unclaimed property subject to escheat. In other words, this is similar to a sporting event that gives the ticketholder the right to exchange the ticket up to the time of the original event. Furthermore, lawyers may argue that value which does not exist for the cardholder (i.e., that which is unclaimable) cannot be described as "unclaimed" for the purposes of the abandoned property law. The issue of refunds for expired value is also related to the question of providing for refund or reimbursement for card theft or loss, or for card or terminal malfunctions.

The three banks participating in the original Atlanta VisaCash program skirted the potential expired value constraints by establishing "maintenance fees" of as much as $5 per month that begin to be assessed against the card's remaining value once the cards expire. Thus, any expired value will soon become maintenance fee revenue to the issuing bank. Resolving the issues associated with expired value is of crucial importance in determining the financial benefits of a prepaid card program.

Responsibility for Lost or Stolen Cards, Card and Equipment Malfunction, or Issuer Insolvency

Because there is currently no legislation governing stored-value cards, there are no regulations related to the handling of lost or stolen cards, card or equipment malfunction, or bankruptcy or failure of the card issuer. The types of regulatory questions associated with these issues include the following:

- Lost or stolen cards—Is the issuer responsible for replacing or refunding a card that is lost or stolen? Stored-value cards are intended to represent "electronic cash," and the consumer must bear the loss of cash; thus, the cardholder would reasonably be expected to absorb the loss of the card value. On the other hand, given the $50 limit on liability for a lost credit card, consumers may well push for a similar provision for stored-value cards.
- Card or equipment malfunction—If a card or the card-accepting equipment malfunctions, is the issuer responsible for the associated loss? The issuer should probably cover any equipment-related loss and would probably be responsible if the card itself is shown to be faulty. However, there may be a question as to whether the cardholder has in fact damaged the card and who decides which party is at fault. Issuers may have to guarantee replacement of malfunctioning cards, regardless of who is at fault, if they are to attract consumers to the product.
- Bankruptcy or failure of issuing entity—If the issuing bank or other institution files for bankruptcy protection or fails, who is responsible for the value remaining on stored-value cards and/or payments to merchants that have accepted the card for purchases or services?

There is clearly a need to instill consumer confidence in stored-value card systems if this new product is to be widely accepted. For this reason, regulations covering the rights and responsibilities of card issuers and users are likely to be introduced at some point. The evolution of such legislation can be seen in several foreign countries where the prepaid concept is more advanced. For instance, in Denmark, the Payment Cards Act of 1984 included the following provisions:

- Limits on cardholder's liability for the loss or unauthorized use of the card,
- Regulation of the solicitation of cardholders,
- Controlled use of cardholder and merchant information, and
- Establishment of a maximum value that could be placed on the card.

Japan passed similar regulations in its 1990 prepaid application legislation; this legislation includes the following requirements, among others:

- Prepaid card issuers must register with the Ministry of Finance when the accumulated unused value (of the pool) exceeds US$69,000. In practice, issuers have to lodge a guarantee or deposit of 50 percent of the unused value at the end of every March and September.
- Organizations issuing prepaid cards to their employees must advise the Ministry of Finance when the accumulated unused value exceeds US$48,000.
- Prepaid cards should be so marked to reflect that they comply with the legislation.

At the same time, a Prepaid Card Association was formed in Japan to review system integrity and to ensure adequate protection of consumers.

It is generally believed that institutions interested in issuing stored-value cards in the United States will have to address the above issues adequately if this is to become a viable payment option here. As noted by Sharon Heaton in a recent paper on these issues, "To the extent that the industry simply resolves all these issues in favor of the industry, consumers may resist participating in the market. There is also a substantial risk of backlash by Congress which could impose detrimental measures on the industry. Working with governmental officials to develop an appropriate regulatory structure may prevent such developments." (*5*)

Transit agencies may or may not be subject to the same types of regulations as will banks when they are issuing closed system payment media. Even if they are not, however, transit agencies introducing stored-value media will have to decide on their own policies regarding consumer rights and refunds or reimbursements. Policies among existing smart card programs vary. In Ventura County, the Passport (a monthly pass) will be replaced for a payment of $5. In London, cardholders can purchase an optional "Fare Protect Scheme" that protects the buyer against loss of a card. Consumer-related issues are discussed further in Chapter 6.

Privacy Issues

Consumer privacy rights in general are increasingly becoming a concern in conducting financial transactions. For example, in a survey conducted in 1994 by Louis Harris & Associates (*6*), 82 percent of credit cardholders responding indicated that "consumers have lost all control over how companies use their personal information," and 77 percent felt that "businesses ask for too much personal information." Prepaid card systems have the ability to create "time stamps" and audit trails for transactions that previously were done with cash and were therefore fully anonymous. In other words, privacy concerns could become significant in a system that can track an individual's small purchases, transit travel, telephone calls, and other daily transactions. Because a stored-value card carries the use information on the card, a key question becomes, who has the right to control or use the data contained on the card? It is unclear whether such "locator cues" are covered by existing statutes. Other questions concern the rights of the consumer when information passes from the original party to a transaction to third parties (i.e., "redisclosure").

The right to privacy is generally protected by laws at the federal and state level and has been upheld by the courts. For instance, in the case of Whalen v. Roe (1977), the U.S. Supreme Court recognized an individual's constitutional right to information privacy. The federal government had created a database of people who had legally obtained certain prescription drugs for which there was an illegal market; the Supreme Court found that this violated these people's rights. At both the state and federal levels, privacy legislation has focused on categories of information sector by sector, although in many cases these statutes tend to be somewhat nebulous. Examples of sector-specific federal statutes include the Electronic Communications Privacy Act, which governs telephone and other communications records; the Computer Security and Privacy Acts, which protect benefits-related records; the Fair Credit Reporting Act, which covers credit records; and the National Labor Relations Act, which governs labor records, including union membership. The Financial Privacy Act of 1978 limits the ability of the federal government to obtain personal financial records maintained by financial institutions, but the Act does not apply to state or local governments. Numerous states have passed legislation to provide consumer protection in financial transactions and other areas.

The privacy of an automated payment system is viewed as crucial by many consumers, and the banking system, in most cases, has been very sensitive to this issue. Transit agencies, on the other hand, have had to pay little attention to the need for customer privacy to date. In part, this is because, with the exception of those who purchase period passes, agencies

have not maintained any information about the user of a specific card. With stored-value media, however, the agencies will be able to collect detailed information on individuals' card use. In fact, most transit agencies see this as a major benefit of electronic fare media and will want to make use of the newly available information on individual riders to improve service—presumably to the benefit of the cardholder. For example, transit service could be extended in a particular geographic area if it is found that there are many regular users in that area. However, because of the potential to use card-specific information as a revenue-generating source by the agency (e.g., through the sale of cardholder lists), privacy issues become important. Transit agencies will have to address riders' concerns in this area as they adopt electronic fare media; where transit payment becomes part of an open system, these concerns will probably be magnified.

Thus, transit agencies will need to balance the gathering of detailed trip information against the protection of riders' privacy rights. The need to deal with this tradeoff effectively and assuage riders' concerns was identified in the Multi-Use Workshop as one of the most important issues associated with introducing multipurpose smart cards. The consensus of the attendees was that agencies should be proactive in addressing this issue: customers must be alerted to the fact that smart card technology can track enormous amounts of information. Therefore, customers ought to be given the choice of whether or not to have their transit use tracked (i.e., anonymous transactions should be allowed). Of course, they must be made aware of the tradeoffs for anonymity: no refund would be possible for a lost or stolen card, and it would be difficult to offer the same types of frequent use incentives.

Workshop participants also believed that effective marketing and public information efforts could assuage many of the fears that customers have regarding invasion of privacy. One suggestion was that an effective tool to address the public's concerns would be something along the lines of a "Customer Bill of Rights." This could take the form of a notice to the customer that is included with schedules, fare brochures, and system maps. The notice would inform the customer as to what type of data is tracked by the agency and the steps that the agency has taken to ensure that his or her privacy rights will not be infringed. A similar recommendation was issued (in mid-1997) by the Smart Card Forum's Legal and Public Policy Committee. This committee has strongly encouraged all Forum members to adopt privacy principles (i.e., a "code of responsible information practices") and to clearly identify these principles to customers.

Surveys indicate that many consumers would prefer privacy-related policies developed by the card issuers rather than the introduction of new government regulations. The aforementioned Harris survey found, for instance, that 75 percent of the credit cardholders responding agreed that ". . . if companies and industry associations adopt good privacy policies voluntarily, that would be better than government regulation." This view is echoed by operators of current stored-value systems overseas (e.g., Danmont and Mondex). They have argued that consumers should be allowed to make the choice between security and privacy and that regulation in this area is largely unnecessary.

In summary, the development of stored-value card systems has raised many legal and regulatory questions. These questions hinge on the similarities to and overlap with existing payment systems (e.g., credit and debit cards) and the differences from those systems. One of the key issues relates to tradeoffs between consumers' desires for guaranteed security of the payments (and value) on the one hand and for privacy on the other. Because the stored-value concept is in its infancy, there are few existing regulations. Many people have argued that regulation is largely unnecessary. For instance, in Europe, where prepaid smart cards are widely used, consumers have not been overly concerned that the value on their cards is not insured. In general, it is believed that whether regulators in the United States choose to assert jurisdiction and the way they interpret existing regulations and statutes or promulgate new regulations will largely be a function of the success and profile of prepaid/stored-value card applications. The more the application develops as a parallel payment system, the greater the drive will be to ensure adequate regulation.

CHAPTER 4

TECHNOLOGICAL ISSUES

INTRODUCTION

Several technological issues must also be considered in pursuing a multipurpose payment program. The major issues relate to

- Selecting an appropriate card technology,
- Integrating the new technology into an existing fare collection system, and
- Ensuring flexibility regarding future technology developments and planning for migration to new technologies.

These issues overlap. For example, integration may influence the selection of a card technology and the rapid pace of development in the card technological arena, coupled with the institutional developments in progress, makes flexibility a necessity.

TYPES OF SMART CARD TECHNOLOGY

As indicated in Chapter 2, smart cards in general have become the technology of choice in all types of multipurpose payment programs. Although magnetic-stripe media are seeing increasing use in the transit industry in general—for stored-value as well as read-only prepaid applications—most efforts to build both integrated fare (e.g., in the San Francisco and Seattle regions) and multiple-use programs (e.g., by Greater Cleveland RTA) have ultimately shifted focus from this technology to smart cards. The specific reasons for considering smart cards vary from one case to the next (see the individual program descriptions in Chapter 2, for instance). However, the advantages of smart cards over magnetic-stripe media for use in multipurpose arrangements include the following: (*7*)

- The higher expected reliability of smart cards and the supporting equipment,
- The greater data and processing capabilities of smart cards (e.g., to facilitate operation of a complex multiagency program and to provide better information on transit use patterns to transit agencies), and
- The move toward adoption of smart cards by the banking and financial services industry and the potential for joint arrangements.

Thus, although the Chicago Transit Authority (CTA), for instance, is installing a magnetic-stripe stored-value fare system, the agency expects the eventual addition of smart cards to enable multiple-use arrangements with financial institutions. Because CTA does not envision completely replacing the magnetic system with smart cards soon, smart cards would become one of several media options, and the issue of integrating a new technology into an existing system becomes an important consideration.

Contact Versus Contactless Cards

Given that smart cards in general will be used in most (if not all) multipurpose programs within the next few years, the choice of technology shifts to one of contact versus contactless—or, alternatively, a card that combines contact and contactless interfaces (i.e., the combi-card or dual interface card). As explained in Chapter 2, contactless cards refer here to any integrated circuit (or "chip") card that does not require insertion into a slot in the reader, but must only be held close to the reader. This includes "remote (or inductive) coupling," "close (or capacitive) coupling," and "RF" cards. Contactless cards are also sometimes known as proximity cards. Contactless cards can be either active (i.e., with an internal battery to supply power) or passive (i.e., without an internal power source; an RF field generated by the card-reading device powers the card). The first contactless cards, such as the original Cubic GO-Card, were active cards. Because these tend to be thicker and heavier than passive cards, the trend is toward use of passive cards.

Both contact and contactless cards can be either memory cards without an on-board microprocessor or microcontroller circuit (or microprocessor) cards. The simplest memory cards have "programmable logic area" chips and are prepaid nonreloadable cards (e.g., prepaid telephone cards) or identification-only cards. More advanced memory cards include algorithms within the programmable logic area and are used for simple stored-value/EP applications. Microprocessor cards are more secure than memory cards and can be programmed to perform various processing functions. The type of chip affects the capabilities of the card, as well as the price. For contactless cards, the type of chip also determines the amount of power needed; microprocessor cards require more than five times as much power as memory cards.(*8*) For this

reason, the bulk of contactless cards now in use do not contain on-board microprocessors. As mentioned in Chapter 2, a non-chip-based memory card—the capacitive stored-value card—has also recently been introduced for prepaid functions such as transit payment.

As mentioned above, contactless cards are the preferred option for transit applications, while contact cards are being introduced for financial and most other types of transactions (e.g., campus uses, health care, government benefits, and retail). The advantages of contactless card systems for transit agencies are seen as the following:

- Potential for lower fare collection equipment maintenance costs, because there are no moving parts in the read-write units;
- Greater reliability of equipment, because there are no open slots that can be jammed (e.g., from insertion of foreign objects);
- Greater convenience for riders, especially for riders who are elderly or have disabilities and who may, therefore, have difficulty inserting a card; and
- Faster boarding of buses and faster entry through turnstiles.

Cost analyses comparing the different smart-card and magnetic technologies have been undertaken in several studies, including those in Paris, Seattle, San Francisco, and Southern California. These and other analyses have determined the contactless card to be more cost-effective for transit agencies than either contact smart cards or magnetic-stripe cards; the capacitive card, a very recent development, was not included in any of these analyses.

Although contactless cards are preferred by most transit agencies, contact cards have been implemented in several transit applications and are planned for others. These applications all represent multiple-use programs involving and generally initiated by financial or other institutions; examples include the EP projects in Denmark, Switzerland, Belgium, the Netherlands, and Germany, and trials in Atlanta, Ann Arbor, and Guelph (Ontario). The research team's survey of transit agencies (see Appendix A) revealed that nearly as many agencies expect to be using contact as contactless cards in the next few years; this probably reflects an acknowledgment of the predominance of contact cards in nontransit uses.

Contact-card technology has been around considerably longer than has contactless and has thus been used in the longer running smart card programs, including prepaid telephone cards in Europe, as well as EP applications in several locations. Contact cards have been standardized in many aspects, as is explained below, and further standardization is under development. Financial and other institutions have invested a considerable amount of time and resources in the development of contact card specifications and applications, and contact cards have thus become the technology of choice for most nontransit applications. Because such institutions generally do not need the increased speed of use of contactless cards, they have as yet seen no real incentive to pursue the higher cost contactless card technology. The potential link with transit is beginning to change some financial institutions' perspectives on this issue, however, as is discussed below.

Many companies are producing smart cards and the chips they contain. Companies manufacturing contact cards include Gemplus, Schlumberger, Giesecke & Devrient, Micro Card/Bull CP8 Transac, DataCard, Orga, US3, Silcox, and Solaic; chips for these cards are made by Motorola, SGS Thomson, Oki, Siemens, Atmel, Hitachi, and Philips, among others. Contactless cards are also produced by several companies; chips (and in some cases, cards) are manufactured by Mikron, Motorola, Cubic, Sony, Racom, GEC, Innovatron, ADE, Nedap, Mixcom, Inside Technologies, and AEG, among others. The capacitive card, which is not based on chip technology, is made by Doyle Argosy Innovators.

Combined Contact-Contactless Cards

As transit agencies consider the introduction of smart cards as a key fare medium, the opportunity to take advantage of multiple-use or open system capabilities—and the resulting benefits—is attractive in many cases. If an agency wishes to become part of an open payments systems, however, the only option at the present time is to accept a contact card, as MARTA is doing in the First Union/VisaCash pilot. In some transit-initiated fare projects, such as those in San Francisco and Seattle, the strong preference for a contactless card has thus far outweighed the desire to use a financial or telecommunications payment card. Of course, even in these efforts the project planners have expressed the intention to allow for the eventual migration to a more open system; conversely, MARTA ultimately would like to use contactless cards—while maintaining the open aspects of the current system. Several other transit agencies are looking into joint arrangements with financial institutions as well.

That several financial institutions also see the potential for joint payments programs is helping to fuel the push for the introduction of combined cards; an early indication of this interest is that the Bank of America has introduced a combined card (with separate chips for the contact and contactless interfaces) for testing in a new bank office building in San Francisco. The major source of interest in a combined contact-contactless card at this point, though, is the transit industry. Cards that combine contact and contactless interfaces are now available so that cards can be used in either type of system. These cards, commonly called "hybrid," "combi," or "dual interface" cards, are of three basic types (see Figure 4). A hybrid card has two completely separate chips; value cannot be transferred from the contact purse to the contactless purse. A combi or dual interface card has a single chip and both contact and contactless interfaces. However, there are two basic types of combi/dual interface cards at this point:

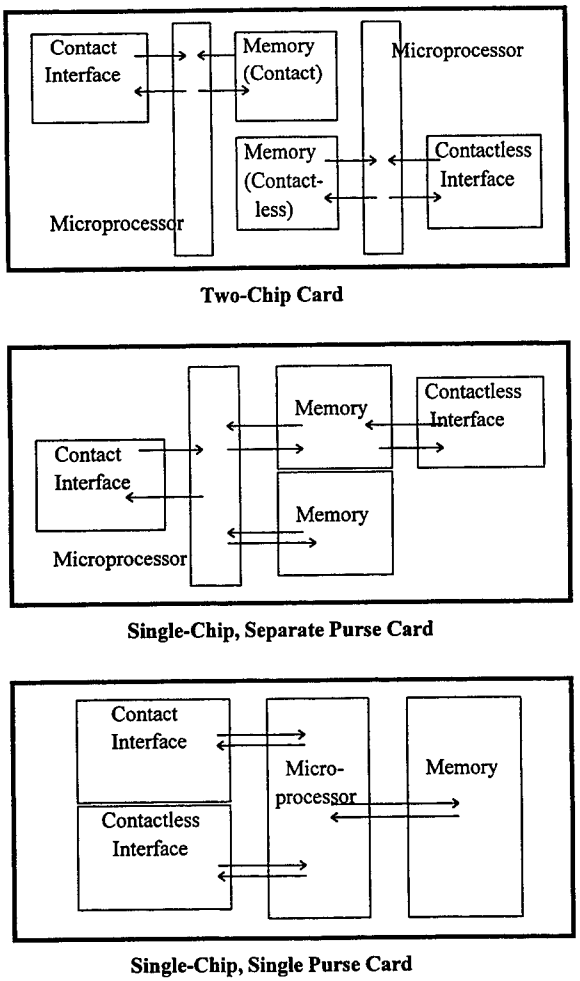


Figure 4. Combination contact-contactless cards.

- One type has separate purses for the contact (e.g., for banking functions) and contactless (e.g., for transit use) interfaces; value would be loaded through the banking (contact) interface and could then be transferred to the transit purse for use in fare payment.
- The other type has a single purse that can be directly accessed by either interface; there may, however, be a separate transit application.

The hybrid card, now available and being tested by Bank of America and others, would be considered an interim solution in a multiple-use transit setting, because the two functions are completely separate; in other words, the user cannot load value through the contact portion and use that value on transit. Such cards are useful for multiple applications not all involving payment; for instance, the CitySmart card in Hong Kong is a hybrid card in which the contact portion contains stored value (Hang Seng Bank) and the contactless portion is used for identification purposes (at City University).

Both types of combi-card use a single microprocessor and allow the user to access value and make transactions through either means. However, they are functionally different. Although value can be transferred from the banking purse to the transit purse in the separate purse option, value cannot be loaded directly from the bank into the transit purse and cannot be taken directly from the banking purse for transit fare payment. Thus, a person could find out on trying to pay his or her fare that all of the value in the transit purse had been expended—even though he or she had value in the banking purse. The rider would then have to go to a TVM, ATM, or add-fare machine to transfer value into the transit purse. In the single purse option, transit value can be loaded directly from the bank (e.g., at an ATM or other reloading location). However, there may be an issue with some types of cards related to speed of transaction in the contactless mode—because of the security requirements associated with a purse that handles banking functions.

Different companies are producing different versions of the combi-card. It is obviously a more complicated device—and hence more expensive—than either a contact or contactless card alone. This raises the question as to who will pay for and distribute the card. In an open system, will a bank pay the cost differential (i.e., compared with a contact card) to issue a combi-card so that it can be used on transit in the contactless mode, or will the bank simply issue contact cards, leaving the transit agency to provide the combi-card (i.e., including the bank's contact card and its applications) for its riders? This remains to be seen.

In a closed multipurpose system, the transit agency (or the system integrator or clearinghouse operator) would presumably issue the cards, which could then be used for other (non-transit) purposes in either the contactless or contact mode as needed. In an open system, a card issuer could provide a card containing the issuer's own functions (e.g., stored value and credit and/or debit) but with an "open architecture" that would permit the addition of other applications (e.g., transit) to the cards; in other words, the transit agency would add the transit fare payment application to the original issuer's card. This could be achieved through the use of a common application programming interface (API). For instance, several major companies recently announced their intention to use the JavaCard API developed by Sun Microsystems' JavaSoft unit as the basic tool for adding applications to smart cards. Visa indicated that it will use the JavaCard API to assist local issuers in the conversion of Visa credit and debit chip cards to multiple-application cards. Besides Visa, companies announcing their support for the JavaCard API (as of May 1997) include IBM, Gemplus, Schlumberger, VeriFone, Philips, SEMP, Siemens, Motorola, Integrity Arts, Spyrus, Citibank, First Union Bank, Bull, TTS, G&D, Hitachi, and Toshiba. Other APIs are also being considered; for instance, Mondex plans to use the Multos system for handling multiple applications. In general, the API approach will allow the addition of applications after cards have been issued and will

mean that entities (e.g., local banks, universities, and perhaps transit agencies) will be able to place their own applications on cards from multiple suppliers.

Another approach to providing combi-cards and multiple applications is represented by third-party companies (i.e., not card or equipment vendors or card issuers) that provide custom designed pre-programmed cards. These cards are sold to the issuing agency containing whatever functions the agency specifies (e.g., transit, parking, EP, and building access). For instance, a software company called Travelogic is producing a combi-card ("Ridecard") with a menu of applications from which the purchasing entity can choose.

A longer term possibility is that "blank" cards will be sold at consumer electronic or other stores, and purchasers will then add applications (e.g., stored value, transit fare payment, and prepaid telephone use) as desired. In this scenario, the consumer would buy a contactless, contact, or combi-card, as needed, and would then go the transit agency to have the transit application installed, as well as to the bank for an EP and to other entities as desired. It is expected that users would also be able to add applications remotely (i.e., through a unit on a telephone or personal computer). This approach would also probably use a common API such as JavaCard.

Depending on the demand for combi-cards, the unit cost could ultimately drop to a point close to that for contactless cards, but at least initially, the differential is expected to be substantial (e.g., 1.5 to 2 times the cost of a comparable contactless card alone, depending on the amount of memory and processing capability of the cards in question). Issues related to cost of the media and the allocation of these costs in providing combi-cards are discussed further in Chapter 5.

Thus, combi- or dual interface cards represent an important potential solution to addressing the differing requirements of transit agencies and other smart card issuers on a single card. However, as of this writing, the technology had yet to be tested in an operational setting, and the administrative and financial issues associated with providing the cards remained to be resolved. The availability of the cards will now allow the possible scenarios—and the ultimate potential for their widespread use—to be tested.

SELECTING AND IMPLEMENTING A TECHNOLOGY

In general, the key concerns in choosing a particular type of media or equipment for a multipurpose program may include the following factors:

- The fare media needs and fare collection goals of the agency or group of agencies,
- System costs and the amount of funding available, and
- The technology to be used by other entities in the region, coupled with concerns regarding card standards and interoperability.

Fare Collection Needs, Goals, and Costs

The transit agency's fare collection needs and goals—along with the amount of funding available—will dictate to a large extent the specific type of technology it will select. As discussed in Chapter 3, an agency's interest in establishing and operating its own—or perhaps a regional—payment system allows the consideration and selection of any technological solution. In the integrated regional program in Ventura County and those being developed in the San Francisco and Seattle regions, for instance, contactless cards have been chosen as the most appropriate medium. An alternative approach, seeking to participate in a more open system in collaboration with a bank, may dictate the use of contact cards—as is so in Atlanta and in the original Ann Arbor campus card trial. The combi-card should eliminate the need to make this distinction, although this will raise additional financial, technological, and institutional issues, as mentioned above.

Another key factor, and one that may strongly influence the agency's basic goals and needs, is the cost of alternative approaches and the availability of sufficient funding. An agency (or consortium) that feels it can afford to finance a new payment system on its own will probably be less interested in pursuing a partnership or participatory arrangement with a financial institution than an agency that cannot afford such a system. For instance, agencies that have committed large sums to installing new magnetic-based AFC systems (e.g., CTA and NYMTA) are unlikely to be able (politically, as well as fiscally) to turn around and immediately pay for installation of their own smart card systems. Thus, NYMTA sought to establish a partnership with a private entity to finance its multiple-use smart card program; CTA has begun to explore potential smart card partnerships with financial institutions. (Financial issues associated with introducing multipurpose programs are addressed in the next chapter.)

Standards and Compatibility with Other Systems

The desire to seek compatibility with the payment systems of other transportation operations in a region will also influence the technology choice. The concern here goes beyond a simple choice between contact and contactless cards—or magnetic cards for that matter. The whole question of standards and interoperability must be addressed: can a card issued by one entity be used by another entity that may not have the exact same system? Standards exist for certain aspects of smart cards and are being developed for others, but at present there is no real interoperability among the different cards and operating systems.

Smart card standards are being developed (in parallel) by several organizations around the world as follows:

- ISO: the International Standards Organization,
- ANSI: the American National Standards Institute, and
- CEN: the European Committee for Normalization.

Within these organizations, standards for the various aspects of the cards—and for different types of cards—are covered by individual working groups (WG) and task forces (TF). Smart card-related standards are being developed under ISO Standard Committee 17 (Identification Cards and Related Devices)—the key working groups are WG 1 (Magnetic-Stripe Cards and Test Methods), WG 4 (Contact Chip Cards), and WG 8 (Contactless Chip Cards). Standard Committee 6 (Financial Transaction Cards) is also dealing with certain aspects of smart cards.

Contact Cards

The basic set of standards for contact cards are collectively known as ISO 7816 (Integrated Circuit Cards with Contacts); these standards address the following card parameters:

- International Standard 7816-1: physical characteristics,
- International Standard 7816-2: dimensions and locations of contacts,
- International Standard 7816-3: electrical signals and transmission protocols,
- International Standard 7816-4: inter-industry commands and responses,
- International Standard 7816-5: registration system for application identifiers,
- Draft International Standard 7816-6: data elements for inter-industry interchange,
- Working Draft 7816-7: additional commands, and
- Working Draft 7816-8: security architecture and functions.

Thus, there are international standards for the size of the card, the size and location of the contacts, and several other aspects of the card and chip design. There are other international standards that pertain to financial transaction cards in particular: ISO 9992 (Messages between the Integrated Circuit and the Card Accepting Device) and ISO 10202 (Security).

In addition to these standards, a set of specifications is being developed to address the interoperability of card acceptance, security, and payment functions. The jointly developed Europay/MasterCard/Visa (EMV) Specifications govern financial (debit and credit) transactions using contact smart cards and have evolved in three parts as follows:

- Definition of the mechanical and electrical characteristics along with card and terminal transmission protocols;
- Definition of the terminal commands, applications, and data elements; and
- Definition of how the card, terminal, and settlement processing network will work together.

These specifications address only debit and credit transactions thus far, although they may ultimately include prepaid/stored-value/EP cards as well. Several other organizations are working to produce standards for prepaid and EP cards; the Smart Card Forum, the European Commission for IC Card Standards, and the European Committee for Banking Standards (ECBS), among others, are considering such areas as data definitions, security protocols, and technical card specifications. Nevertheless, at present, there exist neither standards nor specifications promoting interoperability among prepaid/stored-value card schemes. The various stored-value systems in operation or trial (e.g., VisaCash, Mondex, and Proton) all use ISO-compatible contact smart cards, yet none of these cards work in any of the other systems. The forthcoming Visa/MasterCard/Chase/Citibank venture in New York will require a certain level of interoperability between two different systems. Hopefully, this will be a key step toward widespread interoperability, as has developed with ATMs and credit and debit cards.

Contactless Cards

The development of standards specifications is more advanced for contact cards than for contactless cards. Under ISO WG8 (Contactless Cards), there are two parallel contactless card standardization efforts as follows:

- ISO 10536, Close Coupling Cards: Part 1 has addressed physical characteristics; Part 2 has addressed dimensions and location of coupling area; Part 3 addresses electrical characteristics and reset procedures; and Part 4 addresses transmission protocols. The first three parts have been approved; Part 4 is being reviewed by the ISO member countries.
- ISO 14443, Remote Coupling (or RFID) Cards: Part 1 is addressing physical characteristics, Part 2 is addressing radio frequency interface, Part 3 is addressing transmission protocols, and Part 4 is addressing transmission security features; considerable work has been done on Parts 1 through 3 (as of mid-1997).

Contactless cards in use in transportation applications—transit as well as electronic toll collection—typically fall under the latter category. Within this category, however, there are several types of technologies on the market today. Contactless cards used in transit applications can differ for the following physical and operating parameters, among others:

- Power generation technique (battery versus RF transmission),
- Operating distance from reader (generally under 1 cm for close coupling cards and up to 15 cm for remote coupling cards),
- Data transmission rates (2.4 to 300 kilobits per second),
- Internal logic and memory capacity (e.g., Microprocessor or not, memory capacity of 256 bits - 8,000 bytes),

- Radio frequency (125 KHz to 30 MHz), and
- Memory technology (e.g., electronically erasable programmable read-only memory [EEPROM] versus ferroelectric random access memory [FRAM]).

The cards now being tested or used for transit have different combinations of the above characteristics. However, the key parameters affecting potential interoperability at this point are the memory and processing technology and the radio frequency. The other parameters define the size and capabilities of the card. With regard to power generation technique, cards have, by and large, evolved away from battery power. This has reduced the effective operating distance somewhat—to about 10 cm in most cases—but most agencies prefer that riders pass the card very close or even touch the card to the reader to ensure that the transaction occurs. Data transmission rates continue to differ by card, but most used in transit operate at over 100 kbps. Memory capacity can vary even within individual chip manufacturers. The most widely used transit contactless card at this time (based on the MIFARE system made by Mikron) contains 8k bits and does not have a microprocessor; however, MIFARE chips also come in smaller memory configurations (e.g., 1k). Other contactless cards, such as those developed by Motorola, have microprocessors.

The major memory technologies in existing contactless cards are EEPROM and FRAM. EEPROM is used for both contactless and contact cards. As the name suggests, data are erasable and modifiable, allowing the cards to be reloaded and reused (i.e., until the card itself wears out). In contrast, disposable prepaid cards (contact only) are electronically programmable read-only memory (EPROM); once data have been encoded, they cannot be erased. These cards can be updated by adding data (e.g., value) to unused sectors of the card—if there are any; once capacity has been reached, the cards must be discarded. FRAM is a newer technology used in contactless cards produced by Racom Systems and is being licensed to other manufacturers. The relative advantages and disadvantages of the different technologies are a matter of debate at this point. With regard to radio frequency, 13.56 MHz has been recommended as the standard for power transmission, and most cards targeted at the transit market have now adopted this frequency.

Thus, the smart card industry is moving steadily toward the adoption of standards for both contact and contactless smart cards. Although the existence of standards—as well as specifications—for various card parameters and operating procedures will help move toward interoperability, there will also probably develop certain de facto standards for other parameters. Besides interoperability, the primary benefits of standardization will be an increase in the number of sources of chips for card manufacturers and of cards and equipment for system users; this should result in lower costs, particularly for the chips themselves.

Functional Requirements

Beyond the development of technical standards for cards, transit agencies, as well as potential financial and technology partners, are also concerned about the need for standards for functional requirements. The need for establishment of some type of industry standards, or at least guidelines, for cards in a multiple-use system was identified by many of the participants of the Multi-Use Workshop and has also been suggested at meetings such as the APTA Fare Collection Workshop. The consensus at the Multi-Use Workshop (see Appendix D) was that the industry (i.e., the agencies) should develop these guidelines, with the vendors responsible for the design of actual technical specifications, although it was also thought that the financial sector should participate in the requirements development process.

Along these lines, there are several efforts underway or in the planning stages aimed at developing guidelines for various aspects of the fare payment and collection process. For instance, ITS America has established an ITS Payment Systems Task Force to identify distinct issues and concerns of each sector that may be involved in multipurpose payment programs (i.e., the transit and financial communities, as well as other transportation providers). Meanwhile, the U.S.DOT, through the Volpe Center, is setting up a working group whose task is to define functional requirements and guidelines. The APTA Fare Collection Committee also plans to consider this issue through a new subcommittee. From a somewhat different angle, the FHWA-sponsored Transit Communications Interface Protocols (TCIP) project includes a fare collection working group that is charged with identifying the data requirements and formats related to fare collection equipment and the interface between fare collection and other transit control elements (e.g., passenger information). Thus, there is considerable interest and activity in this area. However, it will be important to coordinate all of these activities so as to work toward production of a coherent, integrated set of standards and guidelines. In light of the nature and timing of several multipurpose projects now in advanced stages of development (e.g., the regional integration efforts in the San Francisco area, the Central Puget Sound region, the Washington, DC, region and elsewhere), the need for standards is urgent and should be accorded high priority by the organizations sponsoring the above efforts.

OTHER TECHNOLOGY ISSUES

In addition to the factors already discussed, a transit agency or consortium should consider other issues in selecting and implementing a new payment technology, including the following:

- Integrating the new technology into the existing fare collection system and
- Ensuring flexibility regarding future technology developments and planning for migration to new technologies.

Unless an agency is replacing its entire fare collection system with a new system, a key concern will be how the new portion of the system (i.e., the smart cards) will be integrated with the current system. This issue includes not only direct equipment interfaces, but also administrative and operational elements, including fare policy and pricing of media relative to existing media (discussed earlier), sale and distribution of media (including employer involvement), marketing, collection and reporting of data, settlement among participating agencies, training of operators and other agency personnel, and maintenance of equipment (e.g., do current maintenance personnel possess the technical capabilities to maintain and repair smart card readers?).

In some cases, the transit agency or group of agencies will consider the smart card system as a separate element of the overall fare collection system, with its own pricing, distribution, and data collection functions. This is likely to be the situation in an open system, such as at MARTA, as the transit agency is simply accepting an outside card for fare payment. However, even where the transit agency is providing its own cards, the smart card readers may be essentially stand-alone units that do not directly interface with the existing collection elements of the farebox or fare gate; this has been the case at WMATA, for instance, with its GO-Card pilot project. The alternative approach is to attempt to fully integrate the new technology into the existing system. This requires retrofitting equipment and the data transmission infrastructure; the complexity of this task will depend on the size of the transit system, the modes of service and types of fare collection equipment in place, and the complexity of the various system elements. Finally, if an agency is just now procuring or implementing a new fare system, it may be possible to plan for the addition of or transition to smart cards. CTA, for instance, specified its new AFC equipment to be smart card-capable; thus, every fare gate is equipped with a contactless card "target." Of course, these readers are designed to work with the Cubic GO-Card; if the CTA ultimately opts for another type of card, these units may have to be replaced (or at least modified).

The latter point underscores the difficulties inherent in planning for flexibility. The card technology is still developing, particularly in the area of combi-cards, and an agency now developing a smart card system may well wish to maximize its ability to migrate to a newer technology once it becomes available. One of the initial recommendations in the TransLink study, for instance, was to procure equipment that would allow future use of contact as well as contactless technology (i.e., once the use of commercially provided stored-value cards becomes widespread).(*3*) Until that time, only the contactless readers would be active. However, the development of combi-cards has advanced considerably since the completion of that study, less than a year ago. Thus, the designers of the TransLink program must now decide whether to continue to follow the initial recommendation, thereby retaining maximum flexibility, or to assume that combi-cards will obviate the need to accept contact cards for transit uses. The rapid pace of technological developments, along with the parallel developments in potential institutional arrangements, has added new complications to choosing the most appropriate path to follow.

CHAPTER 5

FINANCIAL ISSUES

INTRODUCTION

A fundamental factor affecting the potential of multipurpose media and joint transit/banking arrangements is the nature of the financial implications of such efforts—from both the cost and revenue side. There will be various capital and operating costs and benefits associated with implementing any new fare technology or payment system, and the net effect on the transit agency—and any participating financial institutions—will depend on the multipurpose program and any institutional arrangement, as well as the level of current fare collection or payment system costs. The key financial issues concern the following questions:

- What are the capital and operating costs?
- Who will pay for which cost items?
- What are the potential cost savings, new revenues, and other (nonfinancial) benefits?
- How are costs, benefits, and risks apportioned among participating entities?
- How can a multipurpose arrangement be structured financially so as to produce a "win-win" situation for all participating entities?

This chapter reviews the various types of costs and benefits associated with implementing and administering multipurpose arrangements. This includes, as suggested above, consideration of the direct capital and operating and maintenance costs and potential savings, as well as revenue implications related to multiple-use card programs.

COSTS

Cost Concerns

The costs associated with fare collection represent a significant concern to transit agencies. As funding for transit becomes increasingly limited, minimizing all types of expenditures gains importance. Thus, cost is a major consideration in assessing potential fare collection approaches. In the survey of transit agencies conducted for this study (see Appendix A), "reduce cost of producing and distributing fare media" and "reduce cost of fare collection and processing equipment" were each rated "very important" or "important" by about two-thirds of the respondents. In an earlier survey of 150 transit agencies, 83 percent of the respondents cited cost as the most important or at least one of the most important factors related to fare collection. (*9*)

Cost is likely to be of particular concern in implementing a multipurpose media program if this program is being added to an existing electronic fare payment system or one being implemented. As mentioned earlier, several transit agencies are installing magnetic-stripe AFC systems. It will, in most cases, be quite difficult for an agency to justify (to the public and to political decision-makers) paying to add smart card capabilities to a new system that has been promoted as being "state of the art." Some agencies, such as those in the Seattle area, are planning new fare systems based largely on smart cards. However, even in such situations, there is still a need to provide alternative lower cost payment options—tokens, tickets, magnetic or capacitive cards, or at least cash; given the high unit cost of smart cards, it is not, at present, cost-effective to offer smart cards for one-time or occasional users. Similarly, even in an open payment system, where the transit agency accepts outside cards, the agency will likely always have to maintain its own fare collection equipment to accommodate riders who do not have access to—or choose not to use—the open system media.

Cost is also an issue for financial institutions in contemplating stored-value or multiapplication programs, particularly given the uncertainty surrounding the acceptance of the concept and the size of the return on what will be a major investment. In the survey of 98 financial institutions undertaken by Dove Associates (see Appendix C) to find out about plans to issue smart cards, respondents expressed generally strong interest in smart cards; this interest was accompanied by significant concerns about the costs of providing smart cards. Cost concerns were almost unanimously cited as a disadvantage of issuing smart cards and, in fact, represented the single most important component of a potential issuer's decision. The benefit to the institution was the second most important issue. Specific financial concerns included the economic justification for spending much more on the cards themselves ($3.00 to $6.00 was the expected range reported in the survey) than is now spent (i.e., roughly $0.10 for a magnetic-stripe card), as well as the cost of upgrading card-accepting devices so that customers can use the cards. Thus, developing a reasonable business case was deemed crucial to these institutions' participation in smart card programs.

Current Transit Agency Fare Collection Costs

The costs associated with transit fare collection vary widely. Based on the survey conducted as part of this study, some agencies spend less than 1 percent of their total fare revenue on fare collection and related costs, while others spend as much as 20 percent; the average for all agencies responding to the survey is roughly 6 percent. The percentages reported in the survey are summarized in Table 5. As indicated, agencies in all categories tend to spend less on production and distribution of media than on collection and processing of fares; the average for all agencies is just less than 2 percent for the former and more than 4 percent for the latter.

For greater detail on the costs associated with fare collection, the TransLink study provides an example of how these costs break out by function. (*10*) This study focused on six operators in the San Francisco Bay area (BART, ACTransit, MUNI, Golden Gate Transit, Sonoma Co. Transit, and Vallejo Transit) and calculated total fare revenues and costs. These agencies account for more than 80 percent of the transit ridership in the MTC region, and the cost and revenue figures were used as the basis for estimating totals for all operators in the region; these regional figures were subsequently used in estimating potential cost savings attainable through the TransLink program. The total fare collection cost (for the region) was found to be 7.8 percent of the total fare revenue: $20.5 million out of $264.4 million. The fare collection costs break out by function as follows:

- Vault and farebox and barrier costs: 37 percent,
- Internal distribution costs: 35 percent,
- Commissions to third-party sales vendors: 14 percent,
- Production of media (including procurement, inventory control, and production and encoding): 10 percent, and
- Vendor distribution, recruitment, and collections: 4 percent.

This analysis determined the overall fare collection cost per ride to be $0.044. In considering different types of fare media, the cost per ride for cash fares was found to be $0.064, while the cost for prepaid rides is $0.047.

Cost Categories

The cost elements associated with developing, implementing, and administering a multipurpose fare program will vary to some extent depending on the specific type of program (e.g., open or closed system), the modes of service and type of fare collection (i.e., bus/pay on entry, rail/barrier, light rail/proof of payment, and commuter rail/pay on board), the existing equipment, and the extent to which the new equipment will be integrated into the current system. In general, however, introducing a closed (i.e., agency-initiated) smart card-based system will include many—if not all—of the following types of items:

- System design and development effort (i.e., staff and/or consultant time), including specifications for equipment, media, and clearinghouse processes;
- Procurement and installation of fare collection and dispensing equipment and related software (e.g., card-accepting devices and application software and card-dispensing and recharge machines);
- Procurement and installation of garage and station—and central—computer system (including software);
- Installation or modification of the communications infrastructure and system;
- Purchase or production of fare media;
- Day-to-day administration;
- Maintenance and repair;
- Marketing (promotion and education of customers);
- Sales and distribution;
- Revenue accounting; and
- Training (e.g., maintenance, operations, customer service, and revenue and finance).

In an open system (and possibly in a closed multiple-use system) in which a private entity or a public-private partner-

TABLE 5 Transit agency cost of fare collection

Mode or Size of System	Cost (as Percent of Total Fare Revenue)					
	a) Production and Distribution of Media		b) Collection and Processing		Total (a + b)	
	Range	Average	Range	Average	Range	Average
Heavy Rail	0.5-10	2.8	1.5-7	4.2	2-17	7.1
Commuter Rail	0.2-7	2.7	1.6-15	9.2	1.8-22	11.9
Light Rail	0.4-2	1.3	1-7	3.4	1.4-9	4.7
Large Bus	0.2-5	1.9	0.3-3.5	2.1	0.5-8.5	4.0
Small-Medium Bus	0.1-2	1.1	0.4-6	2.3	0.5-8	3.4
Overall Range/Average	0.1-10	1.9	0.3-15	4.3	0.5-22	6.2

source: survey of transit agencies (June 1996)

ship is managing the system, some—and possibly all—of the aforementioned items may be covered through the payment of transaction fees. In an open arrangement in particular, the transit agency will also experience a "cost" in terms of loss of revenue currently received from "float" (from prepaid media sales) and/or unused value (from stored-value media).

Each agency will categorize specific costs somewhat differently, but the fundamental issues to be addressed are how the new system will affect the current operating and maintenance cost structure and what are the capital costs for the new system.

Operating and Maintenance Costs

Transit-Operated Program

The effect of introducing a multipurpose payment program on operating and maintenance costs will depend on changes to existing cost elements, including cost savings, and new cost elements. Potential changes in existing elements include automating certain sales, distribution and processing functions, and maintenance requirements. Cost reductions may be achieved by reducing the number of personnel needed to carry out these functions. Also, expenses, such as sales commissions for prepaid media or contract services for data collection, may be reduced. For instance, several transit agencies implementing new electronic fare systems (e.g., CTA, NYMTA, MBTA, and GMPTE) have projected significant savings in fare collection labor costs. The bulk of the savings are expected to result from eliminating the need for rail station ticket agents and from reducing the need for revenue processing and accounting personnel. A complicating factor, however, is that labor agreements may effectively prevent most immediate staff reductions.(*7*) Although it may be possible to reassign the affected staff to other functions, this means that certain projected personnel savings may be fully achievable only over a relatively long time. On the other hand, where services are contracted out or performed through outside agents (as with off-site sale of media), the costs can be readily reduced as appropriate. In Manchester, for example, the annual amount paid in commissions to the primary vendor selling fare media was expected to be reduced from $400,000 to $200,000.

With respect to maintenance personnel, use of contactless cards and readers in particular should reduce costs because of the low maintenance requirements anticipated for this equipment. The increased sophistication of electronic fare equipment, in general, will, however, create new challenges for an established maintenance organization, possibly requiring more highly trained personnel. At a minimum, considerable retraining probably will be necessary. The net effect of contactless-card programs on operating and maintenance costs has not yet been ascertained, because there is little long-term operating experience with the technology; however, some agencies have projected significant maintenance cost reductions with such programs.

Another area often cited as offering potential cost savings with the use of smart cards is on-board data collection. The storage and processing capabilities of smart cards offer potentially significant cost savings over existing data collection activities. In Manchester, for instance, it was thought that the smart card system would largely replace the existing manual rider survey effort, saving the transit agency nearly $1 million per year. In the Southern California smart card trial (Gardena, Torrance, and LA DOT), the system integrator also estimated a significant data collection savings.

Comprehensive analyses of the cost effects of implementing multipurpose fare systems were undertaken as part of the Central Puget Sound (*2*) and Bay Area TransLink (*3*) regional fare studies. The former study compared new and existing costs for the King County Metro transit system and estimated that the effect of the recommended smart card system on Metro's fare collection operating and maintenance costs could range from an increase of $139,000 per year (roughly 4 percent of the total annual current cost) to a reduction of $309,000 (more than 9 percent of the current total). The estimated effect on the existing cost elements is a savings of $495,000 to $804,000 per year (at full system implementation), or 14 to 22 percent of these elements. The cost categories in which significant savings were projected include "information production," "pass program administration and sales," "general accounting," and "customer service office." The study estimated that new cost elements (i.e., clearinghouse costs and costs for operating and maintaining new on-board equipment) would add between $495,000 and $635,000 per year, or 14 to 19 percent of the current total. The net effect of the new system on Metro's costs also includes an estimate of new revenue expected from various sources.

The TransLink study compared the costs associated with existing fare collection for the entire region with the estimated TransLink implementation and operation costs. The study determined that TransLink would result in total 5-year costs approximately 4 percent lower than comparable costs for the existing system, producing a savings of more than $1.5 million over the 5-year analysis period. Although fare media procurement and clearinghouse functions represent 23 percent in added costs, significant savings were projected for "distribution" (i.e., third-party vendor recruitment, internal distribution, vendor distribution management, inventory control, and sales commissions) and "transit operator costs" (i.e., purchase, installation, and maintenance of new equipment). The net savings attributed to TransLink were estimated to be equivalent to $0.01 per rider: $0.46 versus the $0.47 mentioned earlier.

Capital Costs

Capital cost elements for a transit agency include the following:

- Fare media,
- Fare collection and distribution equipment (i.e., card-accepting devices and card-vending and recharge machines), and
- Clearinghouse and communications equipment and systems (e.g., computers and communications).

The first two categories will be necessary regardless of the type of institutional arrangement; at issue will be who pays for what. The need for items in the third category will depend on the arrangement in place; for instance, much of the clearinghouse-related system will not have to be installed at the transit agency if a bank or other entity is responsible for clearinghouse functions.

Fare Media

The cost of the fare media is important in identifying the costs and benefits of a new fare system. The current unit cost of a smart card is significantly higher than that of a magnetic-stripe or capacitive card; however, the life-cycle cost is the key consideration. The production cost of a smart card varies widely, depending on the specific technology (i.e., contact, contactless, or combi), the actual production process, the amount of memory, and the processing capabilities of the card; the purchase price will then depend on the volume being procured. For instance, the disposable prepaid contact cards originally used in the VisaCash pilot in Atlanta cost approximately $1.50 apiece; the reloadable version of the card costs about $3. Contactless cards used in transit applications cost between $3 and $10, depending on card configuration and volume. However, as indicated in Chapter 4, new production processes, including a modular antenna/chip design, will soon result in the price dropping to less than $2.50 for a 1-Kbit, reloadable contactless card; some manufacturers are planning a lower memory card (probably 256 bits) priced at less than $1 to be introduced in 1998. Combi-cards will be available by the end of 1997; initially, they will cost somewhat more than contactless cards ($10 or more), but the price is expected to drop considerably within the next couple of years. In contrast, the unit cost of a stored-value magnetic-stripe or capacitive card is typically less than $0.20, depending on volumes.

The prices of smart cards continue to decrease and should drop further over time, as more vendors enter the market and card use expands. Although they are unlikely to approach the purchase cost of magnetic media in the foreseeable future, smart cards are more reliable (in terms of failure rate) and have a much longer useful life than magnetic cards. Thus, if users retain their original smart cards for an extended period, the life-cycle cost can become comparable with that of magnetic media.

For a transit agency to provide smart cards cost-effectively, users must pay the cost of the cards themselves, the agency must provide incentives (e.g., in the form of discounts or bonuses) to encourage users to hold onto the cards for an extended period, or the agency must arrange for an outside entity (e.g., a bank) to provide the cards. Analyses of cost and benefits of smart card-based systems, such as that for Seattle, have typically assumed an average life of 5 years for a smart card. The Seattle study also recommended consideration of a charge for the card, perhaps $5 to $10; this would also serve as a "buffer" or reserve in case the rider had insufficient stored value to pay a particular fare. As acknowledged in that study, it is important to demonstrate to cardholders that the card has value in order to encourage retention of cards. People are used to holding onto credit and debit cards for long periods, but fare media are rarely held for more than a month at a time. Thus, consumer education will be an important element in implementing a smart card system. Until transit riders are accustomed to treating fare media like credit and debit cards, some type of financial incentive (e.g., a bonus on recharging the card or some form of rider loyalty program) will be important (incentives and bonuses were discussed in the previous chapter).

Incentives and/or card charges are feasible for riders who use the card regularly. However, occasional—and particularly one-time—riders will neither benefit from nor be interested in keeping a card for a long period, and they are unlikely to be willing to pay a charge for acquiring the card. Thus, to maintain any reasonable cost-effectiveness in its fare collection system, an agency introducing smart cards will need to provide a lower cost fare option for these riders. A cost-effective approach may therefore be to offer smart cards only for riders interested in maintaining high stored values and to continue to accept cash—and perhaps magnetic cards, tokens, or paper tickets as well—for use by one-time or infrequent riders. Alternative approaches for a transit agency to minimize the media cost are to become a participant in an open system and accept a commercially available multiple-use payment card or to use some form of vendor financing in which the agency does not have to purchase the cards itself.

The open system option raises questions concerning the choice of technology, however. Given that financial institutions are planning to issue contact cards for their own purposes, a key question is whether they will be willing to pay for the provision of combi-cards in a multiple-use environment—and, if so, for whom will they supply combi-cards? From the transit agency's point of view, the preferred solution would be for the bank (or other issuer) to supply combi-cards to all of its customers, so that all would have a convenient means of using the contactless interface on transit. Banks in most settings (i.e., in all but the highest transit use cities) may not see this as cost-effective, opting instead to supply the cards only to existing transit riders —who may or may not be bank customers. In other cases, the issuing bank may be unwilling to issue combi-cards at all, leaving that responsibility to the transit agency; in other words, the bank would issue contact cards, while the transit agency would issue combi-cards that included the bank's contact interface and EP and/or other applications. The question in that case would be, does the agency provide combi-cards to all riders

(or at least frequent riders) or contactless-only cards to riders who are not customers of the participating bank?

It is advantageous to the transit agency and the bank for everyone to have a combi-card and thus have ready access to the services of both entities. Indeed, some in the smart card industry think that, eventually, the desire for maximum flexibility in pursuing multiple applications will dictate that all smart cards be combi-cards. In the meantime, the issues that must be considered include the cost—or allocation of costs—associated with issuing a combi-card, as well as the practical problems related to encoding and distributing the cards. As discussed in Chapter 4, the use of an API, such as JavaCard, provides a framework for adding applications to cards and, thus, should become an important element in establishing multipurpose programs; however, it remains to be seen how the finances and mechanics of providing combi-cards will develop.

Equipment

The costs for equipment in a multipurpose fare system will depend on such factors as the system size and modal configuration, the existing equipment and systems (and the extent of changes to these), and the financial agreements among the project participants (i.e., who is paying for what). In general, for a closed-system transit agency-run program, the following basic types of equipment are likely to be required (in addition to fareboxes or faregates):

- Card-accepting devices (i.e., bus or rail read-write units) and application software, along with related data probe equipment;
- Card-vending and recharge machines;
- Garage (bus) and/or station (rail) computers;
- An agency computer (in a multiagency system); and
- A central data collection and clearinghouse computer system.

Costs for these items, as well as costs for supporting functions, will vary considerably depending on site-specific factors. As described in *TCRP Report 10*, "Fare Policies, Structures, and Technologies," fare collection equipment tends to be a customized product. Unit costs are generally developed for each type of equipment on the basis of supplier quotations, equipment characteristics, experience with recent purchases, and appropriate multipliers to allow for economies of scale and escalation for the time value of money. The price for any type of equipment is sensitive to such factors as the following:(*7*)

- The equipment specifications for the individual agency (including performance requirements and features), which affects the amount of customization required for a product (this customization can represent a substantial portion of the overall price);
- The quantities of the particular equipment being ordered;
- The extent to which the new equipment will have to interface with existing equipment (i.e., that is not being replaced);
- Vendor selection and negotiation (e.g., the type of contract whether low bid, two step, or negotiated);
- The timing of the procurement (relative to the procurement of similar equipment by other agencies—and therefore the extent of refinement of the technology);
- Growth potential (e.g., opportunities for new or extended lines);
- Warranty terms (warranties are generally for 1 year, but this period can be extended on the basis of other clauses associated with equipment performance);
- Documentation requirements (i.e., striking a balance between what is offered as manufacturer's "standard" and degree of customization for the agency);
- Software requirements (some software customization is expected, but requests for additional functions, features, and reports will be considered extra and will increase the cost);
- Vehicle/station/facility modifications (the costs of modifications to vehicles, stations, bus garages, or other facilities also need to be considered); and
- Americans with Disabilities Act (ADA) requirements (fare collection equipment must address ADA requirements, including accommodation of wheelchairs in turnstiles, provision of sufficient room on buses to pass the farebox in a wheelchair, compliance with height requirements for buttons on AVMs, and accommodation of the needs of those riders who have vision impairments in purchasing and using fare media).

Many factors must be considered in identifying capital costs for a new fare collection system or an upgrade to an existing system. (Order-of-magnitude cost figures as might be incurred in upgrading an existing fare collection system to smart card capabilities are presented in Table 11 in Chapter 7.)

In estimating the costs of individual types of equipment, an agency must also consider the extent to which items will be physically integrated with other fare collection units. For instance, will card-accepting devices be integrated into existing—or new—fareboxes or faregates or will they be installed as separate units? If new fareboxes are being purchased, will electronic registering units be installed? Will magnetic ticket processing units or automatic transfer issuers be needed? Possibly, the capabilities of the smart cards will allow use of a less expensive mechanical farebox. This decision may depend on the size and ridership of the bus system, as well as the expected market penetration of smart cards; in other words, if most riders are not likely to use smart cards in the next several years, the agency may well opt for electronic fareboxes.

Cards can be sold and recharged through the following methods:

- Stand-alone unattended card vending and recharge machines (CVMs),
- Processors incorporated into cash registers (at stores or other remote sales locations) or existing media dispensing equipment (in agents' booths in rail stations or in existing TVMs), or
- Manually, at ticket agent windows or other locations, as well as through employers (these cards can either be provided with no initial value on them, or they can be preloaded with a certain value; in either case, the cards would be loaded—or reloaded—through CVMs or through add-fare machines).

In Atlanta, NationsBank and First Union Bank installed new smart card-vending machines in key rail stations, while in Washington, contactless card targets were added to the TVMs and add-fare machines, allowing riders to add value to their smart cards. In an open system, cards should be obtainable and rechargeable from ATMs or bank branches, although the transit agency may wish to sell the cards as well. The costs associated with sale and recharge units vary widely, depending on the setting.

The final major capital cost element consists of the communications and data collection and processing computer systems. There may be three distinct systems: the garage and/or station, the agency, and the central clearinghouse systems; in multipurpose programs involving only a single transit agency, the central computer will serve the functions of the agency computer. The garage or station computer records all fare transaction information—and card purchase and recharge data—for the buses using that garage or for a particular rail station and communicates these data to the agency computer (or the central computer if applicable). In a multiagency system, each participating agency will have a computer that aggregates all of the garage and station inputs and communicates with the central clearinghouse system. This computer will also be used to remotely control and monitor station equipment and download updated fare information and to prepare agency-level reports. Finally, the central clearinghouse system processes all transaction data from the agency—or garage and station—computers. In a multiagency system, this computer allocates revenue among the agencies and communicates with bank networks, if necessary. As with the other types of equipment, costs vary considerably for the computer systems and communication links.

The costs associated with clearinghouse functions will depend on the specific nature of the multipurpose arrangement, including the number of participating entities, types of operating agreements, and cost-sharing details. How the transit agencies cover these costs also depends on the details of such agreements, as well as the financing approach in each case. (Order-of-magnitude cost estimates for two hypothetical smart card upgrade scenarios are presented in Tables 12 and 13, in Chapter 7).

Potential Cost Savings

Potential capital cost savings are related to the procurement of equipment and the provision of the cards themselves. Whether there will be any savings depends on the specific institutional arrangement in place. In Manchester, for example, the system integrator provided the on-bus smart card reader units at no charge as part of the partnership agreement with the transit agency. In Atlanta, Visa paid to install the initial card readers in turnstiles in MARTA's rail stations; the cards were also provided—by the three participating banks—at no charge to MARTA; cards will now be provided solely by First Union Bank, under the current agreement with that bank. In the Ventura County Passport project, the smart card units were also provided at no charge to the operators; the cost was assumed by the California Department of Transportation as part of a demonstration program. Of course, the former two projects have involved payment of transaction fees by the transit agencies. Thus, the capital cost "savings" will eventually be off set by the fees.

Open System or Public-Private Partnership

In open payment systems or closed systems involving a joint public-private partnership, the cost effects will probably differ from those discussed above. As indicated in Chapter 3, the chief cost for the transit agency may be a transaction fee per use of the multipurpose card (or possibly per overall system fare transaction) to the system operator or card issuer. The extent of this cost—as well as the effect on other costs—to the transit agency will depend on the specific institutional and financial arrangement and operating agreement as to which entity covers the cost of which elements. This is a crucial factor—for the transit agency and for prospective partners—in developing a business case for a multipurpose system. As can be seen in the dissolution of the NYMTA/Chase negotiations, the structure of the transaction fee agreement is fundamental to the development of a workable partnership. The revenue paid to the issuer must be weighed against the perceived risk in the endeavor, and all parties concerned must be convinced that the agreement is mutually beneficial.

In New York, differences in expectations regarding the extent of the risk led to an inability to reach agreement on the level and type of the transaction fees. Whereas the bank sought to collect a fee on every farecard transaction (i.e., involving both the magnetic Metrocard and the proposed smart card, although the latter transactions would carry a higher fee), the MTA felt that this was inappropriate, preferring that the fee be limited to uses of the smart card to be

issued by the partnership. Including all fare transactions in a closed multiple-use agreement limits the risk—to the system integrator or operator—that the new card will be used less than expected. An alternative approach to limiting the risk is for the transit agency to guarantee a minimum number of monthly or annual transactions (i.e., a minimum total fee payment). Such an agreement might then call for a lower fee for transactions above that threshold, or perhaps a waiver of fees at that point. In an open system, the fee would probably be paid only on transactions made with the multiple-use card.

An important factor in determining the level and basis of the transaction fee is what exactly is being covered by the fee. If a transit agency is paying the fee to a system integrator, the following basic types of costs could be covered through fees:

- Clearinghouse functions, particularly settlement;
- Issuance and/or distribution of cards (may or may not be included under clearinghouse functions);
- Maintenance of equipment; and
- Provision and installation of equipment.

Ongoing types of costs, particularly those related to clearinghouse and maintenance functions, are the most likely candidates for fee-based payment. However, the transit agency may wish to pay for equipment through fees as well. Thus, financial agreements could consist of various combinations of these costs, depending on such factors as the capital funds available, the willingness of the integrator to finance the capital elements of the system, and the general cash flow capabilities of the transit agency. (Examples of three basic payment and financing options are presented in Table 14 in Chapter 7.)

Because of the limited experience in instituting multiple-use programs, there are as yet no established fee models. Each program established to date has its own arrangement. In Manchester, for instance, the transit agency paid fees only for use of the smart cards by its full-fare riders—and not for concessionary riders. MARTA has paid a slightly lower fee per transaction (for the smart card) than are other types of merchants for use of the VisaCash card (approximately 2 percent of the value of each $1.50 transaction compared with approximately 2.5 percent for the others), although the exact rate is individually negotiated. In accepting credit cards, Valley Metro in Phoenix has reduced the amount it has to pay in transaction fees by batching transactions, rather than sending them one at a time. Once the stored-value card becomes a common commodity, it is possible that more standardized fee arrangements will develop, as they have for credit and debit cards. With regard to the EP programs in existence around the world, the range in merchant fees is 0 to 5 percent, with most falling between 0.3 and 1 percent. Regardless of the actual amount, the transaction fee represents an important concern, either as a cost (to participating transit agencies) or as revenue (to the issuing financial institution or partnership).

Another "cost" associated with transit participation in an open system or private partnership arrangement is loss of revenue now being received from interest on float—and, for agencies with stored-value media, from unused or expired card value. As defined in a recent article in the *New York Times Magazine*, "Float is wealth in transit, money that has been parked temporarily in a place where someone, probably not you, can earn interest on it." (*11*) Transit agencies have benefited from this source for years through the sale of period passes and other prepaid media (i.e., multiple ride tokens and tickets or stored-value cards). Thus, agencies must consider the effect of forfeiting this revenue in entering a new type of arrangement. Although the use of stored-value media is limited among transit agencies, the potential loss of revenue from unused value must also be considered if an agency is yielding control over issuance of its stored-value media.

Regarding the overall effects, a transit agency participating in an open system (or in a closed system operated by a private entity) should save money in areas such as sales and distribution of media and revenue accounting. The net effect will therefore be determined by the level of cost savings—both operating and capital—compared with the transaction fee and any loss of float income.

REVENUES

Types of Benefits

The introduction of electronic fare payment is expected to benefit a transit agency. Although some benefits are financial, others are related to goals such as improving convenience for the customer. The general types of benefits typically associated with electronic/stored-value media are as follows:

- *Improved flexibility*, in terms of the range of fare options that can be offered and the ability to modify the fare structure;
- *Improved revenue accountability and security*, in terms of improved ability to track transactions and discourage employee theft or mishandling of fare revenue;
- *Reduced fare abuse*, including reduction of counterfeiting of media and short payment or illegal reuse of media;
- *Improved ridership data* generated from fare payment;
- *Reduced operator and rider interaction and administrative and operational requirements* (i.e., related to the need for operators to sell and verify the validity of media, such as flash passes and transfers, in particular);
- *Improved convenience* for riders, in both purchasing and using the media;
- *Ancillary revenue* from float and unused value on stored-value cards and, perhaps, from transaction fees (in a multiple-use program); and

- *Expansion of employer programs,* which will result in additional revenues from people who buy passes because they are subsidized and who would not otherwise use transit regularly.

Contactless smart cards, in particular, offer additional benefits, including the convenience of not having to insert or swipe the card; this is seen as especially important for riders who are elderly or who have disabilities and who may have trouble using another medium. Other contactless card benefits include the following:

- *Faster throughput* (i.e., faster boarding of buses and passing through fare gates),
- *Lower maintenance costs* (because there is no physical contact with the turnstile or farebox and the read-write unit has no moving parts), and
- *Improved reliability of fare collection equipment and media* (this can result in forfeiting less revenue because of equipment malfunctions).

The question is, to what extent can the above benefits be translated into financial benefits (i.e., new revenues or cost savings). There will be savings where personnel costs can be reduced and/or where capital costs can be avoided (e.g., where an outside entity is paying for equipment or cards). Additional revenues can result from an increase in use—and thus fares—a reduction in fare abuse and evasion, or through the creation of new revenue sources (e.g., unused value, float, or transaction fees).

Potential Revenues

The potential sources of additional revenues—for transit agencies—associated with multipurpose payment programs are as follows:

- Increased fare revenues (from increased ridership),
- Increased fare revenues (from reduced fare abuse and evasion),
- Float on prepayment or card balances,
- Unused or expired value, and
- Transaction fees (from merchants).

For financial institutions issuing stored-value cards or involved in settlement or other clearinghouse functions, potential revenue sources overlap with those for transit—with other types of fees added to the list. These sources include the following:

- Reduced card fraud and abuse,
- Float on card balances,
- Unused or expired card value (or maintenance fees on expired cards),
- Transaction fees (from merchants), and
- Other types of fees (e.g., for reloading, settlement, and reporting).

The specific type of additional revenue sources will depend on the parameters of the payment system and the functions of the institution in question.

Increased Ridership

The first of these sources, higher fare revenues from increased ridership, reflects the assumption that some riders probably will increase their use of the system if they have stored-value (or any prepaid) cards. In surveys of reported (or intended, in a new system) use of stored-value media, riders have indicated the likelihood of making additional trips because of the convenience of having the cards. For example, in a survey in Chicago regarding intended use of the new stored-value cards, respondents indicated that they expected to increase their tripmaking on CTA after purchasing the cards; analysis of the results produced an estimate that the fare cards can be expected to induce 2 to 5 percent additional trips among these riders.(*12*) Use of the transit system will also grow if the customer base is expanded. For instance, holders of an open system payment card may decide to use transit because they have the fare media on hand, whereas they might not go out of their way to purchase a transit-only fare instrument or gather the exact change needed to ride. The greater convenience of transferring between transit systems offered by an integrated fare card should also generate additional rides.

Finally, another potential source of fare revenue is the expansion of employer-subsidized fare programs. That a smart card-based pass could be issued for more than a month at a time would result in a smaller monthly administrative requirement for an employer, which could attract additional companies to a pass program. Because of the subsidy, some employees will buy a monthly (or other period) pass even if they do not use transit every day; the difference between the amount an employee formerly paid (i.e., in cash or individual tickets) and the full price of the pass represents additional revenue to the transit agency. The Central Puget Sound study concluded that the planned smart card program could generate a 20-percent increase in the number of passes sold through the Employer Pass Subsidy Program, resulting in an annual revenue increase of $450,000 to $750,000.(*2*) Although the increase in transit use in any one of these scenarios may be relatively small, they are not mutually exclusive and could combine to significantly boost fare revenue.

Reduced Fare Abuse and Evasion

Because of their enhanced security characteristics, smart cards are expected to reduce the potential for abuse, fraud, and evasion. In the survey for this study, the average amount

of revenue reported lost through "theft, fraud, counterfeiting" was approximately 1 percent for all respondents, or an average of roughly $1 million per year; this amount was significantly higher for the larger systems, an average of approximately $1.8 million, or 1.6 percent, for the heavy rail and commuter rail systems. Counterfeiting of magnetic cards has not been found to be a significant problem in the transit industry; as discussed in *TCRP Report 10*, advances in protection technology have made magnetic cards increasingly difficult to duplicate.(*7*) However, there has been substantial abuse of flash passes, both through counterfeiting and simple use of invalid passes. Thus, the reduction or prevention of fraud is often cited as a primary reason for deciding to use smart cards. The Central Puget Sound study estimated the potential revenue effect from reducing fraudulent pass use at $120,000 to $180,000 per year, assuming that smart cards would cut the extent of pass-related fraud by 50 percent. In Manchester, an annual increase of at least $2.5 million is anticipated through the reduction of abuse in the use of concessionary (half-price trip) cards.

For financial institutions, the reduction of fraud is envisioned to be the largest source of anticipated additional revenues. The European card association, Europay International, for example, has estimated that moving to smart cards (for credit and debit cards, as well as the introduction of a stored-value card) will result in a benefit (from reduced fraud as well as cost savings) of $2.9 billion over the 7-year conversion period.(*13*) Europay executives think that this benefit is significant enough to warrant conversion to smart cards, regardless of additional revenues that might be generated from new card services (e.g., float).

Float on Prepayment or Card Balances

Float on card balances or on any prepaid sum represents another source of revenue for card issuers. A key issue in a public-private multipurpose payment arrangement is "who owns and manages the float pool?" In a closed system, any agreement must carefully define whether the float (from stored-value cards) accrues solely to the initiating entity (e.g., the transit agency or consortium of agencies) or to the actual issuing entity (e.g., the bank or other private partner) or is shared between the parties. In an open system, there also must be a specified arrangement for apportioning float revenues among the various card issuers; potential approaches are being studied by the Smart Card Forum. The relative effect of float as a revenue generator will depend on the average card balance for a program. This is difficult to calculate—it depends on the average initial purchase or reload amount, the average remaining value at the point at which cards are typically reloaded, and the average length of time a cardholder takes between reloading actions. The average balance can be influenced by discounts or bonuses offered for purchase and/or reloading.

For a transit-operated program, any estimate of income from float on a new fare medium must consider the loss of float on existing media being replaced or from which riders are switching to use the new medium. For instance, the Central Puget Sound study assumes that float on smart cards would derive from a nonrefundable "buffer" (envisioned to be $5 to $10 in the feasibility study) on each card created by requiring cardholders to pay the cost of the card itself and from any stored value held on a card. This study calculated potential income from float based on the estimated fare buffer value of outstanding cards ($600,000 to $750,000 per year), the stored value on cards ($400,000 to $600,000 per year), and an assumption regarding the loss of float on existing prepaid media ($150,000). The resulting estimate of interest income (assuming an annual return of 5 percent) is $43,000 to $65,000 per year.

Unused or Expired Card Value

In any prepaid or stored-value card program, a certain portion of some cards' value will never be used (i.e., for transit trips or purchases). In some instances, the cards will reach their expiration date before being fully used; in other cases, some of the value will simply never be used because people may throw away cards before they are fully expended or they may keep cards as collectibles. This is more likely to occur with a prepaid (nonreloadable) card than with a reloadable card, although, depending on the pricing incentives associated with reloading a card, reloadable cards can certainly generate unused value as well. In the absence of a discount, bonus, or other loyalty program associated with retaining and reloading the same card or of a replacement charge for the card, many cardholders will throw cards away as they approach the remaining value.

What must be kept in mind is that this unused value does not represent new revenue, because it has been prepaid. It is simply revenue that is not expended. As explained in Chapter 3, this places unused or expired value in the category of abandoned property, which may make it subject to being returned to the cardholder or turned over to the state. This has led to the establishment of a variation on the revenue source: a maintenance fee that begins at the time of the card's expiration; as explained in Chapter 3, such an arrangement was instituted by the banks taking part in the VisaCash demonstration in Atlanta.

Merchant Transaction Fees

The major source of new revenue associated with many multiple-use card programs is likely to be the fee per transaction a merchant pays the card issuer. The merchant can be a retailer or other vendor paying a fee to a bank, a transit agency, or a public-private partnership that is issuing cards or it can be a transit agency that is accepting a card issued by

another party. The latter case represents a cost to a transit agency, as well as being a revenue source for the card issuer. There is no set structure for fees in a stored-value program. In fact, rates are being negotiated with each merchant in some programs as the card issuers seek to enlist participants. In the VisaCash pilot in Atlanta, for instance, the typical rate has been approximately 2.5 percent per transaction, although MARTA has paid somewhat less, at about 2 percent; MARTA and First Union Bank have negotiated a new rate, but this figure was not public information as of this writing. The transaction fee represents a fundamental element of the business case for most multiple-use or stored-value programs. In the existing EP schemes around the world, the merchant fee ranges from none (e.g., Danmont) to a high of 5 percent (the maximum fee for the CiT Transcard in Sydney) of transaction value. Most current schemes charge between 0.3 percent and 1 percent to merchants.(*14*)

Other Types of Fees

In addition to fees for merchant transactions, there may be other fees in an open system (e.g., related to use of the card, handling transactions, reporting, or other functions). These may accrue to the issuer or to an acquirer or clearinghouse network operator and may take the following forms:

- Cardholder fees,
- Card reload fees,
- Advertising fees,
- Terminal sales and rental fees (for transaction acquirers),
- Interchange and settlement fees (for transaction acquirers or network operators),
- Management report fees (for transaction acquirers or network operators), and
- Vendor certification fees (for network operators).

In general, these types of fees apply primarily to a financial system card program. A bank or other issuer could charge a cardholder fee (similar to a credit card annual fee), a monthly fee, or a reload fee (similar to an ATM use fee). In the original Mondex trial (Swindon), cardholder fees were seen as the primary source of revenue; customers received the card free of charge for the first 6 months, but were then charged the equivalent of US$2.25 per month. Customers using the Mondex "wallet" (see Chapter 2) were charged US$5.25 per month. Mondex has not settled on a final pricing plan; however, the charges to users—and to merchants—will be set by the individual banks and thus probably will vary from one location to the next. There probably will not be a monthly cardholder fee, but rather fees for individual transactions. In the VisaCash pilot in Australia, the charge varies, with customers charged as much as US$2.50 per month.

A transit-managed program is less likely to charge such fees regularly, although it could conceivably establish an initial charge for the card. Some transit smart card programs charge or are considering an initial fee for the card that is higher than the stored value contained on the card. In Manchester, for instance, the cardholder paid a minimum of $5 on receiving a card; this included $3 worth of value and $2 to help cover the cost of the card. In the Central Puget Sound area, it was suggested in the feasibility study that cardholders pay the cost of the card (assumed in the analysis to be $5 to $10); this nonrefundable deposit would serve as a buffer to be accessed if the amount of stored value was insufficient to cover the cost of a particular trip. This buffer is assumed to be a key source of float. In the financial services sector, banks using the Proton card make their own pricing decisions, but at this point the average charge to a customer is approximately US$5.70 to obtain the card. The charge for the CiT Transcard is approximately US$12.60.

With regard to other fees, practices vary widely. The different EP systems have different pricing approaches. The specific pricing decisions are in flux—these programs are conducting trials and beginning broader implementation. Mondex, for example, has charged participating merchants a terminal rental fee in the Swindon trial; this fee is negotiated with each merchant. In the VisaCash system, there is an interchange fee that each participating bank must pay to Visa for handling the transaction. In the United States, this fee is 1.2 percent of the purchase amount, plus $0.02 per transaction; hence, on an average transaction amount of $2.50, the bank would pay Visa $0.05.

Thus, revenue from various sources could be realized through multipurpose smart card programs. Other possible sources may develop as well, given that the storage and processing capabilities of smart cards could facilitate new types of arrangements and functions unforeseen. Although the full extent of the possible benefits and costs has yet to be demonstrated in a long-running broad-scale transit-oriented program, several studies have determined that the anticipated benefits outweigh the expected costs.

CHAPTER 6

CUSTOMER ACCEPTANCE ISSUES

INTRODUCTION

The success of stored-value media depends on how the concept is embraced by customers. Stored-value fare payment has been used in transit for more than 20 years, and its long-term acceptance at BART and WMATA suggests that there is no reason why it should not be accepted by transit riders elsewhere. Recently introduced stored-value programs in New York and Chicago have had widespread acceptance. Moreover, prepayment in other forms (i.e., time-based passes and multiride tickets or tokens) is heavily used throughout the transit industry. On the other hand, the use of prepaid/stored-value payment options for other purposes is new and largely untested in the United States. With the recent rollout of the VisaCash card in Atlanta, the introduction of prepaid telephone cards (these are used extensively in Europe), the use of campus cards at several colleges, and the introduction of stadium cards, the appeal of stored-value cards outside of transit is beginning to be demonstrated here. Traveler's checks have long been in use, but only for a very specialized purpose: spending while on vacation. Thus, the potential market for multiple-use media in this country can only be speculated on at this point. Several EP programs have been successfully introduced in Europe, however, and several report widespread use; over 50 million stored-value cards are expected to be in circulation by the end of 1997 in Germany (GeldKarte) alone, for instance.

Given the transit and financial industries' interest in stored-value cards and concerns over the potentially high investment required to introduce these cards, there has been considerable market research into the potential use of such cards in various settings and into potential customer concerns related to the cards' use (e.g., privacy). Surveys and focus groups have been employed to test transit riders' level of interest in stored-value transit media, multiple-use options, and smart cards, in general, in several locations. Meanwhile, several institutions with an interest in smart cards have conducted market research to ascertain public receptiveness to smart cards, stored value, and other applications.

TRANSIT STORED-VALUE AND MULTIPURPOSE MARKET RESEARCH

Several transit agencies have undertaken market research efforts within the past few years related to the introduction of stored-value fare media and/or the use of smart cards as a fare payment mechanism. In surveys and focus groups, these agencies have sought to address such issues as

- The likely acceptance and extent of use of these new media by current transit riders,
- The ability of such media to increase transit use by current riders and to generate use by current non-riders, and
- Issues and factors considered important to potential users.

In addition to market research into stored-value and smart cards, many agencies have conducted surveys related to use of prepaid fare media in general. These surveys have generally indicated that prepaid fare media (including flash passes and bulk-purchase tickets and tokens) are popular with transit riders, primarily because of increased convenience and the ability to save money (through prepayment discounts). The popularity of prepaid fare options is documented in the high level of prepayment at many transit agencies. The average percentage of fares paid with prepaid media for the respondents to the transit agency survey (see Appendix A) is roughly 47 percent. This percentage is as high as 92 percent (Toronto Transit Commission) for rail/bus systems and as high as 80 percent (Ottawa-Carleton Regional Transit Commission) in bus-only systems; two other bus-only systems (Spokane Transit Authority and Miami Valley Regional Transit Authority) reported figures around 70 percent. The success of existing prepaid options suggests that there is significant marketing potential for "cashless" fare media in general.

Recent market research associated with stored-value programs (using magnetic media) in New York (MetroCard AFC and expanded utility programs), Chicago (AFC project), and Southern California (Metrocard project), as well as smart card systems (stored value is one option) in the San Francisco Bay Area (TransLink Program), Southern California (Advanced Fare Payment Program), and the Seattle region (Regional Fare and Technology Coordination Program) are discussed in the following paragraphs.

New York MTA—MetroCard Program

In mid-1992, the NYMTA conducted consumer research on the expanded utility aspects of the stored-value card in

order to obtain information that could be statistically projected to the entire New York City population. (Although the NYMTA had conducted several studies previously, these focused only on fare payment and did not include use of the card in other venues.) The NYMTA used qualitative and quantitative techniques to conduct the research. For example, two focus groups were conducted in the District of Columbia using WMATA riders because of their familiarity with the use of a stored-value farecard. Approximately 900 telephone interviews were conducted in five consumer segments in New York to quantify and test reactions to various card concepts.

The overall reaction to the use of the card as a payment device for applications other than transit was positive. Almost 50 percent of the New York City consumers interviewed thought "very highly" of the expanded use concept and anticipated using the card. The primary reason given for this positive reaction was the card's convenience, particularly not having to carry cash. Consumers who were male and younger, had higher incomes, were employed, had higher education levels, and were more "card-oriented" (i.e., heavy credit card users) tended to view the card more favorably than did other groups. These individuals tended to be acceptors of the basic MetroCard product.

Consumers viewed both transit- and nontransit-related activities as popular uses of a stored-value card. Venues that were identified, in order of priority, were subways, buses, commuter railroads, bridge and tunnel tolls, car services, taxis, parking meters, and parking lots and garages. Nontransportation uses frequently mentioned included supermarkets, small groceries, delicatessens, and payphones.

All the groups in the study considered the NYMTA an appropriate issuer of the card. For those who were shown an unbranded card, the NYMTA was most frequently mentioned as the group that should sponsor the card. Consumers were, overall, more comfortable with the introduction of the stored-value card's use capabilities in stages, rather than all at once. Consumers indicated that they would be more receptive to expanded use after they had become comfortable with use of the card for transit purposes. However, it did not appear to be true that consumers who are familiar with using the card as a transit card would be more likely to accept the expanded applications of the card for retail purchases.

The WMATA focus groups showed neither a more positive nor a negative reaction to the expanded use of the card than the New York City focus groups from one of the prior studies. One-fourth of the New York City group indicated they would not be likely to use the card. Many of them appeared to be confused as to how the system would work or did not want to change from their current use of tokens.

Finally, the New York City groups projected monetary values loaded on the card at a much higher level then what is actually expected. The quantitative element of the study suggests that consumers would place an average of $109 on the card, with suburban residents adding $138. Focus group participants average $50, which is more in keeping with programs in other parts of the world.

Although the expanded utility aspect of the MetroCard has not been developed, the MetroCard has been in use for transit for more than 3 years now. Usage of the stored-value medium grew slowly during the first 2-1/2 years, but climbed dramatically in mid-1997. As of April 1996, MetroCard accounted for approximately 6 percent of subway rides and 3 percent of bus rides. By April 1997, use had risen to 17 percent on each mode. Use rose to 33 percent systemwide by June and was reportedly near 50 percent by August 1997. Probably the major cause of this growth was that the NYMTA began to offer free bus-rail transfers with use of the card in July 1997; prior to that point, there had been no financial incentive to use the MetroCard rather than tokens. Market penetration should increase further, given that the NYMTA has announced plans to offer a purchase discount beginning in January 1998.

Besides the absence of a discount, several other factors contributed to the program's slow start. First, the full systemwide AFC installation was not completed until May 1997, although all buses had been equipped by early 1996; until all stations were equipped, many travelers could not use MetroCard at both ends of their trips. Moreover, the card could only be purchased at a few locations; the NYMTA is planning to expand the card's availability and to install CVMs in subway stations beginning in 1998. Another factor is that the NYMTA did not previously offer any prepaid fare media; as one of the few transit agencies with no passes or other discounted multiride option, riders were simply unaccustomed to the concept of prepayment. With no discount initially offered on the MetroCard, there was no financial incentive for riders to try it.

Chicago Transit Authority—AFC/Stored-Value Program

A "stated preference" survey of 800 current CTA riders was conducted between March and June 1995 as part of a study to identify potential use of the CTA's new stored-value farecard.(*12*) The form of the survey was telephone recruitment/mail-out/telephone retrieval. The survey sought information on current CTA use, past CTA use, and preferences regarding future fare media use. The preferences represented choices among several payment methods and pricing levels. Each respondent had to make tradeoffs among several parameters (e.g., a greater discount or bonus versus a higher initial cost) in selecting future payment options. The basic parameters that had to be considered in each case were

- Type of fare medium (e.g., stored-value farecard, token, pass, or cash),
- Discount or bonus (for prepayment versus use of cash), and
- Level of minimum initial purchase price.

The key findings from the survey and the subsequent analysis effort included the following:

- The stored-value farecard concept appears to be popular among CTA riders. Overall, survey respondents chose farecard options in 68 percent of the scenarios of future fare payment methods.
- Although the farecard was often the most economical choice, it was also often selected when there was a less expensive option. Cost, although important, was not the only factor determining fare method choice—convenience was also an important factor.
- People who are predominantly bus riders are considerably less interested in farecards than those who are predominantly rail riders. This reflects the concern of the bus riders that they will have to go out of their way to purchase a farecard.
- Respondents selecting farecards indicated that they expected to increase their trip-making on CTA after purchasing the cards. Adjusting for "commitment bias," it was estimated that the farecards would induce approximately 2 to 5 percent additional trips among these riders.

These survey results indicate that the CTA riders place considerable value on the convenience associated with using a stored-value farecard, although the cost of fare payment is the single most important factor affecting choice of a fare method. Issues associated with convenience of purchase of the farecards are also important, given that bus riders view the ability to readily purchase a card a potential problem. There is considerable interest in the ability to use credit/debit/ATM cards to buy farecards and to buy cards through the banking network (probably through ATMs). Finally, the CTA's decision to require a $5-minimum purchase for the farecards does not seem to be a significant barrier to sale of the cards.

The stored-value card was introduced in early-1997, and the rate of customer acceptance has been dramatic; within 3 months of implementation, more than one-third of system boardings were being made with the card. An important reason for the rapid acceptance of stored-value is that a discount is offered with use of the card: $15 worth of rides are purchased for $13.50.

Southern California—Metrocard Program

A stored-value card for transit fare payment, Metrocard, is available for use in three bus systems in the Los Angeles area: Foothill Transit, which serves the San Gabriel and Pomona Valleys; Montebello Transit, serving Montebello and the surrounding communities; and Culver City Transit, serving Culver City and the surrounding area. Metrocard went into revenue service in April 1994. A survey of Metrocard users was conducted in early 1995, after the Metrocard system had been monitored from September through December 1994.(*15*) The survey obtained information on Metrocard customers, the transit operators they use, their ticket purchasing activity, their travel patterns, and their experiences with and opinions of Metrocard. The key results of the survey included the reasons why customers used the Metrocard. These results, shown in Table 6, indicated that it was very important to users that they no longer had to carry cash, but that it was relatively unimportant that the Metrocard could be used on multiple systems. Other significant findings of the survey included

- Most riders put between $10 and $25 on their first Metrocard;
- Sixty-two percent added value to their first Metrocard; 36 percent of these riders had added value to their Metrocard between four and ten times; and

TABLE 6 Reasons for using Metrocard

Reason	Very Important	Important	Somewhat Important	Not Important
Overall discount (saves money)	43%	25%	20%	28%
Ability to use on multiple systems	17%	28%	43%	63%
Two year expiration date	32%	31%	31%	57%
Ability to buy a high face value	28%	44%	41%	28%
Ability to add value to card	33%	48%	27%	24%
Don't have to carry cash	89%	19%	10%	
Other	11%	3%		
Total Cases	127	75	49	51

source: Mundle Associates (*15*)

- Seventy-three percent added between $10 and $50 to their Metrocard each time they added value to it; on average, riders added $43 to the card each time they added value to the card.

In terms of satisfaction with the Metrocard program, 62 percent of the survey respondents were "very satisfied" with the program and another 35 percent were "satisfied." A total of 68 percent thought that the "program should be continued." The remaining 32 percent also thought that the program should be continued, but improvements should be made. These improvements include expanding the program to other transit providers, increasing the number of sales outlets, adding a discount, expanding the hours at sales locations, and printing the remaining value on the card. "The most frequently suggested improvement was to provide a discount for using the Metrocard." In all, 86 percent of the respondents said that they would use the card more often if it were discounted. When asked if they used transit more than before the introduction of the Metrocard, a significant number of Metrocard users indicated that they were using transit more, as shown below.

Transit System	*Percentage Using Transit More*
Foothill Transit	24%
Montebello Bus Lines	26%
Culver City Bus	26%

San Francisco Bay Area—TransLink Program

In July 1995, a telephone survey of transit riders in San Francisco County and the western portion of Alameda County was conducted to obtain information about consumer acceptance of a universal fare medium for the Bay area.(*16*) There were five key findings from this survey, which are summarized below.

First of all, the survey revealed that there is substantial interest in a universal fare medium that could be used on all forms of public transit, particularly for those who would transfer to another transit operator. Of the seven benefits that were evaluated through this survey, the ability to purchase the card in many locations and the card not expiring were rated the highest.

The second key finding was that rechargeable media were preferred over disposable media; two-thirds of those surveyed prefer rechargeable media. Those who prefer rechargeable media were more willing to put a higher dollar value on the card than those who prefer disposable media. San Francisco commuters would put a maximum of $50 and a minimum of $8 on the card, while Western Alameda commuters were willing to put slightly more on the media. Further, San Francisco commuters would add on average $28 to the media, while Western Alameda commuters would add an average of $33. Commuters would prefer to buy the media where they shop or from transit agents. They were least inclined to buy the media on board transit vehicles or through the mail.

The third major finding related to use of the fare media. Consumers were specific about how they would like to add value, have the fare deducted, obtain information on the value remaining on the card, and have the card read. If a rechargeable card is used, survey respondents would feel most comfortable adding fare using devices at major transit facilities or at ATM machines. As the card is being read, the amount of the fare being deducted and the amount remaining on the card should be displayed. Methods of presenting the media to the reader that were acceptable included inserting, swiping, waving, or touching the reader. Using a medium while it was still in a wallet or purse raised concerns about potential reader errors and privacy issues.

Fourth, most consumers were also generally interested in high-use discounts and being able to use the media for things other than transit. San Francisco commuters are very interested in using the media to pay tolls and to pay for taxis. Half of the San Francisco and half of the Western Alameda commuters found these features most attractive. Further, of the six features mentioned in the survey, the least attractive was the ability to purchase low-cost items with the media at locations in or near transit stations.

Finally, most consumers indicated a willingness to pay a one-time fee for the cost of the media. San Francisco commuters would pay up to $4 for the media, while Western Alameda commuters would pay $4.25. The idea of using "ride credits" to offset the cost of the media was of great interest to those surveyed.

Southern California—Advanced Fare Payment Program

Contact and contactless cards were tested, for a 7-month period ending in June 1995, on 21 buses in three transit systems in Southern California: Torrance Transit, Gardena Transit, and Los Angeles Department of Transportation (LADOT). (The next phase of this project is now underway, in Ventura County, California). Three hundred cards of each type were in revenue service. Rider opinions on the media were captured using self-administered surveys and focus group interviews. Although this survey did not address stored value or integrated ticketing per se, the findings regarding the use of smart cards are of interest. Overall, the customers' reactions to the cards were very positive. The key findings of the survey and focus groups included the following: (*17*)

- Although there was a strong preference for the contactless card, both cards were perceived as making public transit easier to use.
- Riders felt safer and more secure using the cards, because they did not have to carry cash.

- Riders perceived that the card would encourage increased transit use because of its ease of use and its ability to be used by an entire family and because they did not have to have the cash fare on hand.
- Once riders were aware that they could recharge a card remotely, recharging the card at an outlet was not as appealing. Recharging could be done by calling the transit agency and providing a MasterCard or Visa number or by giving the driver a check. (In either case, the in-vehicle fare collection equipment is then instructed to recharge the card the next time it is presented for fare payment.)

Seattle/Central Puget Sound Region—Regional Fare/Technology Coordination Program

As part of the Central Puget Sound Fare Technology Feasibility Study, focus groups of inter-county transit and ferry riders were conducted in March 1995 to assess preferences in various aspects of regional fare payment. Four focus groups were conducted, covering customers of Community Transit, King County Metro, Kitsap Transit, Pierce Transit and the Washington State Ferry System. (*18*) The key finding was that the convenience of contactless cards was highly valued, but there were significant concerns about "the ramifications of possible malfunctions of invisible computer chips and readers." The research also revealed that most participants were interested in using the cards only for transit, although they indicated that the broader the sales and distribution of the cards, the better.

Because the research indicated that customers will require that the technology be proven over time in order for them to feel comfortable with it, a major planning and educational effort will be required to successfully introduce a smart card technology. An educational effort would also be needed to address the concern over using the card for purposes other than transit. Further, because significant concerns were raised about the potential for malfunctions, "detailed policies and procedures for handling the malfunctions bound to be associated with any of these new technologies" would have to be developed. "Before riders will be comfortable using this technology, more than any other issue, they want to be assured that they will not suffer or be inconvenienced when the systems fail, or seem to fail." (*18*)

GENERAL MARKET STORED-VALUE CONSUMER RESEARCH

The high level of interest in the smart card and stored-value markets on the part of financial institutions has also resulted in several market research efforts over the past several years. Like the aforementioned transit agencies, several major banks and associations have undertaken surveys to ascertain the potential acceptance of and concerns about these new payment options. This section discusses the findings from recent market research (both qualitative and quantitative) done by the Smart Card Forum (conducted in 1995) and MasterCard (conducted in 1994–1995).

Smart Card Forum Research—Stored-Value and Multiapplication Smart Cards

Qualitative Market Research

The Smart Card Forum (SCF) first used qualitative research to help formulate its subsequent quantitative research project. This initial phase of the research involved three focus groups and six one-on-one interviews. Consumers were divided into one of the following three groups:

- Early Adopters were those who indicated they probably would be among the first to try a stored-value smart card;
- Considerers were those who indicated they would wait a little while before trying the card, but thought a stored-value smart card was a good idea; and
- Outright Rejecters were those who did not like the card and would never use it.

All participants were between the ages of 18 and 65, were equally represented by gender, and had household incomes in excess of $15,000.

The primary benefits of the card were seen as being convenience, consolidation, and storage of emergency information. Convenience was mentioned most often as the primary benefit of the card. The card would allow users to carry less cash; they wanted to be able to use it anywhere; they could use it as a budgeting item (e.g., the card would help control expenditures by limiting the amount of money they had to spend); and they could keep information that would allow them to avoid completing forms. The ability to combine several cards into one card was identified as a major benefit by all three groups. (Several of those mentioning this benefit had made little effort to consolidate the cards they carried.) Although concern was expressed about storing a large amount of personal information, most also agreed that having a card with important emergency medical information would be beneficial.

Participants saw the chief barriers to their use of the card as being a lack of privacy or security and there not being widespread merchant acceptance of the card. Most people believed that the card was secure, but that card security could conceivably be compromised and their information viewed. People were concerned about what would happen to their money if the card were lost or stolen. Many participants felt that the card would only be accepted in a few places at first, and it would take some time for the card to be accepted on a widespread basis. The need for a PIN to use the card was seen as a negative when making small dollar purchases, although PINs were considered favorably for making large purchases

by several of the participants. Finally, several of the participants were concerned about how the information stored on the card would be accessed.

The participants raised several issues that could strongly affect the success of the card; these issues were explored to a greater degree in the quantitative research. For example, there was a definite preference for the card to be issued by a known, established company. The types of companies mentioned most frequently were banks, credit card companies, and high-technology or telecommunications firms. The respondents were also comfortable with the card being issued by a merchant where the card use matched the merchant's field (e.g., NYMTA for mass transit, Kroger for groceries). There was a definite expectation that cards would be refilled at banks, which are considered safe places. Some participants wanted to be able to refill cards at home (e.g., through their computers).

Quantitative Market Research

Using the results of the qualitative research, SCF commissioned a quantitative study (focusing on multiapplication smart cards) divided into two stages. Stage One consisted of telephone interviews with 1,000 consumers to establish initial interest levels and assist in defining a sample for Stage Two. Stage Two used an eight-page survey that was mailed to the same 1,000 consumers with a 55 percent response rate. Because of the limited number of consumers in this group who were 65 years of age or older, the research focused on the 18- to 64-year-old market.

Although the qualitative research identified three main groups—Early Adopters, Considerers, and Outright Rejecters—the quantitative research showed a need to further segment the Considerers group based on their responses to "likelihood to obtain" a multiapplication card and "likelihood to be the first to try such a card."

The findings of the SCF quantitative research showed that consumers are comfortable with the concept of a multiapplication card. Two-thirds of the group were "positive" regarding the idea, with 25 percent "enthusiastic." Something less than half (42 percent) of the group would seriously consider acquiring a multiapplication card. The overall positive reaction was strengthened by the intent of those favorable to the card to use it for various uses.

The following four market segments were identified (see Figure 5):

- Early Adopters would obtain the card and be the first to try it;
- Strong Considerers would obtain the card, but not be the first to try it;
- Weak Considerers were neutral about obtaining the card; and
- Outright Rejecters were negative about obtaining the card.

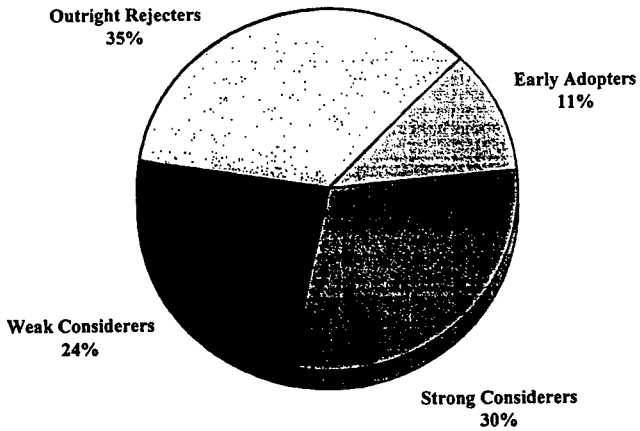


Figure 5. Population identified in SCF quantitative research.

The two main reasons given for the positive reactions to the multiapplication card were its value in an emergency (e.g., access to medical and insurance information) and the ability to consolidate existing cards. The Early Adopters were comfortable with new technologies and indicated that they would tend to use cards more aggressively than would the other segments. Although considering themselves well organized, they viewed the multiapplication card as more convenient.

The barriers to greater card acceptance were essentially the same as those that surfaced in the qualitative survey—privacy and security. The major concerns included

- The ability of others to use the card or obtain the information from the card,
- The financial loss that would result if the card were lost or stolen, and
- The fear that privacy, with respect to personal information, would not be protected.

Operational issues related to use of the card and merchant acceptance of the card were also cited by the respondents. Even Early Adopters were concerned about these issues, but they valued the benefits of the card to a higher degree. With regard to individual applications, the respondents were actually more favorable to the information and membership/identification components of a multiapplication card than to the payment component. The payment component weakened even further when viewed in a prepaid context. The findings might reflect an individual's reluctance to change from his or her current and established payment habits. The Early Adopters had a strong desire to use all of the components, including stored value, because they wanted to take advantage of all the card's benefits. The quantitative research identified the most promising specific uses within a multiapplication card, as shown in Table 7; the table also presents secondary uses that showed some potential. Four basic

TABLE 7 Multiapplication card uses

Information	Membership/Identification	Stored Value
Primary Uses		
Bank account balance and transactions	Driver's license	Gasoline
Auto insurance	Social Security card	Groceries
Health insurance	Health insurance / prescription card	
Emergency medical data	Video club	
Credit card numbers	Automobile registration	
	Store membership	
Secondary Uses		
Personal medical data	Library card	Stamps
Life insurance	Frequent flyer card	Convenience store
Children's medical data	Shopping courtesy card	Restaurant
Car maintenance		Fast food
Frequent flyer numbers		Books/ magazines
		Video store

themes emerged for the use of a multiapplication card: medical, transportation, emergency, and automobile. The development of the theme concept had a mixed effect on two of the groups. The Early Adopters were less enthusiastic about the card in a theme package, perhaps reflecting a desire to design the card to fit their specific needs. The Weak Considerers had a more positive view of the multiapplication card once a "real life" application was placed on the card.

MasterCard Research—Stored-Value Cards

MasterCard performed qualitative research in the U.S. market in Fall 1994 and quantitative research in the United States and Australia in early 1995. The 1994 research focused on evaluating different types of applications that could be placed on a smart card, similar to the SCF research. The 1995 research addressed only a stored-value smart card product as either a stand-alone card or combined with another payment card.

Qualitative Market Research

The qualitative research was divided into two stages, with both stages consisting of focus groups. The first stage included nine focus group sessions in San Francisco, Tallahassee, and Manhattan in September 1994. Participants were grouped according to their use of and attitudes toward credit and debit/ATM cards. The objective of this stage was to assess the consumer reaction to smart card technology and some positioning for different applications of the card. The second stage used the data gained from the first stage to reposition the concepts to address specific needs and to recruit participants who would be receptive to this positioning. Five focus groups were held in October 1994 in Clifton, New Jersey, and Stamford, Connecticut; these included the following market segments:

- Younger mothers with children,
- Older mothers with children,
- Dual-income families,
- Credit-averse individuals, and
- Frequent business travelers.

With the exception of the frequent business traveler application, specific applications did not generate mass market appeal, but were liked by niche groups (e.g., business travelers and parents of teenagers). The consumers did not perceive a need to store monetary value on a card and many had little desire to load money before they are ready to spend it. Most of the consumers were comfortable with their present payment behavior. Some of the consumers were worried about the infrastructure required to support such a card.

The frequent business traveler card had the greatest appeal because it offered benefits to its audience that were primarily information storage and did not involve the storage of monetary value. Frequent business travelers wanted to keep a record of their spending to facilitate preparation of their expense report. They also wanted to store all their hotel, airline, and rental card loyalty program information on a single card. The ability to store a travel advance to pay for incidental expenses was viewed as a benefit as well.

For most of the concepts, the consumers preferred that the application be linked to their ATM/debit cards and not to their credit cards. There was a strong desire to keep credit liability separate from day-to-day expenses. The business traveler group, on the other hand, wanted their credit card to have these features because it was the card that was predominantly used when traveling. Consumers were hesitant to pay fees for these applications. If fees were imposed, they preferred an annual fee instead of a fee charged each time the card was used or money loaded to it. As with the other research, several of the respondents expressed concerns about the privacy and security of the information on the card.

Quantitative Market Research

In early 1995, MasterCard conducted consumer research in the United States and in Australia to focus on attitudes toward a stored-value smart card product. The study involved 2,000 consumers evenly divided between the two markets. Research was conducted in 23 U.S. cities and in 4 cities in Australia. Because MasterCard was considering a pilot in Australia, it wanted to determine how "exportable" the results would be to the United States. There turned out to be a high level of correlation between the groups.

Approximately 60 percent of the U.S. respondents indicated they would switch financial institutions to obtain the stored-value product, while 55 percent of the Australians surveyed indicated they would change. Approximately 55 percent of the U.S. sample expressed positive interest in the stored-value concept, as compared with 50 percent of the Australian group. Both groups strongly favored the stored-value feature incorporated on their ATM/debit or credit card instead of as a stand-alone card (United States, 84 percent; Australia, 76 percent). The most favored types of merchants were the same in both groups: gasoline stations, supermarkets, and convenience stores. There was some difference in the second tier of merchants desired. In the United States, respondents wanted drug stores, department and discount stores, family restaurants, and vending machines to accept the cards. Australians wanted fast food restaurants, newsstands, payphones, and public transportation to accept the cards.

Approximately 52 percent of the U.S. group selected ATMs as the most desired place to add value to the card. POS locations at retailers' checkout counters was also favored. Americans said they would carry an average minimum of $100 and an average maximum of $300 on their card. The Australians were a little more conservative, with a range of $50 to $250.

Other Research

Other potential issuers of stored-value cards have conducted market research as well to determine concerns and potential acceptance. For instance, Visa International conducted qualitative research in conjunction with the development of the VisaCash in July 1994; this research consisted of ten focus groups across the United States. The general conclusions of this research were as follows:

- Speed and convenience of using a stored-value card were recognized as the primary advantages over using cash.
- Loss or theft of the card was mentioned as the main concern over using the card.
- Other concerns included
  - –Not being able to know easily how much money is left on the card,
  - –The likelihood of spending more money,
  - –Malfunctioning card-reading devices,
  - –The scope of card acceptance,
  - –The potential that a fee would be charged to use the card, and
  - –The potential lack of security for personal information.
- Being able to reload the card was considered very important.
- Brand recognition was important.

In conclusion, transit has accepted prepayment and has demonstrated the concept of stored value for more than 20 years. Beyond transit, the acceptance of prepayment and the stored-value concept is relatively unknown (with the exception of purchasing travelers' checks). However, there is general acceptance of new payment technology across the board, particularly when the introduction is combined with education and training. Although multiple-use applications are not particularly highly valued by transit riders according to this initial market research, stored-value cards are valued in general for their convenience, ability to pay for transit-related services (e.g., tolls and parking), and ability to consolidate existing cards. Although the extent of the potential market for multiple-use media is not clear at this point, the market research suggests that consumers are generally receptive to the stored-value concept for transit, transit-related, and non-transit services.

CHAPTER 7

GUIDELINES FOR DEVELOPMENT OF MULTIPURPOSE PROGRAMS

INTRODUCTION

Development of any type of multipurpose payment program will result in fundamental changes in the way the participants operate. These changes apply to the transit agency, the financial institution or other potential card issuer, the participating merchant, the equipment vendor, and the customer. Some concerns will be specific to each type of participating entity and each type of program; others will be common to all participants in all programs.

Although current multipurpose development efforts are beginning to address many of the issues, all prospective participants must still grapple with the uncertainties surrounding any major change from their typical ways of doing business. Establishing the necessary agreements—much less implementing the program—is anything but straightforward. As shown by the unsuccessful 1996 New York MTA-Chase negotiations, the lack of precedent for this particular type of public-private arrangement and the absence of successful operating models are significant barriers to implementing a mutually acceptable agreement. These barriers are not insurmountable, as evidenced by the recent MARTA-First Union agreement to extend the VisaCash pilot and transit acceptance of EP media in several locations abroad. Nevertheless, each prospective project participant must address the full range of issues and must seek to understand the concerns and motivations brought to the table by its would-be partners.

As additional projects are developed and implemented, various types of arrangements will be tested, and reasonable approaches will be identified for each type of program and institutional setting. At this point, however, it is useful for those pursuing multipurpose arrangements to understand the issues and options that should be considered at each decision point in the development process. Thus, incorporating the research conducted in this study, this chapter presents guidelines for the consideration of the key issues and design parameters and the selection of appropriate strategies in developing the different types of multipurpose media program. (Although a multipurpose card program does not necessarily involve transit, this study has focused on transit applications, and these guidelines assume participation of one or more transit agencies in the program.)

TYPES OF ISSUES AND PARAMETERS

A multipurpose payment program can be established in a range of institutional settings, including a transit-only environment, a more general public transportation setting, or a broader "open" environment. The institutional setting and arrangements will depend largely on who is initiating the program (e.g., transit agency versus financial institution), and the capabilities and constraints (i.e., financial, administrative, legal, and technological) and goals (e.g., reduce costs and increase revenues) of that entity.

The fundamental questions that need to be answered in establishing a multipurpose payment program include the following:

- Will the program be closed (the transit agency or group of agencies issues the card) or open (the transit agency accepts a card issued by one or more non-transit entities, such as a bank or a university)?
- Which entities will be involved, and what will be their roles and responsibilities in designing, implementing, and operating the program?
- How will the program be financed, and how will risks and revenues be allocated?

In answering these questions, it is necessary to address a range of issues and design parameters; these issues and parameters can generally be categorized as follows:

- Institutional and financial: who are the participants in the program, how is it organized and operated, and what are the financial arrangements among the participants?
- Operational and administrative: how are the different applications on a card priced, and how are cards distributed and reloaded?
- Legal and regulatory: what state and federal legal and regulatory requirements or restrictions must be addressed?
- Technological: what types of card will form the basis for the program, what are the design requirements, how will the new technology be integrated into the existing system, and how can compatibility with future technological advancements be ensured?

DESIGN AND IMPLEMENTATION STEPS

The specific actions that must be undertaken in developing and instituting a new program will vary from one setting to the next, depending on the particular entities involved and each entity's interests and constraints. However, a transit agency should follow several basic steps in most cases—these are shown in Figure 6 and summarized below.

Identify Goals and Constraints

The first step in the development of a multipurpose program is to identify

- The goals the agency or group of agencies seeks to achieve and
- The constraints (i.e., legal, financial, policy, or other) to participation in the various possible arrangements.

The specific goals and objectives of the transit agency will play a major role in dictating the program to be pursued. For instance, if facilitating seamless travel within a region is a key motivating factor (at least initially), then some type of closed system—administered by one or more transit agencies—is the likely approach. If, on the other hand, the reduction of fare media distribution and processing costs is of greater importance, then the transit agency may prefer to become a participant in an open multiple-use program initiated by a financial institution. Several of the key goals and their relationship to types of multipurpose system are shown in Table 8.

In addition to the transit agency's goals, its constraints will be key factors in influencing the type of program initiated. For instance, some agencies may be legally prohibited from entering into partnership-type agreements with private entities. In other cases, an agency may simply be unwilling to yield direct control of its fare payment system. The availability of resources will also influence the decision; an agency (or group of agencies) with insufficient funds to acquire and implement a new fare system will be more interested in a scheme that reduces its own financial requirements. Thus, an agency must identify the major constraints it faces in attempting to develop a new program.

Identify Local Opportunities for Participation

An agency's decision on a multipurpose strategy is affected by local opportunities regarding potential arrangements, as well as any internal constraints. There are two key questions here:

- Is there an existing or planned program (i.e., a multiapplication card program or a neighboring transit agency

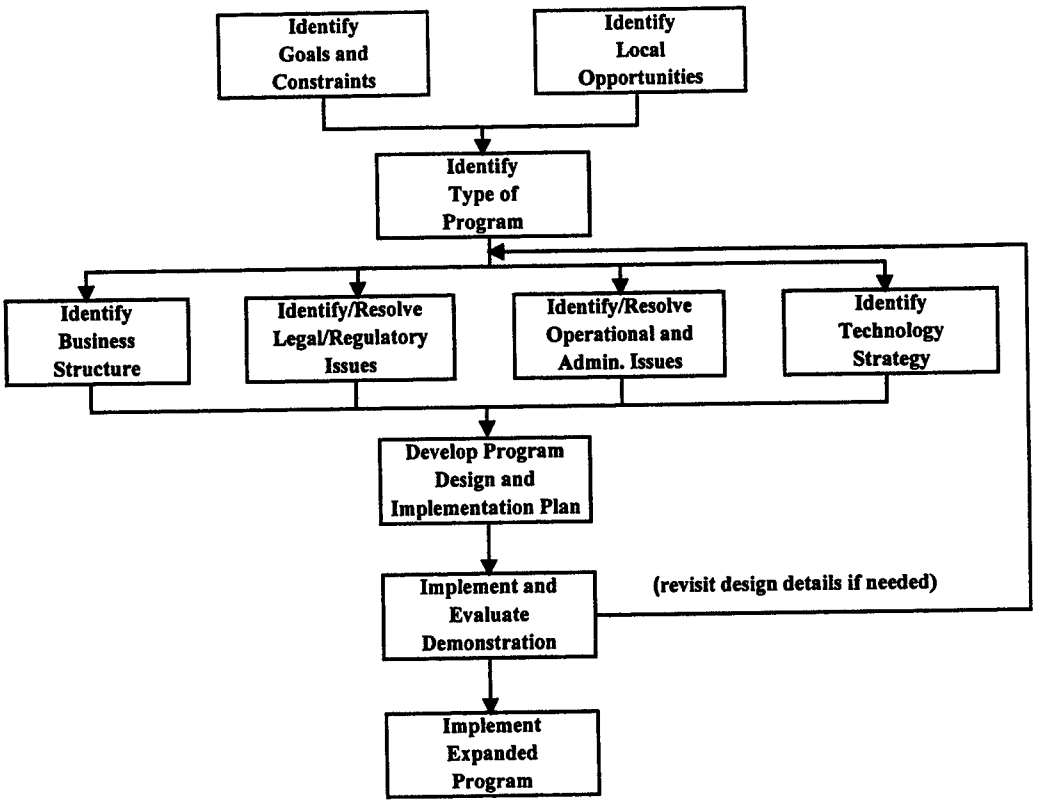


Figure 6. Multipurpose program development/implementation steps.

TABLE 8 Multipurpose fare media parameters—goals

Type of System	Goal				
	Upgrade Fare Collection	Seamless Travel	Expand Market	Reduce Fare Collection Costs	Generate Add'l. Revenue
Closed multiple use	X		X		X
Closed regional fare integration	X	X			
Open	X		X	X	

smart card program) in which the transit agency could conceivably participate?

- Is there potential interest among other entities in participating in a multipurpose program with the transit agency?

With regard to opportunity, MARTA was able to participate in an open system because of the VisaCash pilot being implemented in Atlanta. Similarly, that the University of Michigan had begun to issue a smart card on its Ann Arbor campus prompted AATA to accept the cards for transit fare payment. A different type of example is the initiation of an integrated regional smart card program (e.g., in the Ventura Co., San Francisco, and Seattle areas); such a project gives a local agency an opportunity to participate in a multipurpose program. (The other side of "opportunity" is that, in some cases, an agency may be reluctant to participate, but will be strongly encouraged, if not absolutely required, to take part in a regional program.)

Short of the presence of an existing or emerging smart card program, a transit agency may find interest in developing a new joint program from among local entities that issue or use some type of payment or ID card. In Cleveland, for example, the GCRTA decided to pursue some type of multipurpose arrangement following discussions with a range of potential partners; some of these (e.g., banks, universities, and the County Department of Human Services) would be card issuers (or perhaps co-issuers), while others (e.g., retailers, museums, stadiums, and restaurants) would accept cards issued by GCRTA. Several of those interviewed expressed at least tentative interest in working with the transit agency; as of mid-1997, GCRTA was moving ahead with discussions with a subset of the prospective partners. Of course, moving from the "potentially interested" stage to an actual agreement can be difficult—as other agencies have discovered in efforts to recruit partner institutions. A key issue in such instances becomes the need for all parties to have a solid business case for their own participation.

Identify Type of Program to Pursue

On the basis of goals, constraints, and local opportunities, the transit agency must decide which type of arrangement or program to pursue. From a transit agency's point of view, the basic institutional options for a multipurpose program can be basically categorized as follows:

- Closed (transportation-only) system—A transit agency or a group of agencies issues fare media usable on any of the agency's (or member agencies') services. Individual functions (e.g., card production and revenue settlement) can be provided directly by one or more of the member agencies, by a system integrator (under contract to or in partnership with the agency), or by a newly created entity established by the agency or group of agencies.
- Closed multiple-use system—The transit agency-issued fare media can be used for certain other purposes (e.g., vending, telephones, and newsstands) as well as for transportation purposes. Again, the support functions can be provided by the agency, by a private contractor, or through a partnership with a financial institution, integrator, or other private entity.
- Open system—The transit agency accepts media from one or more outside issuers. There are several possible models for a transit agency's participation in an open system, including the transit agency's becoming a participating "merchant" in a general EP/stored-value card program or an application in a multiapplication program and probably paying transaction fees for its customers' use; the agency becoming a formal partner in the arrangement, sharing both the benefits and the financial risk involved in the venture; or the agency (or consortium) administering its own payment program, but allowing outside issuers' cards to be used provided they meet the program's requirements.

The closed system option represents an expansion of the current fare collection system (in place at every transit agency) to incorporate neighboring transit services and perhaps other modes (e.g., parking and ferries) as well. The second option is essentially an extension of the first, as the fare card's use is expanded to include functions beyond transportation services. The third approach, the open system, represents a fundamental change from the way transit agencies currently manage fare collection activities. What may well

occur in certain instances is an evolution from a fully closed system to a closed multipurpose system and then to an open system. This would probably take place over several years, as an agency (or integrated regional program) may wish to wait until general purpose EP cards are well established.

Although some transit agencies will have an interest in participating in such a program and not issuing their own electronic fare media, others will prefer to retain full control over their fare systems and will not wish to participate as a merchant in an open program. An agency or group of agencies considering an appropriate approach must weigh the advantages and disadvantages of the alternative approaches against its own goals and constraints. The relative advantages and disadvantages are summarized in Table 9.

Identify Business Structure

The results of the Multi-Use Workshop (see Appendix D) indicate that the greatest challenge in developing and implementing any type of multipurpose arrangement is likely to be establishing a reasonable, realistic business structure. The basic elements of the business structure include

- Ensuring that the roles and responsibilities of the participants in the program in designing, implementing, and managing the program are clearly defined and
- Identifying what the system will cost, what revenues can be expected, how the system will be financed, and how risks and benefits will be shared among the participants.

Roles and Responsibilities

The basic roles within the alternative types of multipurpose programs are summarized in Table 10 (these roles are defined in Chapter 3). The clearinghouse is a particularly important element, because it is responsible for managing many of the support functions within the program. The specific functions will vary from one program to the next, but the clearinghouse operator may well carry out the requirements associated with issuer, distributor, and acquirer, as well as functions such as revenue management and settlement, customer service, and perhaps marketing. The clearinghouse operator may also be responsible for recruiting merchants to participate in a closed multiple-use program. It is very important in developing the program to identify all functions and to spell out the individual responsibilities for each.

In an open system, the transit agency or consortium plays the role of merchant and possibly co-issuer or distributor. The agency would thus pay a transaction fee to the card issuer. In a closed system, however, there are several management and financing options that can be considered, depending on the nature and complexity of the management functions required, the financial resources of the transit agency, and the flexibility and capabilities of the system integrator or vendor. For instance, the transit agency or consortium initiating the program can retain direct responsibility for clearinghouse functions, or it can involve the private sector (through a contacting or partnership arrangement). The basic management and financing strategies related to a closed multipurpose program are as follows:

- Direct transit agency responsibility for basic clearinghouse functions, with contracts for equipment and certain specific support functions; in this option, the agency retains all system revenues;
- Third-party contracting for management of all functions, with subcontracts for certain functions; this can involve either traditional contract procurement or some form of turnkey/leaseback arrangement; depending on the terms of the financial arrangement, the agency could retain all auxiliary system revenues (e.g., from float and any merchant fees), or revenues may be shared with the system integrator as part of the financing arrangement; and
- Partnership with a private company, with the responsibilities divided between the partners or formation of a new entity (i.e., a "joint venture" involving a group of transit agencies or one or more agencies and a private

TABLE 9 Relative advantages for a transit agency of closed versus open systems

Area	Closed	Open
Financial Impact	ability to retain all (or portion of) additional revenues* lower exposure to fraud	reduced fare collection costs limited financial risk
Degree of Control and Administrative Responsibility	ability to retain authority over all fare collection functions	reduced responsibility (e.g., for distribution and settlement)
Appeal to Customers and Pricing Flexibility	greater flexibility in pricing (e.g., setting discounts or bonuses)	greater appeal to customers: more flexible card and wider distribution

* The share of revenue actually received by the transit agency will depend on the financial arrangement with the system integrator

TABLE 10 Comparison of roles in closed versus open payment systems

Role	Closed (transportation only)	Closed Multipurpose	Open
user	anyone buying a fare card	anyone buying a fare card	anyone with multiple use card (from bank or transit agency)
merchant	participating transit and other services (e.g., parking, toll)	transit (and other transportation) services and other participating entities (e.g., retailers)	any entity accepting card (e.g., transit agency, retailers, banks)
issuer	participating transit and other services (e.g., parking, toll)	participating transit and other services (e.g., parking, toll), or private partner	banks, other participating entities (e.g., transit agency)
distributor	participating transit and other services (e.g., parking, toll)	transit (and other transportation) services and other participating entities (e.g., retailers)	banks, other participating entities (e.g., transit agency)
acquirer	(same as clearinghouse)	(same as clearinghouse)	private entity
clearinghouse	lead transit agency, consortium, or third party contractor	lead transit agency, consortium, third party contractor, or private partner	central network

entity) that is responsible for all functions; in this option, the system integrator could finance implementation of the system in return for a transaction fee from the transit agency; the sharing of revenues will depend on the specific financial agreement.

In considering the advantages and disadvantages of alternative management and financing options, the major issues relate to degree of day-to-day administrative responsibility for all functions, the financial costs and benefits to the transit agency or consortium (including the need to add staff), and the transit agency's ability to use the financial sector's capabilities and expertise and existing transactions processing infrastructure.

Potential Costs and Benefits

Along with the identification of responsibilities, the key element of the business structure is the development of the business case. Each participant must be convinced that it will derive a net benefit from participating. The key questions that must be addressed are as follows:

- What are the capital and operating costs, and who will pay for which items?
- What are the potential cost savings, new revenues, and other (non-financial) benefits, and how are these distributed among the participants?
- How can a multipurpose arrangement be structured financially so as to produce a "win-win" situation for all participating entities?

Costs. In estimating costs for a new system, a transit agency must consider both changes to existing fare collection elements and new items associated with the multipurpose program and the use of smart cards. Potential changes in existing elements include automating certain sales, distribution and processing functions, and maintenance requirements. Potential sources of cost savings include reduction in personnel, sales commissions, maintenance costs, and data collection.

An analysis of the costs associated with the planned integrated regional smart card system in the Central Puget Sound Region estimated that, for King County Metro, the new system would produce an annual operating and maintenance cost impact ranging from an increase equivalent to 4 percent of the total annual current cost to a savings of 9 percent. A similar analysis for the TransLink project in the San Francisco Bay area estimated savings compared with existing fare collection costs on the order of 4 percent; this would be equivalent to approximately $0.001 per rider for the participating agencies.

With regard to transit capital costs, the major elements are the provision of fare media and the procurement of fare collection and processing equipment. The exact types and quantities of equipment needed and the cost to the transit agency will depend on the program and institutional arrangement being established. The fare media costs will also depend on the details of the arrangement (i.e., who is providing what). For instance, one option is for the transit agency to not directly provide the cards for its riders, either by participating in an open system or through vendor financing.

Although actual costs will depend on equipment capabilities and specifications, as well as quantity purchased and specific manufacturers, it is useful to consider order-of-magnitude costs. Table 11 presents a range of estimated cost figures, such as might be incurred in upgrading an existing fare collection system to smart card capabilities. This table does not include ongoing operating and maintenance expenses associated with the overall fare collection and rev-

TABLE 11 Unit cost estimates—smart card-based fare systems

Cost Element	Unit Cost (range)*	Nature of Cost	
		One-time	Ongoing
Bus-related Costs			
card-accepting devices	$1200-2500	X	
electronic registering farebox	$3500-4500	X	
mechanical farebox	$1500-2500	X	
ticket processing unit (magnetic)	$2000-4000	X	
on-board probe equipment**	$500-1500	X	
garage probe equipment**	$2500-3500	X	
application software	$0-100,000	X	
garage hardware/software	$10,000-15,000	X	
central hardware/software	$25,000-75,000	X	
Rail-related Costs			
card-accepting devices	$1000-2000	X	
fare gate (magnetic/contactless card)	$22,000-27,000	X	
smart card TVM interface upgrade	$4000-7000	X	
card vending machine	$40,000-50,000	X	
add-fare machine (cash only)	$5,000-25,000	X	
portable (on-board) validator	$2000-3000	X	
station hardware/software	$10,000-100,000	X	
central hardware/software	$100,000-200,000	X	
Variable System Costs			
spare parts	10-12% of equipment cost	X	
support services***	10-15% of equipment cost	X	
installation	5-10% of equipment cost	X	
non-recurring engineering	0-25% of equipment cost	X	
maintenance costs, equipment	6-7% of equipment cost		X
clearinghouse costs	++		X
Fare Media Costs			
magnetic or capacitive cards	$0.05-0.50		X
contactless cards	$2-5		X
contact cards	$1-4		X
combi-cards+++	$5-10		X

source: estimates from studies in Seattle, San Francisco, San Juan, and quotes from maufacturers

* These are 1997 $; the actual cost depends on functionality/specifications, quantity purchased, and specific manufacturer.

** In an integrated system (with ERF), there is no additional cost for probe equipment.

*** Support services include training, documentation, revenue testing, and warranties.

++ This depends on the nature of the multipurpose program, if any.

+++ Expected cost range.

enue control function; the ongoing costs shown pertain specifically to the multipurpose smart card elements.

Tables 12 and 13 present order-of-magnitude cost estimates for two hypothetical smart card upgrade scenarios. In each case, the agency represented is assumed to be part of a multipurpose arrangement—the multimodal system in Table 12 is participating in a multiple-use program with local merchants; the smaller bus system shown in Table 13 is assumed to be part of a regional integrated card program. The costs associated with the clearinghouse functions in particular represent very rough estimates—as actual costs will depend on the specific multipurpose arrangement, including number of participating entities, types of operating agreements, and cost-sharing details. The manner in which the transit agencies cover these costs also depends on the details of such agreements, as well as the financing approach in each case. Examples of potential revenue sources and alternative financing arrangements are presented below.

Revenues. The use of smart cards in general is expected to generate a range of benefits to a transit agency. Some of these are financial; others are related to more general goals. Participation in multipurpose programs, coupled with use of smart cards, can conceivably generate the following sources of additional revenues:

- Increased fare revenues (from increased ridership and from reduced fare abuse or evasion),
- Float on prepayment or card balances,
- Unused or expired value, and
- Transaction fees (from merchants, if a multiple-use program).

TABLE 12 Smart card upgrade estimate—bus/LRT system in multiple use program*

Cost Element	Unit Cost	No. of Units	Total Cost
One-time Costs			
card-accepting device (bus)	$1,500	800	$1,200,000
application software	$100,000	1	$100,000
garage hardware/software	$10,000	4	$40,000
card vending machine**	$45,000	20	$900,000
card TVM interface upgrade	$5,000	40	$200,000
station hardware/software	$10,000	20	$200,000
spare parts	10% of equipment cost		$335,000
support services	13% of equipment cost		$436,000
installation/non-recurring engineering	5% of equipment cost		$168,000
fare media costs (contactless cards)	$3.00	90,000***	$270,000
Total One-time Costs			*$3,849,000*
Ongoing Costs			
maintenance costs, equipment	6% of equipment cost		$200,000
clearinghouse costs	++		$400,000
Total Ongoing Costs			*$600,000*
Total First Year Cost			***$4,449,000***

* This system has 800 buses (4 garages) and 20 LRT stations. Average weekday ridership = 200,000; annual ridership = 60 million. The transit agency has developed a multiple-use program and is adding smart card accepting devices to the existing fareboxes and TVMs.

** It is assumed that one vending machine per station can vend (and reload) smart cards; the other TVMs in the stations continue to vend/validate paper tickets. However, smart cards can be used to buy proof-of-payment paper tickets.

*** The estimated number of smart cards assumes that 30% of riders use the cards (for monthly passes or stored-value cards), and that there is a replacement rate of 50% for the first year (i.e., half of the cardholders retain their cards for at least a year).

++ Clearinghouse costs include collection of merchant revenue, settlement, distribution of media, and other related functions.

Financial institutions issuing stored-value cards or involved in settlement or other clearinghouse functions can expect some of these same sources of revenue, as well as other types of fees; these sources include the following:

- Reduced card fraud and abuse,
- Float on card balances,
- Unused or expired card value (or maintenance fees on expired cards),
- Transaction fees (e.g., from merchants), and
- Other types of fees (e.g., for reloading, settlement, and reporting).

The specific type of revenue sources will depend on the parameters of the payment system and the specific agreements developed. There are various fee structures in place in the different EP programs around the world, and no single model predominates at this time. In some programs, rates are negotiated virtually on a case-by-case basis. The current range in merchant fees among EP programs is 0 to 5 percent, although most fall between 0.3 and 1 percent.

Thus, costs and benefits associated with a multipurpose payment strategy depend on the type of program and the details of the arrangement among the participating entities. Although analyses of possible programs have indicated positive cost-benefit ratios, each prospective participant must be convinced that it will share in this net benefit. Therefore, the single most important issue that must be resolved in establishing a joint transit-bank (or other private entity) payment system is the distribution of costs and revenues: who will pay for what, and who will receive which portion of the revenue?

Financial Agreement: Allocation of Risks and Benefits

In some cases, the transit agency will pay for the implementation of the new system, and these costs will (hopefully) be offset by a combination of operating and maintenance cost savings and increased revenues. Alternatively, a joint arrangement may result in capital as well as operating

TABLE 13 Smart card upgrade estimate—small/medium bus system in regional fare program*

Cost Element	Unit Cost	No. of Units	Total Cost
One-time Costs			
card-accepting device	$2,000	100	$200,000
application software	**	1	$10,000
mechanical farebox	$2,000	100	$200,000
on-board probe equipment	$1,000	100	$100,000
garage hardware/software	$10,000	2	$20,000
add-fare machine***	$10,000	5	$50,000
spare parts	10% of equipment cost		$58,000
support services	15% of equipment cost		$86,000
installation/non-recurring engineering	5% of equipment cost		$29,000
fare media costs (contactless cards)	$3.00	15,000++	$45,000
Total One-time Costs			*$798,000*
Ongoing Costs			
maintenance costs, equipment	7% of equipment cost		$40,000
clearinghouse costs	+++		$50,000
Total Ongoing Costs			*$90,000*
Total First Year Cost			***$888,000***

* This is a bus system with 100 vehicles and 2 garages; average weekday ridership = 20,000. The transit agency is installing smart card read-write units and mechanical fareboxes to handle cash.

** This agency will also be responsible for a portion of the cost of application software for the CADs; this is estimated at $100,000 for the overall system.

*** It is assumed that smart cards are sold through the normal pass sales outlets and by employers. However, there are add-fare machines available to reload the cards once they have been acquired. Cards can also be reloaded on the buses.

++ The estimated number of smart cards assumes that 50% of riders use the cards (for monthly passes or stored value cards), and that there is a replacement rate of 50% for the first year (i.e., half of the cardholders retain their cards for at least a year).

+++ It is assumed that this agency is participating in a regional integrated card program and is responsible for a portion of the clearinghouse funding; clearinghouse costs include collection of merchant revenue, settlement, distribution of media, and other related functions.

cost savings, where the private entity (a financial institution or perhaps a systems integrator or equipment vendor) subsidizes or provides the new equipment and media needed. In this case, the costs to the transit agency include the loss of float and unused value, as well as payment of transaction fees for use of the system. The financial issues can be complex. There may be questions, for example, regarding allocation of both fees and revenues (e.g., from float) among participants. (Table 14 shows examples of three basic payment options with the multiple-use program scenario introduced above.)

Development of the agreement regarding apportionment of both risk and possible benefits is thus key; it is necessary to establish an arrangement that satisfactorily meets the needs and addresses the expectations of both sides. With regard to the level and structure of the transaction fee and the sharing of auxiliary revenues, questions that must be addressed include

- To which transactions (e.g., all fare transactions versus only those made using the smart card) does the fee apply?
- What types of expenses does the fee cover (e.g., equipment installation as well as maintenance, issuance and distribution of cards and settlement and other clearinghouse functions)?
- Is there a guaranteed minimum fee payment (e.g., per month)?
- How are revenues (e.g., float, merchant transaction fees, and reload commissions) allocated?

Agreements will depend largely on each party's assumptions regarding the costs of developing and managing the

TABLE 14 Payment options—multimodal system in multiple-use program

Purchase/reimbursement option	
Transit agency purchases (or leases) equipment and covers (or reimburses integrator for) one-time variable costs and provision of cards.	
total (one-time) cost:	***$4,449,000***
Transit agency covers (or reimburses integrator for) ongoing costs (clearinghouse and equipment maintenance).	
annual cost:	***$600,000***
Combined purchase/reimbursement and transaction fee option	
Transit agency purchases (or leases) equipment and covers (or reimburses integrator for) one-time variable costs and provision of cards.	
total (one-time) cost:	***$4,449,000***
Transit agency pays integrator for ongoing costs (clearinghouse and equipment maintenance) on a fee per fare transaction basis.	
transaction fee (annual):	***$0.01****
Full transaction fee option	
Transit agency pays integrator for equipment, variable costs, and cards on a fee per fare transaction basis (over a 5 year period).	
transaction fee (annual):	***$0.015*****
Transit agency pays integrator for ongoing costs (clearinghouse and equipment maintenance) on a fee per fare transaction basis.	
transaction fee (annual):	***$0.01***

* Based on an estimated 60 million fare transactions per year.

** This is a rough estimate of the transaction fee calculated to amortize the principal over a 5-year payback period. The actual figure would be calculated to include interest on the unpaid balance, and the fee would decline each year as the balance is reduced.

(Note that fees are generally negotiable, based on the integrator's estimate of potential additional revenue through multiple use arrangements.)

program, and particularly the risk involved weighed against the revenues that might be generated. Given the limited precedent for multipurpose programs and particularly the lack of a proven business model shown to produce a win-win situation, there is a reasonable level of risk in these programs. Until there have been several longer term demonstrations of successful programs, prospective partners will each have to be willing to assume part of this risk; this will make the development of workable agreements between transit agencies and private companies complicated undertakings.

Identify and Resolve Legal and Regulatory Issues

Depending on the program and the specific roles of the various participants, there may be legal or regulatory issues associated with establishment of a multipurpose payment program. The key areas that may have to be considered include

- Authority of banks and non-banks to issue prepaid (i.e., stored-value) cards;
- Electronic funds transfer regulations (i.e., Regulation E);
- Record-keeping and reporting requirements (i.e., Bank Secrecy Act);
- Abandoned property and escheatment laws;
- Responsibility for lost cards, card and equipment malfunction, or issuer insolvency; and
- Privacy issues.

Because the stored-value concept is new to the financial sector, lawmakers and regulators of the banking industry (e.g., the Federal Reserve Board and the Federal Deposit Insurance Corporation) are just now reviewing the possible applicability of existing statutes and regulations. Transit has been using stored-value media for more than 25 years, and most such regulations probably will not directly apply to stored-value media in a transit-only setting. However, multiple-use media could be subject to more general financial considerations. The current (as of mid-1997) status of the above categories can be summarized as follows.

Authority to Issue Prepaid Cards

One of the fundamental issues concerning prepaid cards relates to whether the issuing body is "receiving deposits" in

selling the cards. States generally prohibit non-bank entities from engaging in the business of banking by receiving deposits. With a prepaid/stored-value card, however, the card issuer is not holding the card purchasers' funds for the purpose of repaying its customers; rather, the funds are used to reimburse others for the delivery of goods and services to the cardholder. The FDIC essentially supports this argument and has issued a ruling that stored-value card balances are not considered deposits and, therefore, will not qualify for deposit insurance.

Electronic Funds Transfer Regulations

Regulation E provides consumer protection related to EFT (e.g., in the use of credit or debit cards). In 1994, the Federal Reserve Board began to consider the implications of stored-value cards for Regulation E. The Federal Reserve Board initially recommended (in early 1996) that certain types of stored-value cards ("on-line" systems or cards containing more than $100) should be subject to provisions of Regulation E. However, following additional review and discussions with smart card proponents, the Federal Reserve Board decided (early 1997) not to apply any of the regulation's provisions at the present time. Thus, Regulation E will not be an immediate issue in introducing stored-value programs, although until the final regulations are determined, it remains a background concern for both transit and financial institutions.

Record-Keeping and Reporting Requirements

The Bank Secrecy Act (BSA) authorizes the Secretary of the Treasury to require financial institutions to keep records and file reports that it determines to have a high degree of usefulness in criminal, tax, and regulatory matters, as well as to detect and deter money-laundering programs and tax evasion schemes. The Treasury Department has delegated the regulatory development and compliance enforcement to the Financial Crimes Enforcement Network (FinCEN). In early 1997, FinCEN proposed new regulations that would specifically include stored-value products within the scope of the BSA. These regulations would impose the BSA requirements on *money service businesses* other than banks; such businesses would include issuers of traveler's checks, money orders, or stored value (if such an instrument is issued in an amount greater than $500 to any person in a day) and transmitters of money (i.e., anyone who accepts currency and transmits the currency or funds through a financial institution or an EFT network).

A transit agency could be included in both definitions, because it would be issuing cards and transmitting the value of transactions captured at its fare collection equipment. Given that transit agencies generally use anonymous, self-service automated devices for card issuance and value loading, it will be very difficult to track issuance of cards to a single individual, although it is unlikely that a single person would receive transit stored value totaling more than $500 in a day. There are concerns in the smart card and financial services industries that the significant record-keeping and reporting requirements will dampen all entities' abilities to develop stored-value programs in general. FinCEN has requested comments from interested parties about the proposed regulations and is expected to issue a final set of regulations later in 1997. This issue needs to be monitored, because it could affect the introduction of all types of stored-value applications.

Expired Value and Abandoned Property Laws

Another important issue affecting stored-value card programs in general is the treatment of expired or unused card value (i.e., the dollar value that remains on a card after it has expired or that is never used because the card is thrown away or kept as a collectible and so forth). The revenue potential associated with expired card value can make this issue an important component of the card issuer's overall business case. The possible regulatory barriers to the issuer being able to retain the expired card value are that the expired value may have to be turned over to the state, and/or the cardholder may be able to apply for a refund of the expired value. The applicability of the abandoned property law (commonly referred to as "escheatment") to stored-value cards is uncertain at present. Most states have enacted laws that dictate that "unclaimed property" be given to the state after a specified period. In some cases, transit agencies planning to institute stored-value card programs are seeking exemptions to the state law. In other cases, the transit agency may be considered an arm of the state government and thereby permitted to keep all expired value. Because this issue varies by state, a transit agency will have to investigate the applicable law in its own state.

The related issue is the cardholder's rights to a refund of expired value. If the purchase of the card is considered a contract, it can be argued that the value to a cardholder of an expired stored-value card would terminate by agreement, rather than becoming unclaimed property subject to escheat. The issue of refunds for expired value is also related to the question of providing for refund or reimbursement for card theft or loss or for card or terminal malfunctions. Resolving the issues associated with expired value is crucial in determining the financial benefits of a multiple-use card program.

Responsibility for Lost or Stolen Cards, Card and Equipment Malfunction, or Issuer Insolvency

Because there is currently no legislation governing stored-value cards, there are no regulations related to the handling of lost or stolen cards, card or equipment malfunction, or

bankruptcy or failure of the card issuer. There is a need to instill consumer confidence in stored-value card systems, if this new product is to be widely accepted. For this reason, regulations covering the rights and responsibilities of card issuers and users are likely to be introduced at some point. Transit agencies may or may not be subject to the same types of regulations as will banks when they are issuing closed system payment media. Even if they are not, however, agencies introducing stored-value media will have to decide on their own policies regarding consumer rights and refunds and reimbursements. Policies among existing smart card programs vary. In some cases, a card will be replaced (e.g., for a payment of, say, $5). In at least one case (London), cardholders can purchase an optional "Fare Protect Scheme" that protects the buyer against loss of a card.

Privacy Issues

Informational privacy rights constitute a major issue that will be raised by consumers in the introduction of smart cards for stored value and other applications. Because a stored-value card carries the use information on the card, a key question becomes, who has the right to control or use the data contained on the card? Another question concerns the rights of the consumer when information passes from the original party to a transaction to third parties (i.e., "redisclosure").

With stored-value media, transit agencies will be able to collect detailed information on individuals' card use. In fact, most transit agencies see this as a major benefit of electronic fare media and will want to use the newly available information on individual riders to improve service, presumably to the benefit of the cardholder. However, because of the potential to use card-specific information as a revenue-generating source by the agency (e.g., through the sale of cardholder lists), privacy issues become important.

Transit agencies will have to address riders' concerns in this area as agencies adopt electronic fare media. The need to deal with the privacy issue was identified in the Multi-Use Workshop as crucial to the successful introduction of multipurpose programs. One of the major recommendations from the workshop was that agencies must be proactive in addressing this issue: agencies should identify the tradeoffs associated with offering anonymous transactions (i.e., it may not be possible to provide refunds for lost cards) and should consider offering riders a choice as to whether or not to allow their detailed card use information to be tracked. The workshop groups also indicated that effective marketing and public information efforts would go far toward assuaging riders' concerns regarding invasion of privacy. A specific suggestion was that agencies draft a "Customer Bill of Rights" that would provide information about the types of data normally tracked by the agency and the steps the agency has taken to protect riders' privacy.

Identify and Resolve Operational and Administrative Issues

Certain operational and administrative issues must be addressed in establishing a multipurpose program. Key issues include

- Pricing of media (e.g., related to discounts and bonuses for purchase or use) and
- Sale and distribution of media (e.g., related to initial availability and ease of reloading media).

Pricing of Media

An important consideration in a multipurpose payment program is the need to accommodate different pricing structures and policies on a single card. At issue is whether the card contains a single EP (as in the VisaCash card introduced in Atlanta) that can be used to pay for various items or services (e.g., transit use, vending items, or fast food) or is a multiapplication card in which each use has its own separate application. In the latter, a transit agency's fare structure (e.g., including any use discount or purchase bonus) is added to a card, along with a bank's credit or stored-value application and perhaps other functions as well. In this case, each application retains its own pricing structure.

The single EP card, however, poses a problem in that every expenditure—transit or other—will be subject to the same discount or bonus. Thus, in Atlanta, when the VisaCash card is used to board a MARTA train, a single fare ($1.50) is deducted; MARTA is unable to apply any discount with use of this card, as opposed to its other prepaid media, which offer various discounts. A similar problem exists with a transit-issued single-application EP card (e.g., the planned NYMTA/Chase smart card) in that any purchase (or reload) bonus intended for transit use cannot be restricted to transit; it will also result in an effective discount for purchases from any merchant accepting the card. There are several possible ways to circumvent this problem, however. These include offering a discount on rides taken, rather than a bonus on amount of purchase, and introducing a "loyalty" program based on frequency of transit use. A multiple-use arrangement will be simpler if no discount or bonus is offered; however, the use of a discount or bonus, particularly when adding value, can encourage a transit rider to keep the same card for an extended period.

Thus, a transit agency must carefully consider the implications of its own pricing policies in initiating or participating in a multipurpose arrangement. The agency's policies can be a key factor in selecting an institutional arrangement and technology approach.

Distribution and Reloading of Media

One of the most important factors to be addressed in developing a multipurpose program is ensuring sufficient

availability of the cards and the ease of reloading and checking remaining value on them. This has been found to be a crucial concern to potential card users. This issue is particularly important for bus riders—either those who do not use rail in multimodal systems or riders in bus-only systems. One option is to establish a widespread remote sales network (e.g., sell cards through ATMs and at common remote sales locations). However, this will still result in availability problems for some riders (e.g., those boarding in suburban areas and not having ready access to a sales point or the unbanked). Emerging distribution options include

- Employer distribution,
- Purchase at home (i.e., via telephone, mail, or computer),
- Purchase via specially equipped public telephones, and
- Sale on board buses.

Employer distribution is an important option, although there can be problems related to employer transit subsidies provided through issuance of cards that can also be used for retail or other uses. The issue is that the employer can be effectively subsidizing non-transit uses if employees use the card for, say, retail purchases rather than transit. As discussed in Chapter 3, this may require restricting subsidized cards to transit use.

The sale of payment media at home represents one of the key emerging developments in banking, and the ability to load value at home or through smart card-accepting telephones could prove to be essential in successfully introducing stored-value cards in general; the development of "personal ATMs" and similar devices will greatly facilitate this approach.

Allowing card reloading on buses enhances the convenience for riders and has been used, or is under consideration, by several agencies. In some cases, this requires calling the agency ahead of time, to allow pre-authorization and downloading of value from the caller's account to the card-accepting devices; the value is then added to the card the next time the rider uses it on a bus. However, many agencies will not want to use on-bus reloading, because of concerns about boarding delays and introducing additional operator responsibilities.

Identify Technology Strategy

The major technological issues to be addressed in developing a multipurpose payment program relate to

- Selection of an appropriate card technology,
- Integration of the new technology into an existing fare collection system, and
- Ensuring the flexibility necessary to migrate to new technologies in the future.

Selecting Appropriate Card Technology

Contact and Contactless Cards. A key element in a multiple-use arrangement is the specific type of card technology that will be used. Smart cards have become the medium of choice in all types of multipurpose programs. Regarding the type of smart card, however, transit agencies have expressed a definite preference for contactless cards because of the expectation of improved throughput, lower card reader maintenance requirements (because there are no moving parts and no slots or openings), and greater convenience for riders. On the other hand, nontransit applications, not requiring as much speed for transactions but having greater security concerns, have primarily opted for contact cards. Contact cards have been used in transit environments in a few cases (e.g., Atlanta; Ann Arbor; Guelph, Ontario; and several locations abroad), but, even in these cases, the transit agencies have typically expressed long-term plans to migrate to contactless cards—perhaps in conjunction with contact cards. Ann Arbor Transit Authority, for instance, found the contact transaction times much too slow on its initial pilot involving acceptance of the University of Michigan campus card on buses. It has been suggested that transaction speed problems can be addressed through the use of faster contact card readers now being developed, but a more promising solution would appear to be a card that combines contact and contactless capabilities on one card.

Types of Combi-Card. There are three different types of cards that include both contact and contactless interfaces; the specific type needed will depend on the multiple-use arrangement. (The basic card types were shown in Figure 4 in Chapter 4.) Dual-chip—or "hybrid"—cards have completely separate contact and contactless applications. There are two types of single-chip cards (these are called "combi-cards" or "dual-interface" cards) as follows:

- One type has separate purses for the contact (e.g., for banking functions) and contactless (e.g., for transit use) interfaces; value would be loaded through the banking (contact) interface and could then be transferred to the transit purse for use in fare payment.
- The other type has a single purse that can be directly accessed by either interface; there may, however, be a separate transit application.

The dual-chip hybrid card would be considered an interim solution in a multiple-use transit setting, because the two functions are completely separate (i.e., the user cannot load value through the contact portion and use that value on transit). Such cards are useful for multiple applications not all involving payment.

Both types of single-chip card use a single microprocessor and allow the user to access value and make transactions through either means. However, they are functionally different. Although value can be transferred from the banking purse to the transit purse in the separate-purse option, value cannot be loaded directly from the bank into the transit purse and cannot be taken directly from the banking purse for transit fare payment. In the single-purse option, transit value can be loaded directly from the bank (e.g., at an ATM or other reload-

ing location). The major disadvantage of the separate-purse option is that a person could find out on trying to pay a fare that all of the value in the transit purse had been expended—even though there was value in the banking purse. The rider would then have to go to a TVM, ATM, or add-fare machine to transfer value into the transit purse. Although this situation would not occur with the single-purse card, the contactless mode (which is necessary to provide the transaction speed required for use by transit) does not provide the security needed for a banking purse. The operational and market acceptance implications of the different configurations need to be assessed through operational tests of the different types of cards.

Distribution of Combi-Cards. Both types of single-chip card have recently (mid-1997) been announced by different manufacturers, but neither has been used in operational multiple-use tests. Thus, in addition to the single purse versus separate purse differences, other issues related to combi-cards will have to be worked out and tested as part of any partnership agreement or demonstration. Perhaps the most important questions at this point relate to who will pay for and distribute the cards (i.e., as opposed to contact cards [distributed by the issuing bank, college, human services agency, or other entity] or contactless cards [distributed by the issuing transit agency]). At this point, the distribution options would seem to be the following:

- In an open system, a financial institution could cover the cost differential (i.e., compared with a contact card) and issue a combi-card so that it can be used on transit in the contactless mode.
- Alternatively, the financial institution could simply issue contact cards, leaving the transit agency to provide the combi-card (i.e., including contact-based applications) for its riders.
- In a closed system, the transit agency (or its clearinghouse operator) would presumably issue the cards, which could then be used for other purposes as needed.

In any of these models, the card issuer could provide a card containing either various applications (e.g., general EP, credit, and transit payment) already loaded or the issuer's own functions, but having an "open architecture" that would allow the addition of other applications (e.g., transit) to the card; applications could be added through use of some type of API contained in the card. Several major smart card, computer, and financial companies have recently (mid-1997) announced support of a common API (JavaCard), which is seen as promoting card interoperability and the ability of entities to add their own applications to cards issued from multiple sources.

Integration into Existing System and Ensuring Future Flexibility

Besides selecting a particular media technology, a key challenge for a transit agency will be integrating the new technology into the existing system. For instance, regarding the installation of smart card read-write devices: should they be fully integrated with existing fareboxes and turnstiles or should they be stand-alone units that do not directly interface with the existing equipment? The former will require retrofitting of equipment and the data transmission infrastructure and may be expensive. For pilot projects aimed primarily at demonstrating the general media technology and the multipurpose institutional framework, integrating the test equipment may not be necessary. Over the long term, however, full integration of the smart card system with fare collection and other on-board (or in-station) systems (e.g., automated vehicle location, automated passenger counting, and other advanced technology) should be the goal.

There are advantages to being able to plan ahead and include smart card capabilities in new equipment being installed as part of a more general fare collection project. However, the evolving nature of the technologies makes it difficult to predict the exact technology that will be available—and wanted—in the future; thus, maximizing flexibility is important. For instance, even if a program is planning to use combi-cards, a dual reader that can process both contact and contactless cards may be useful over the longer term; this will ensure maximum flexibility in terms of reading commercial contact cards (i.e., for people who do not have combi-cards).

Standards and Specifications

In general, the selection of a type of card will be driven by a combination of several factors as follows:

- Fare collection goals and needs (including type of institutional arrangement desired),
- Cost implications of the options (including available funding), and
- Desire to seek compatibility with other transit systems (related to interoperability of technologies).

The latter concern raises the issue of standards for the different types of cards. Standards are being developed for both contact and contactless cards, but no real interoperability among the various cards and operating systems exists yet. International standards exist for certain contact card parameters, and a set of specifications (EMV) is under development to address the interoperability of various functions. With regard to contactless cards, standards are being developed to address certain parameters. However, there are several distinct types of cards on the market; they differ for certain key physical and operating parameters. As of mid-1997, a standard had been recommended for one key parameter (power transmission radio frequency [13.56 MHz]) and other standards were emerging, but there remained competing memory technologies (i.e., EEPROM versus FRAM). The result is that, despite a steady move toward standardization—both formal and de facto—of both contact and contactless cards,

there is no real interoperability among competing cards and operating systems yet.

Beyond technical standards, there is also concern among transit agencies and their potential partners about the need for standards for functional requirements for cards and multipurpose systems. The Multi-Use Workshop participants identified the need for the transit industry to develop guidelines in this area, with substantial input from the financial sector. Considerable activity has begun—or is planned—related to defining requirements for various aspects of the electronic payment process in general; these efforts should help provide the necessary industry guidance.

Develop Program Design and Implementation Plan

The next step is to combine the elements developed or selected through the foregoing steps into a unified program design and a plan for implementing the program. The program design and implementation plan should define all elements of the multipurpose program, including the following:

- A refined set of goals;
- The type of program and the partners;
- The business structure, including the roles and responsibilities of the program participants, the itemization of expected costs and revenues, and the financial relationships;
- Any legal or regulatory issues and how they will be addressed;
- Any operational and administrative issues and how they will be addressed;
- The technology strategy;
- The scope of services and setting of the pilot project;
- The functional requirements and performance specifications for equipment and cards;
- The schedule for procuring, installing, and testing equipment and cards and the schedule for the overall pilot project (including evaluation); and
- The plan for systemwide expansion, perhaps phased.

The program design should be reviewed and agreed to by all major participants. Once the pilot project has been completed and evaluated, the design should be revisited and modified appropriately.

Implement and Evaluate Pilot or Demonstration

Before any attempt to implement a full systemwide program, the multipurpose arrangement should be tested through a limited pilot or demonstration. Because such programs represent not only a new fare payment technology but a fundamentally different type of institutional arrangement for both the transit agency and its partner(s), it is important to examine the different project components through a controlled operational test. The pilot should be designed to allow an assessment of such issues as

- The extent to which the program is addressing the different participants' goals for the project;
- The feasibility of maintaining the partnership (or other type of arrangement) permanently;
- How well the multipurpose payment technology works in the transit and nontransit environment;
- Whether the technology and the supporting system elements can be integrated into the agency's overall operation and fare collection system;
- The costs and benefits of the arrangement to the transit agency, the partner(s), other participants (e.g., Merchants), and the user; and
- Consumer reaction, including what users like and dislike about the technology and the program, and whether market acceptance is high enough to warrant expansion to the full system.

Implementation of the Pilot Project

With regard to implementing the pilot or demonstration and a subsequent full systemwide program, there are three basic approaches a transit agency can follow:

- Select a vendor or integrator for the pilot and then conduct a separate full program procurement; this strategy is being used in the Central Puget Sound project;
- Select a vendor or integrator for the pilot, with an option to expand to the full system; this is the approach planned for the TransLink project in the San Francisco Bay area;
- Participate in an open system, as a merchant, on a trial basis; then, either continue in this program or develop a closed system (or an agency could issue its own transit cards and continue to accept the outside card); MARTA is following this basic scenario.

Although the pilot should be structured so as to fully demonstrate one of the multipurpose concepts (i.e., regional integration, closed multiple use, or open), it should be kept as simple as possible (i.e., the number of participants, at least initially, should be kept to a minimum [e.g., a transit agency and one other entity, either issuing or accepting the card]). Once the basic arrangement has been demonstrated to be administratively, operationally, and technologically feasible, additional merchants or card issuers can be added as part of a wider rollout. In addition, it is advisable to implement the pilot on a limited portion of the transit system (e.g., on a single rail line or buses operating out of one garage or on a discrete set of routes). Lessons learned from evaluating the pilot can ultimately be applied to planning for expansion to the full system.

Evaluation of the Pilot Project

In conducting an evaluation, the agency should first develop an evaluation plan. This plan should spell out the evaluation issues; categories might include

- Travel behavior impacts (e.g., to what extent did the demonstration generate increased ridership?);
- Management and operational impacts (e.g., how effective was the demonstration at producing improved ridership data and at reducing fare queues?);
- Financial impacts (e.g., to what extent did the demonstration allow the agency to capture new revenues and to reduce maintenance time and costs?); and
- Institutional issues (e.g., how well did the multiple-use arrangement work?).

The plan should also include, for each category of issues, the identification of the types of impact, the impact measure(s), and the source of data and method of analysis. The actual evaluation would then involve a combination of staff and rider interviews, observation and timing (e.g., of speed of boardings), user and nonuser surveys, focus groups, and analysis of ridership and revenue data.

Implement Expanded Program

If the institutional, operational, technological, and customer acceptance aspects of the pilot are demonstrated and found successful, the next step would be to proceed with a more extensive implementation, if not a full systemwide program. As suggested above, the broader program may involve the same partners as did the pilot, or the pilot participants could decide to modify the program's structure. This could involve expanding participation, perhaps through recruitment of additional agencies or merchants or by arranging to accept additional issuers' cards. However, it could also result in pursuit of a somewhat different strategy—either institutional or technological. For instance, dissatisfaction with the media technology tested in the original TransLink demonstration (in three transit systems in the Bay area) led to initiation of a new system design, based on a different technology; the TransLink program will implement another pilot to test the new strategy. Another example is MARTA's decision, following the initial pilot period, to continue the VisaCash project with only one local bank, rather than the three with which it had been participating originally. This change was motivated by a desire to simplify the institutional requirements of the program.

As shown in both the TransLink and MARTA cases, depending on the program, this may or may not constitute the final step. As suggested above, some programs will eventually migrate from a closed to an open system or from a limited open system (e.g., in which the transit agency accepts one entity's cards) to a system involving multiple card issuers.

SUMMARY: MULTIPURPOSE SCENARIOS

This chapter has presented guidelines for the development and implementation of various types of multipurpose payment programs. Although design details will tend to vary significantly from one program to the next, there are three basic multipurpose scenarios that summarize many of the key issues described above. Tables 15, 16, and 17 describe a closed multiple-use system, a closed integrated regional fare system, and an open system (in this case, there is only one card issuer). Included are advantages and disadvantages to the transit agency, as well as examples of each approach.

TABLE 15 Multipurpose fare media scenarios: closed multiple-use system

Transit Setting:	stand-alone or multiple agencies in region
Goals:	upgrade fare collection generate additional revenues
Technology:	contactless or combi card
Participants (& Roles):	*transit agency* -- card issuer and acceptor *integrator/vendor* -- equipment provider, clearinghouse operator *financial institution* -- clearinghouse operator, possibly integrator *merchants* -- card acceptor
Financial Arrangement:	*contract basis* -- agency buys equipment, retains all revenues *turnkey/leaseback* -- agency leases system from integrator, retains all revenues *franchise or partnership* -- integrator finances system, agency pays transaction fee and shares merchant fee revenue

(continued on next page)

TABLE 15 Multipurpose fare media scenarios: closed multiple-use system *(continued)*

Advantages/Benefits to Transit Agency:	increase market penetration potential for additional revenue maintain control over fare collection system maximum pricing flexibility potential for innovative financing of new system
Disadvantages to Transit Agency:	expanded responsibility beyond transit, acts like bank need for settlement adds complexity to "fare collection" may be legal/political barriers to agency collecting merchant fees
Examples:	*Manchester (UK) Transit* -- partnership (integrator and transit agency); trial completed *New York MTA/Chase Manhattan Bank* -- proposed partnership (bank and transit agency); negotiations unsuccessful *Sydney (Australia)* -- partnership (integrator with taxi association and private transit operators); trial complete, moving to broader use

TABLE 16 Multipurpose fare media scenarios: closed integrated regional fare system

Transit Setting:	multiple agencies in region
Goals:	provide seamless regional travel upgrade fare collection
Technology:	contactless
Participants (& Roles):	*lead agency* -- designs system, coordinates participants *other agencies* -- card issuers and acceptors *integrator/vendor* -- equipment provider, clearinghouse operator *financial institution* -- clearinghouse operator, possibly integrator
Financial Arrangement:	*contract basis* -- transit agencies (or lead agency) buy equipment *turnkey/leaseback* -- agencies lease system from integrator *partnership* -- integrator finances system, agencies pay transaction fee
Advantages/Benefits to Transit Agency:	maintain control over fare collection system seamless regional travel potential for innovative financing of new system
Disadvantages to Transit Agency:	need to accommodate all agencies' fare policies, media usage requirements/specs, and operating & maintenance policies need to coordinate procurement/installation of equipment need for settlement adds complexity to fare collection
Examples:	*Ventura Co. (CA)* -- 7 agencies accept common card *San Francisco Bay Area* -- plan for common card for 26 agencies; system design underway *Seattle/Puget Sound Area (WA)* -- plan for 6 transit (and ferry) agencies; trial completed; system design underway *Hong Kong* -- 5 agencies formed joint venture to implement common card, trial underway *Seoul (South Korea)* -- contactless cards on 8700 buses (89 bus cos.); over 2 million cards issued; moving to rail

TABLE 17 Multipurpose fare media scenarios: open system

Transit Setting:	stand-alone or multiple agencies in region
Goals:	reduce fare collection costs reduce risks associated with new technology increase ridership leverage financial infrastructure
Technology:	contact or combi
Participants (& Roles):	*transit agency* -- card acceptor (and possibly co-issuer) *financial institution* -- card issuer, clearinghouse operator *vendor* -- equipment provider *merchants* -- card acceptors
Financial Arrangement:	issuer installs (or finances) equipment, agency pays transaction fee
Advantages/Benefits to Transit Agency:	lower fare collection costs and risks of new technology maximum market penetration (i.e., bank cardholders) ability to leverage financial infrastructure functions potential for additional revenue (if co-issuer)
Disadvantages to Transit Agency:	more complex partnership agreements requires existence of bank or other cards less control over fare collection less flexibility re pricing
Examples:	*MARTA (Atlanta)/First Union Bank* -- VisaCash (contact) card accepted in rail stations; 3 banks in pilot, 1 now *DelDOT/Wilmington (DE) Trust Co.* -- plan to accept bank-issued card on buses *Ann Arbor Transit/U. of Michigan* -- AATA accepts U. of M. card (contact) on buses; plan to also accept contactless cards *Guelph (Ontario)/Mondex* -- Mondex (contact) cards accepted on buses; trial underway

CHAPTER 8

SUMMARY OF FINDINGS

INTRODUCTION

The desire on the part of transit agencies and financial institutions to reduce the use of cash for payments and improve customer convenience has dovetailed with advancements in the payment technology area to facilitate various types of multipurpose payment media. Specifically, the development of integrated-circuit (smart) cards and the use of stored value have created opportunities for reaching more than one market with a single payment option. Multipurpose transit fare media can take two basic forms:

- Multiple-use media that can be used in several applications (e.g., transit, retail purchases, and banking) and
- Integrated regional fare media that can be used on multiple transit agencies in an area (i.e., a universal ticket) and/or on other transportation modes (e.g., for parking and tolls).

TCRP Project A-14, *Potential of Multipurpose Fare Media,* was intended to identify issues and concerns on the part of transit agencies and financial institutions, assess customer and financial implications associated with various approaches, monitor emerging developments, and develop guidelines for the development and implementation of multipurpose programs.

Multi-Use Workshop

One of the key elements of the study was a 1-day workshop held in April 1997 in Washington, DC. The Multi-Use Payment Media workshop brought together senior managers from various agencies and companies with an interest in smart cards and multiple-use payment media. Participants included representatives of transit agencies, regional planning agencies, banks and other financial institutions, U.S. DOT, transit industry trade groups, smart card manufacturers, equipment vendors and system integrators, and research institutions and consultants. Seventy people attended the workshop: 60 were invited participants and 10 were representatives of the research team and TCRP. The purpose of the workshop was to facilitate direct discussion of the key issues and appropriate directions and to disseminate preliminary findings from the project. The workshop was successful in allowing the different entities to hear about and discuss other industries' concerns and goals related to introduction of joint payment programs as well as the introduction of smart cards in general. The workshop was attended by senior managers from most of the largest U.S. transit agencies, as well as officials representing several major financial institutions, government officials, researchers and consultants, card manufacturers, and system integrators. Thus, decision-makers associated with most of the existing, developing, and potential multiple-use programs were able to develop a better understanding of the existing barriers as well as the steps necessary to address these barriers and expand such programs. (The workshop results are summarized in Appendix D.)

Final Report

This Final Report reviews multipurpose developments to date, including several in the planning stages, and identifies the full range of concerns and issues to be addressed in the consideration of multipurpose payment media and arrangements.

MULTIPURPOSE PAYMENT PROGRAMS—EMERGING DEVELOPMENTS

In the last few years, there has been extensive activity related to the development of stored-value programs and particularly transit multipurpose payment projects. Efforts are in various stages at this point: some programs are in widespread use, some are in limited trial, some are in the planning stage, and some have been put on hold. As of mid-1997, there were more than 25 projects involving transit in place on either a trial or ongoing basis, with several others in advanced planning stages. (Current operational and planned multipurpose projects involving transit are summarized in Chapter 2 and listed in Table 1.) Virtually all of these projects use smart cards. These projects and programs can generally be divided into transit-initiated multipurpose programs and financial, postal, or telecommunications industry-initiated stored-value/EP programs.

Transit Programs

The expanding use of smart cards in transit applications has begun to spur the development of multipurpose programs

throughout the world; in fact, most current projects have been initiated only within the last 3 years (i.e., since 1994). In North America, for example, integrated regional fare projects are being pursued, or already are in place, in the San Francisco Bay area, the Los Angeles area, Ventura County, CA; the Seattle/Central Puget Sound area; the Washington, DC, area; and the Montreal region. Multiple-use projects (e.g., with financial institutions, universities, or other entities) have been implemented in Atlanta and Ann Arbor and are being planned in Cleveland and Wilmington (DE). In other parts of the world, projects have been initiated in Sydney (Australia), Hong Kong, Seoul (South Korea), Paris, Manchester (GB), and elsewhere.

Financial Services and Other Programs

Financial and other types of institutions (e.g., telecommunications and postal companies) have begun to test and roll out stored-value/EP programs throughout the world. These include international EP systems (i.e., Mondex, VisaCash, Proton, and Europay Clip), nationwide programs (e.g., Geld-Karte and PayCard in Germany, Danmont in Denmark, Postcard in Switzerland, Quick in Austria, Postchecque in Belgium, and Chipper and ChipKnip in the Netherlands), and more localized programs initiated by banks or other entities. Included in the last category are campus cards issued by several universities (e.g., in Michigan, Florida, Missouri, and Oklahoma) and sports stadium-based stored-value cards (e.g., in Charlotte, NC; Jacksonville, FL; and Chicago). The United States trails Europe and Australia in tests of EP cards, but besides the Atlanta VisaCash pilot, several others are being tested by individual banks at their own headquarters. As of mid-1997, more than 50 EP projects were in place or in planning around the world.

Thus, there is considerable interest in multipurpose payment programs. The various efforts in place and under development are demonstrating both the potential of the concepts and the issues to be addressed. Because these programs entail fundamental institutional and technological changes in transit and other organizations, there are, understandably, barriers that must be overcome—not every project has proceeded as envisioned. The NYMTA's proposed multiple-use program was never implemented, because the NYMTA failed to reach an acceptable agreement with the Chase Manhattan Bank regarding the transaction fee structure—and the sharing of risk in general. The Wilmington project has been on hold for more than 2 years because of delays in getting the smart card system off the ground; a new system will now be used, and it is hoped that the project will soon move forward. A regional integration effort in the Toronto area has been delayed because of funding problems in Ontario. The Manchester project is now in limbo following privatization of the transit service; as of mid-1997, the operator had not yet agreed to accept the smart card system.

Moreover, many of the projects in place represent "special cases" in which agreements have been facilitated by extraordinary circumstances. For example, many of the multipurpose trials now underway around the world represent efforts by large national or international organizations (e.g., Visa, Mondex, and Banksys) to introduce and test a new concept and product (i.e., stored-value cards). In the United States, the few transit trials and pilots that have been implemented are the result either of such product tests (e.g., Atlanta, where the presence of the Olympic games was a key factor behind the timing of the overall VisaCash trial), federal- and state-funded demonstrations (e.g., Ventura County, CA; and Washington, DC), or proximity to a specialized card program (e.g., Ann Arbor).

There is much to learn from the above experiences—both positive and negative. Although the multipurpose concepts show considerable potential, they are largely untested and involve complex arrangements that have many uncertainties and issues to address.

IMPETUS FOR PURSUING MULTIPURPOSE ARRANGEMENTS

Transit Agency Interest

The substantial number of projects under development suggests that the various sectors involved—transit, financial and banking, telecommunications, postal—see considerable potential in multipurpose payment media. For transit agencies, the major reasons for considering a multipurpose program likely include some combination of the following:

- To offer seamless regional transit travel through use of a universal ticket (i.e., in a multioperator region);
- To reduce fare collection costs (e.g., by having a bank or other private entity provide media, by introducing economies of scale in the implementation and management of fare collection activities, and/or by using lower-maintenance fare collection technology);
- To generate additional revenues (e.g., through reduced fare abuse and evasion, expanded utility arrangements, float, expired card value, and advertising on media);
- To improve customer convenience (e.g., through the use of prepaid/stored-value media in general or through the use of easier-to-use media and by expanding the distribution network for prepaid media);
- To expand the market base for transit (e.g., by accepting commercial payment media or by increasing employer participation) and increase ridership (e.g., through the institution of loyalty tie-ins with merchants or frequent rider-type bonuses);
- To improve data collection and reporting capabilities;
- To improve equity and timeliness of the reconciliation and distribution of revenues collected in a multioperator system;
- To improve the ability to modify fare policies and structures (e.g., to better target specific markets); and
- To get out of the "payments and settlements" business (i.e., to use the capabilities of financial institutions).

The specific type of multipurpose arrangement pursued will depend at least in part on which of these goals the agency considers most important.

Financial Institution Interest

Financial institutions have a somewhat different impetus for participating in multipurpose payment arrangements. In considering stored-value cards in general, the banks and other institutions see a significant potential market in capturing small cash purchases through prepaid media. It is estimated that, worldwide, there are more than $8 trillion worth of cash expenditures each year; nearly a quarter of this is in expenditures of $10 or less. In the United States alone, there are roughly 340 million cash transactions per year, accounting for about $1.7 trillion; more than one-third of this total is on transactions under $20. Financial institutions hope to generate revenues through transaction fees (and possibly card use fees) and to reduce costs by requiring fewer bank tellers.

This move toward stored-value media has also been driven to a large extent by the growing interest in smart cards for various payment applications. The financial services industry, thus, sees smart cards as the future standard technology for all payment-related media (e.g., credit cards, electronic benefits transfer, medical claims processing, and retail loyalty programs) as well as access and identification media for on-line transactions in the near future. Another goal in offering stored-value cards is to expand the range of services provided to consumers, as banks in particular seek to improve their status in the increasingly competitive payments environment.

In general, tying in with a large transit agency offers a financial institution several potential benefits, including

- The opportunity to quickly establish a critical mass of users of the bank's prepaid media;
- Access to potential customers for its other products and services (e.g., bank accounts), perhaps through co-branding of fare media;
- Access to transit facilities (particularly rail stations) for possible installation of bank ATMs—to dispense the prepaid media and to provide for other banking functions; and
- Access to merchants closely affiliated with transit (e.g., vending machine operators and newsstands).

Moreover, transit use is particularly well suited to the use of prepaid media and stored value in particular: it involves numerous low-value transactions, and it requires rapid transactions (i.e., on-line authorization for payments is infeasible). Furthermore, transit agencies typically require exact payment and do not give change. Most transit agencies offer some type of prepayment, typically in the form of unlimited-ride passes or multiple tokens or tickets. Of particular relevance, the transit industry has been using stored-value media for more than 25 years. Thus, the transit industry has experience with this approach, and its riders are accustomed to the general notion of prepayment.

Besides looking at transit as a participant in a card program, financial institutions also see opportunities to assist transit agencies through partnership and contracting arrangements in the establishment and administration of their own stored-value programs. Banks and other institutions can offer their expertise in managing the various elements of the payments business, including the back-end reconciliation and settlement functions as well as the production and distribution of the media themselves.

ISSUES AND BARRIERS RELATED TO DEVELOPMENT OF MULTIPURPOSE ARRANGEMENTS

Even though several multipurpose projects have been initiated around the world, many issues and concerns need to be addressed by prospective project participants. These projects involve several concepts that are new to most would-be participants: new types of public-private partnerships, the use of stored-value payment options, and the use of smart cards. The absence of precedent for certain types of institutional arrangements is compounded by rapidly changing technology and the absence of definitive regulatory rulings. Fortunately, as interest in multipurpose programs and smart cards grows, the number of projects will grow too and it will be easier to identify the most appropriate strategies and resolve the most complicated concerns.

As explained in this report, the issues that must be addressed fall into the following general categories:

- Institutional and financial,
- Operational and administrative,
- Legal and regulatory, and
- Technological.

In most of these categories, the issues and requirements will differ depending on the type of program being developed (i.e., open system versus closed multiple use versus regional integration). However, several concerns are more general and may apply to any type of effort. Such concerns are discussed below, within the context of the major types of multipurpose program.

General Issues and Open Payment Programs

Concerns Related to Partnerships and Business Structure

The major challenge facing prospective participants in any type of multipurpose program is developing a reasonable and realistic business structure (i.e., one that adequately distributes program responsibilities, financial risk, and benefits

among the participants). Multipurpose arrangements typically involve the establishment of some form of public-private partnership. A transit-initiated program may well be managed and financed through a partnership; in an open payment system, the transit agency will enter the partnership as a merchant accepting outside cards.

Because of the minimal experience in establishing such partnerships, particularly between transit agencies and financial institutions, there are few proven models for structuring agreements. Partners must be confident that each will benefit from the arrangement, but the uncertainties of both the risk and the benefits can make it difficult to develop a mutually acceptable agreement. Developing a partnership agreement can be complicated by the following factors:

- The underlying motivations for public and private institutions are fundamentally different: a private company's interest in any such venture will be driven primarily by the desire to generate a profit (or at least to minimize its risk) while gaining access to a new customer base; a public agency is interested in generating additional revenues, but is typically more concerned with increasing ridership and improving the quality and efficiency of its service.
- General-market stored-value media have not yet been widely tested in the United States and acceptance by the general public has, therefore, not yet been established (i.e., outside of a handful of transit agencies), creating a sense of risk in such a venture. There tends to be disagreement as to how the perceived risk should be shared by the partners.
- The legal and regulatory status of stored-value products has not been fully resolved. Preliminary rulings have exempted stored-value cards from Regulation E (dealing with consumer protection related to EFT) and from the need for deposit insurance, but these and other regulations have not been finalized, leaving their ultimate implications unclear.
- Financial institutions have selected contact cards as the preferred medium for their new payment instruments, while transit agencies generally prefer contactless cards; the development of combi-cards offers a solution to this situation, but several issues related to provision and distribution of these cards (e.g., who will provide and distribute combi-cards and who will receive them) remain.

The barriers to establishing partnerships should be eased once one or more such agreements have been completed; however, it will be some time before any partnerships now under consideration are demonstrated to be reasonable for both parties. Developing a partnership with an equipment vendor or system integrator may be less complicated than with a financial institution, given that these vendors are already familiar with the types of requirements and constraints facing transit agencies. There are a few examples of this type of partnership around the world, including systems that have been tested in Seoul (equipment vendor and integrator with transit providers), Sydney (integrator with consortium of private transportation providers), and Manchester (equipment vendor and integrator with transit agency).

Concerns Related to Technology and Operations

Beyond the issues related to partnerships, there are also several concerns that relate either to the technology itself or the operational aspects of the programs. The following factors represent potential barriers to transit participation in multipurpose programs—and sometimes to the introduction of smart card projects in general:

- Transit agencies—as well as other prospective smart card issuers—are concerned about privacy issues being raised by cardholders. Cardholders may not want the issuer to be able to track their ridership patterns or maintain other information about them. Card issuers will have to be proactive in addressing these concerns and may have to offer card buyers a choice as to how much card use information is reported (e.g., in exchange for giving up the ability to get refunds for lost cards).
- Abandoned property (escheatment) laws may mean that stored-value card issuers must turn over expired or unused value to the state; this would eliminate a significant potential revenue source from such programs. The laws vary from state to state; in some cases, transit agencies may be exempted or may be considered to be a part of the state government.
- Ensuring sufficient availability of cards (and reloading locations) can be a problem, particularly for bus riders. Many agencies will not want to issue or reload cards onboard buses, and many transit riders may not have access to an ATM. Employer distribution and purchase at home (via computer, telephone, or mail) are important distribution options.
- With single-purse open-system EP cards, a transit agency will be unable to apply any fare differentials (e.g., multiple-use discounts or bonuses); only a single preset fare is deducted. This problem does not apply with a multiapplication card.
- Many transit agencies have developed a fear of immediate obsolescence in considering new technology; given the rapid pace of advancements in technology, many agencies are reluctant to invest in new fare equipment and media, fearing that the items will soon be replaced by something new and improved. A related concern applies to cost; the cost of providing smart cards is a concern to at least some agencies, and many of these agencies feel that they should wait until the costs drop—or until some other entity offers to pay for the cards (one benefit of participating in an open system).

Closed Multiple-Use Programs

The closed multiple-use program, in which a transit agency (or consortium) receives revenues from other entities accepting the card it issues, faces most of the concerns cited above, particularly if it involves a partnership with a private entity. That NYMTA and the Chase Manhattan Bank were unable to agree on mutually acceptable terms regarding the nature and level of fees—related to the sharing of costs and risk—indicates the difficulties inherent in establishing such partnerships. The particular card technology to be used in New York was also an issue, and this had apparently not been resolved when negotiations were terminated.

Besides the above concerns, there are also potential barriers that apply specifically to this type of program; these include the following:

- A transit agency may be reluctant to enter into such an arrangement because of concerns about becoming like a "bank" by adding administrative responsibilities related to collecting fees from merchants and by subjecting itself to regulations governing such activities. Although many agencies will simply not pursue such an arrangement (indeed, some may be legally prohibited from collecting such fees), those that do (e.g., NYMTA) will probably seek to assign responsibilities for recruiting and conducting business with merchants to a private partner (e.g., a bank or other financial institution).
- Any purchase bonus or employer subsidy intended for transit will result in the cardholder receiving an effective discount on merchant purchases as well. It may be necessary, therefore, to modify the transit pricing policy (e.g., to offer a discount based on rides taken rather than a purchase bonus).
- There will be resistance from some merchants, because of a reluctance to add another card-accepting terminal; in any event, the issuing agency or partnership will likely have to provide the terminals at no charge, at least until the program becomes well established and merchants see that participation benefits them (e.g., through the reduction in cash-handling).

Of the three basic types of multipurpose program, this has been tried the least. Several transit smart card projects (e.g., the Seoul smart card system already in operation; the Hong Kong integrated regional card project now being tested; the planned test in Valenciennes, France; and the Manchester project, which is in limbo) have plans to eventually add multiple-use arrangements. In the United States, the GCRTA in Cleveland has explored the concept, although it has not yet decided on a specific type of program. The most notable operational closed multiple-use project is the Sydney Integrated Card System, which was initiated by a consortium of taxi and private bus operators in partnership with the system integrator. Although this project has apparently generated interest among transit operators, nontransit entities, and consumers, it is too early to assess the potential of the concept for U.S. agencies. Operational trials are needed to test U.S. agencies' abilities to address the above barriers and develop and implement multiple-use programs.

Integrated Regional Fare Programs

Integrated regional fare programs will also have to deal with many of the issues related to developing public-private partnerships if they consider management and financing approaches involving private entities. Most efforts now underway are envisioning significant private sector involvement. Partnership issues aside, the biggest challenge in these projects is simply dealing with what can be numerous entities (i.e., transit agencies), each having its own requirements and constraints. Some agencies may resist participation altogether and end up feeling forced into the new program. The challenge to the project planners is addressing each agency's needs and concerns while coming up with a technologically realistic solution. Based on integrated card efforts in Ventura County, the Bay area, the Los Angeles area, and the Central Puget Sound area, specific concerns will likely include the following:

- Agencies have different combinations of service, vehicle types, and fare collection strategies (e.g., light rail systems typically have proof-of-payment fare collection, which may require a different technological approach than pay-on-entry systems).
- Agencies have differing levels of automation in their fare collection, and some may not want to upgrade again.
- Some agencies may prefer to pursue their own solutions or to wait until the new technologies have matured.
- All participating agencies must agree on a system management concept, including how revenue allocation will be done, who will provide clearinghouse services, and how those and other support functions will be paid for.
- Once a smart card system has been implemented, each agency must adequately train its own operators and maintenance personnel and gain their cooperation in using and maintaining the new equipment.

Several integration projects are under development, including several in the United States, but few have been implemented. The major efforts now in trial are those in Hong Kong (a consortium of four transit providers), Oslo (three transit agencies), and Ventura County (seven agencies). The projects now being developed in the San Francisco and Seattle regions as well as those planned for Paris, Montreal, and elsewhere, will ultimately provide excellent case studies of the problems encountered and how they have been overcome.

Although the above represent the major potential barriers to project development and implementation, other details must be addressed in establishing and implementing a multipurpose program; these are reviewed in the body of the report and summarized in Chapter 7. Although none of the barriers identified above—and in the rest of this report—should be considered insurmountable, they are significant and have complicated development efforts to date. Fortunately, as each new project is designed and implemented, additional guidance is provided in addressing these issues.

POTENTIAL FOR CUSTOMER ACCEPTANCE

In addition to overcoming development and implementation barriers, the key to the ultimate success of any new payment option lies in widespread customer acceptance. Prepayment is very popular in the transit industry; the average percentage of fares paid with prepaid media for the respondents to the transit agency survey is nearly 50 percent. Stored-value transit applications have been in place for more than two decades—albeit in a limited number of locations. Stored-value media have been used extensively in the original applications in San Francisco and Washington. In the largest new program (i.e., New York), use has increased significantly after a slow start; in the other major new stored-value program (i.e., Chicago), acceptance of the concept was much quicker. For the financial services and other industries, North American stored-value trials have not been in place long enough to demonstrate clear acceptance of the basic approach; in Europe, however, several programs have seen extensive acceptance.

Given the substantial cost involved in introducing stored-value programs, and smart cards in general, transit agencies, financial institutions, and other prospective card issuers are understandably concerned about their likely appeal. To gauge the level of interest and the nature of concerns among prospective customers, several entities have undertaken market research into potential use of such cards in a range of applications. The key findings and implications of the various market research efforts are summarized in the following sections.

Transit Market Research

In surveys and focus groups, several transit agencies have sought to address such issues as

- The likely acceptance and extent of use of new stored-value media and/or the use of smart cards in general by current transit riders,
- The ability of such media to increase transit use by current riders as well as to generate use by current non-riders, and
- Issues and factors considered important to potential users.

General Reaction to the Stored-Value Concept

- Respondents were generally positive toward the concept of stored-value media. Transit riders place considerable value on the convenience associated with using a stored-value farecard, although the cost of fare payment is the single most important factor affecting choice of a fare method.
- Convenience of purchase and reloading is important. Bus riders, in particular, view the inability to readily purchase a card a potential problem and are concerned that they will have to go out of their way to purchase cards.
- Respondents selecting farecards indicated that they expected to increase their trip-making after purchasing the cards. In Chicago, adjusting for "commitment bias," it was estimated that the farecards would induce approximately 2 to 5 percent additional trips among these riders. Roughly 25 percent of Metrocard (LA area) users indicated that they were using transit more since buying Metrocard than they had before.
- A financial incentive for using stored-value cards is considered important. In the LA Metrocard survey, for instance, the most frequently suggested improvement was to provide a discount for using the Metrocard. In all, 86 percent of the respondents said that they would use the card more often if it were discounted. Most consumers in the Bay area were also generally interested in high-use discounts.

Reactions to Multiple Use

- The overall reaction to the use of a stored-value card as a payment device for applications other than transit was mixed. Almost 50 percent of the New York City consumers interviewed thought "very highly" of the expanded use concept and would anticipate using the card. In the Los Angeles, San Francisco, and Seattle areas, on the other hand, multiple use for nontransportation applications was considered relatively unimportant.
- Consumers were, overall, more comfortable with the introduction of the stored-value card's use capabilities in stages, rather than all at once. Consumers indicated that they would be more receptive to expanded use after they had become comfortable with use of the card for transit purposes.
- Many people projected monetary values loaded on the card at a higher level then had been expected. In New York, survey respondents indicated that they would place an average of more than $100 on the card; in the San Francisco area, respondents indicated that they would put between $8 and $50 on the card initially.

General-Purpose Market Research

The high level of interest in the smart card and stored-value markets on the part of financial institutions has also

resulted in several market research efforts over the past couple of years. Like the aforementioned transit agencies, several major banks and associations have undertaken surveys to ascertain the potential acceptance of and concerns about these new payment options.

General Reaction to the Stored-Value Concept

- Consumers are comfortable with the concept of a multiapplication card. In research conducted by the Smart Card Forum, for instance, about 67 percent of the respondents were "positive" to the idea, with 25 percent "enthusiastic." Forty-two percent of the group would seriously consider acquiring a multiapplication card. In MasterCard's research, more than one-half of the respondents expressed positive interest in the stored-value concept, and approximately 60 percent of the U.S. respondents indicated they would switch financial institutions to obtain the stored-value product. In this research, Americans said they would carry an average minimum of $100 and an average maximum of $300 on their cards.
- The two main reasons given for the positive reactions to the multiapplication card were its value in an emergency and the ability to consolidate existing cards. The emergency information especially pertained to medical and insurance information. The primary benefits of the card were seen as being convenience, consolidation, and storage of emergency information. The card was also seen as being used as a budgeting item (e.g., to help control expenditures). The ability to combine several cards into one card was also seen as a major benefit.

Barriers to Use

- Participants saw the chief barriers to their use of a smart card as being a lack of privacy or security and there not being widespread merchant acceptance of the card. People were concerned about what would happen to their money if the card were lost or stolen. Many participants felt that the card would only be accepted in a few places at first, and it would take some time for the card to be accepted on a widespread basis. The need for a PIN to use the card was seen as a negative when making small dollar purchases, although PINs were considered favorably for making large purchases. Finally, several of the participants were concerned about how the information stored on the card would be accessed. Other concerns (from various other research efforts) included the following:
  - Not being able to know easily how much money is left on the card,
  - The likelihood of spending more money,
  - Malfunctioning card-reading devices, and
  - The potential that a fee would be charged to use the card.

Thus, the market research reviewed in this study indicates a generally positive response to stored-value media (and smart cards in general) for transit use. There appear to be mixed feelings among transit riders about a multiple-use card, although there are indications that riders would be more responsive to a multiple-use card after becoming comfortable with its use in a transit setting. Among general market consumers, smart cards are accepted positively, although stored value does not appear to be considered the most important application. The market research suggests that there is a need for effective consumer education in the introduction of any new fare payment technology, especially a multiple-use card. Transit has long used prepayment and has demonstrated the concept of stored value for more than 20 years. Although the extent of the ultimate market for multiple-use media is not yet clear, the market research suggests that consumers are generally interested in the stored-value concept for transit, transit-related, and nontransit services.

RECOMMENDED NEXT STEPS

Many questions must be answered as multipurpose payment programs are developed. Demonstrations of the various concepts, accompanied by evaluations of the costs and benefits, will help address the types of issues identified here and will likely highlight new issues as well. However, beyond the need for demonstrations and pilot projects, this research has identified several initiatives that will help facilitate the development and testing of multipurpose arrangements. Recommended next steps that should be pursued within the transit industry, in collaboration with financial institutions, include the following:

- Establishment of industrywide guidelines and standards on functional requirements for transit smart card applications,
- Development of guidelines and principles for addressing consumer privacy concerns, and
- Establishment of a continuing support effort to monitor and research ongoing activities and developments and to provide technical assistance in the development of multipurpose programs.

Establish Standards for Functional Requirements

Given the growing consideration of smart cards by transit agencies and the interest in multiple-use programs, there is an immediate need for a transit industry consensus on the functional requirements for the transit application on the

cards—whether transit-only or multiple use. The need to establish industry standards (or at least guidelines) for multiple-use cards was identified as a priority action item at the Multi-Use Workshop (see Appendix D) and has also been noted at the APTA Fare Collection Workshop and other industry meetings. The general recommendation at the Multi-Use Workshop was that the transit agencies should develop these guidelines, with input from the financial sector; the vendors would then be responsible for the design of actual technical specifications.

There is considerable activity underway in this area—several parallel efforts were initiated in 1997; these include ITS America's ITS Payment Systems Task Force (which seeks to identify distinct issues and concerns of each sector that may be involved in multipurpose payment programs), the U.S. DOT (which, through the Volpe Center, is setting up a working group and planning a workshop to begin to define functional requirements), and the APTA Fare Collection Committee (which plans to consider this issue through a new subcommittee). A closely related effort is the FHWA-sponsored Transit Communications Interface Protocols (TCIP) project, which is establishing the data requirements and formats related to fare collection equipment and other transit control elements (e.g., passenger information) and the interface between them.

Although there is considerable interest and activity related to the establishment of functional requirements, these efforts must be closely coordinated so as to produce a coherent and integrated set of standards and guidelines. Given the scope and timing of the multipurpose projects now in advanced stages of development (e.g., the regional integration efforts in the San Francisco area; the Central Puget Sound region; the Washington, DC, region; and elsewhere), the need for standards is urgent and should be accorded high priority by the organizations sponsoring the above efforts.

Develop Privacy Guidelines

The need to address customers' concerns regarding the protection of their privacy rights is a crucial issue in the introduction of any type of smart card application. A key recommendation of the Multi-Use Workshop was that card issuers should be proactive in addressing this issue. In particular, they should inform customers that smart card technology can track enormous amounts of information. Card issuers may wish to give cardholders some say about the extent to which their card use (e.g., for transit) is tracked. For instance, issuers may want to allow anonymous transactions. Of course, customers also must be made aware of the tradeoffs for anonymity—no refund would be possible for a lost or stolen card, and it would be difficult to offer the same types of frequent use incentives. One method to address the public's concerns would be something along the lines of a "Customer Bill of Rights." This would inform the customer about what types of data are tracked by the agency and the steps that the agency has taken to ensure that privacy rights will not be infringed.

Given the importance of this issue, transit and other industries planning to issue smart cards would do well to work together to develop a coherent set of privacy principles or guidelines that can be tailored and adopted by individual entities. Several industry organizations have already proposed such guidelines. For example, ITS America has recommended privacy principles for transportation technologies in general, and the Smart Card Forum has developed smart card-related guidelines designed for use across multiple industries. The transit industry should review these and identify its own requirements. A draft set of guidelines that represents the consensus of various industries would save public and private entities considerable time and effort in developing their own sets of privacy principles.

Establish Ongoing Monitoring and Technical Support Effort

Because multipurpose programs are just beginning to emerge, most of the issues identified in this study have yet to be resolved. What is needed now is some type of ongoing support effort to monitor activities underway and being planned, conduct further research into the key issues, and provide technical assistance to agencies contemplating new programs. Such a technical support effort, could be initiated through TCRP, U. S. DOT, and/or an entity such as APTA, ITS America, or Smart Card Forum. A technical support effort of this type should do the following:

- Document and analyze the implications of technological and regulatory developments and project planning and implementation efforts by periodically surveying industry practice and disseminating the resulting information;
- Facilitate the exchange of information on multipurpose arrangements among transit, financial, and other (e.g., telecommunications, university, and human services) entities; for instance, periodic interindustry workshops, such as that held as part of this project, would provide one such forum; and
- Provide technical assistance to entities (contemplating or planning multipurpose programs) in addressing technological, legal and regulatory, financial, and institutional issues; this could perhaps be done through a format such as the now defunct FTA-funded Public-Private Transportation Network (PPTN), in which industry "experts" in various areas were made available to interested agencies (and paid for their time by PPTN.)

The ongoing support activities could be centralized in a single agency or research entity or could be handled through two or more coordinated efforts. Regardless, ongoing research and support activities such as those described here

are crucial to the resolution of multipurpose program implementation and management issues.

CONCLUDING REMARKS

There is considerable activity in the development of multipurpose payment programs, and interest in the concepts is increasing steadily. Electronic media, particularly smart cards, have facilitated the consideration of new approaches to regional transit fare integration, as well as linking transit and other payment methods. Smart card-based regional integration efforts have been driven by the desire to provide seamless travel within a region and improve transit access in general. As with the push for increased convenience in regional trip-making, the transit industry has begun to consider the potential benefits associated with integrating fare payment into the broader payments environment. Many transit agencies would like to "get out of the fare collection business" as much as possible or at least be able to participate in open payments systems. Other agencies see the potential for broadening their markets and perhaps generating new revenues through nontransit acceptance of their farecards. An increase in interest in stored value and prepayment in general in the financial, retail, and service sectors has dovetailed with the interest in the transit industry; as the number of general-market stored-value applications grows, so too will opportunities for multiple-use arrangements.

Various models are being considered for the different types of multipurpose arrangement. Efforts to date have been marked by successes and setbacks. The institutional structures needed to implement and administer these programs represent new approaches to most of the participants, and the financial agreements can be complex. Myriad issues—operational, legal, and technological—must be addressed, and there is limited precedent for each type of structure, particularly in the United States. Thus, although there appears to be considerable potential for multipurpose programs, more testing of the various approaches is needed, along with evaluations of longer running projects.

The ultimate success of these programs will depend largely on the degree of acceptance of multipurpose media by card issuers, merchants, and consumers. This acceptance has only recently begun to be tested in many parts of the world, although a few programs have now been in place for at least a few years. The early results from these efforts have been generally positive, but use has sometimes grown more slowly than had been anticipated. As different types of programs continue to roll out and result in additional experience, questions will start to be answered. The full answers will not be available until these new concepts have been tested extensively.

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APPENDIX A

TRANSIT AGENCY SURVEY

This appendix presents the results of a survey of transit agencies conducted as part of the study; the questionnaire and cover memo are presented at the end of the appendix. The focus of the survey was on current fare collection practices and costs, plans for use of emerging technologies, agency goals for improving fare collection systems and issues, and concerns regarding possible multiple-use payment arrangements. A questionnaire was sent to 86 transit agencies throughout North America. These include all agencies currently operating rapid rail, commuter or light rail service, as well as a range of bus-only systems (small, medium, and large). A total of 54 transit agencies, or 63 percent of the total sent, responded to the survey. The respondents are shown in Table A-1, separated by modal classification (see below); annual systemwide ridership is presented for each. The results of the survey were processed using the Statistical Product for the Social Sciences (SPSS) software. The responses are summarized below.

OVERVIEW OF THE TRANSIT AGENCIES

All modes of public transportation are represented among the respondent agencies. While many of the responding agencies operate only one mode, some of the agencies are multimodal. In order to prevent counting an agency's response more than once for results that are presented by mode, each agency was categorized according to the following hierarchy:

- *Bus Only*—This category consists of those agencies that operate motorbuses only. The only exception is the Detroit Transportation Corporation, which only operates automated guideway.
- *Light Rail and Streetcar*—This category consists of those agencies that operate light rail or a combination of bus and light rail.
- *Commuter Rail*—Agencies in this category operate either commuter rail only or a combination of commuter rail with bus and/or light rail.
- *Rapid Rail*—As a minimum, agencies in this category operate rapid rail only or a combination of rapid rail with any of the other modes already mentioned.

Using these categories, the modal breakdown for the survey respondents is summarized in Table A-2. As shown in Table A-2, most of the survey respondents (57.4 percent) are bus-only systems. Rapid rail is the next largest category with 20.4 percent of the survey respondents. The remaining 22.2 percent of the respondents are composed of light rail and commuter rail systems.

PRESENT FARE COLLECTION SYSTEM

In the survey, each agency was asked a set of questions about its current fare collection system. These questions addressed the areas of media, payment options, and fare collection and issuing equipment. Each of these areas is discussed separately below.

Types of Media

Each agency was asked to identify the types of media that are currently accepted on its services. The responses are summarized in Table A-3. It is important to note that the total in Table A-3 represents the number of agencies that submitted at least one response. The numbers and percentages do not add up to the total since multiple responses are possible. For example, an agency may accept cash, tokens, and magnetic-stripe cards. As such, this agency is counted once for every response and once in the total.

By far, cash is the most widely accepted medium for transit travel with 98.1 percent of the agencies accepting it. Fifty percent of the agencies report tokens as a media type that is accepted. The next most widely accepted medium is magnetic-stripe swipe cards. Nineteen (35.2 percent) of the survey respondents accept swipe cards. Very few of the responding agencies report accepting credit cards (nine respondents), debit cards (five respondents), stored-value cards (eight respondents), or smart cards (three respondents). The category of "other types" represents 46.3 percent of the survey respondents. This category included flash passes, paper tickets, transit checks, and photo ID cards.

Payment Options

In addition to the types of media, each agency was asked to identify all available payment options, that is, the different products it offers in terms of passes and multiride tickets. The responses are summarized in Table A-4. As with media types, the numbers and percentages do not add up to the totals since multiple responses are possible. As shown in Table A-4, a significant number of agencies offer some form of prepayment option. The most widely available form of prepayment appears to be the monthly pass. A monthly pass option is available at 88.7 percent of the systems operated by the respondents. Multi-ride tickets are the next most widely available with 43.4 percent reporting these as an option. Agencies with weekly passes compose 26.4 percent of the respondents and those with stored-value cards compose 17

TABLE A-1 Survey respondents

Category	Location (Agency)	Annual Ridership (000's)
Rapid Rail	Atlanta (MARTA)	62,700
	Baltimore (MTA)	92,800
	Boston (MBTA)	178,403
	Chicago (CTA)	441,000
	Los Angeles (LACMTA)	361,000
	New York (NYMTA)	1,550,000
	Philadelphia (PATCO)	11,134
	Philadelphia (SEPTA)	200,000
	San Francisco (BART)	79,870
	Toronto (TTC)	389,700
Commuter Rail	Ft. Lauderdale (Tri-Rail)	2,755
	Los Angeles (SCRRA)	5,000
	NY (MNCRR)	62,376
	Toronto (GO Transit)	32,000
	Vancouver (BC Transit)	200,000
Light Rail	Buffalo (NFTA)	27,300
	Calgary (CT)	56,300
	Dallas (DART)	43,500
	Detroit (DTC)	2,300
	Pittsburgh (PAT)	70,000
	Portland (Tri-Met)	63,468
	Sacramento (RTD)	23,088
	St. Louis (BSDA)	50,000
Bus-only	Albany, NY (CDTA)	10,000
	Ann Arbor (AATA)	4,085
	Bridgeport, CT (GBTD)	4,750
	Charlotte, NC (CT)	12,000
	Cincinnati (SORTA)	22,457
	Contra Costa Co., CA (CCCTA)	3,988
	Culver City, CA (CCMBL)	4,000
	Dayton, OH (MVRTA)	15,000
	Grand Rapids, MI (GRATA)	3,600
	Hartford (Connecticut Transit)	19,000
	Honolulu (HPTA)	80,650
	Houston (Metro)	60,000
	Lafayette, IN (GLPTC)	1,950
	Las Vegas (RTC)	28,500
	Louisville, KY (TARC)	15,000
	Madison, WI (Metro)	9,730
	Memphis (MATA)	12,682
	Montebello, CA (MBL)	5,438
	Norfolk, VA (TTDC)	8,365
	Orange Co., CA (OCTA)	42,188
	Ottawa (OC Transpo)	71,800
	Phoenix (Valley Metro)	30,000
	Raleigh-Durham, NC (TTA)	338
	San Antonio (VIA)	46,349
	San Bernardino, CA (Omnitrans)	9,822
	San Mateo, CA (SamTrans)	23,088
	Seattle (Metro)	76,400
	Spokane, WA (STA)	7,467
	Tallahassee, FL (Taltran)	3,674
	Tampa, FL (HART)	10,000
	W. Covina, CA (Foothill Transit)	12,500

TABLE A-2 Number of respondents by type of system

Type of System	Number	Percent
Bus Only	31	57.4%
Light Rail/Streetcar	8	14.8%
Commuter Rail	4	7.4%
Rapid Rail	11	20.4%
TOTAL	54	100.0%

percent, a relatively low proportion. Twenty agencies reported the availability of other payment options beyond those mentioned above. These consisted primarily of day passes, group passes, and specific multi-ride punch cards and tickets.

In addition to listing the payment options, the respondents also provided data as to the percentage of fares paid with prepaid media. These data are summarized by type of system in Table A-5. As shown in this table, rapid rail and commuter rail have the highest proportion of prepaid fares, with 57.5 and 53.3 percent prepayment, respectively. Light rail is next with 49.6 percent prepayment. Bus-only systems have the lowest proportion of prepayment.

Existing Fare Collection and Issuing Equipment

Each of the agencies was asked to indicate its existing types of fare collection and issuing equipment. The responses are summarized in Table A-6. Since multiple responses are possible, the numbers and percentages do not add up to the totals. Electronic registering fareboxes are the most widely used pieces of fare collection equipment used by the responding agencies. Eighty-two percent of the respondents indicate that

TABLE A-3 Present fare collection system: media types

Media Types	Agencies Responding	
	Number	Percent
Cash	53	98.1%
Token	27	50.0%
Magnetic Stripe (swipe)	19	35.2%
Credit Cards	9	16.7%
Debit Cards	5	9.3%
Magnetic Stripe (stored value)	8	14.8%
Smart Cards	3	5.6%
Other Types	25	46.3%
TOTAL	54	100.0%

Note: Question permitted multiple responses

TABLE A-4 Present fare collection system: payment options

Payment Options	Agencies Responding	
	Number	Percent
Weekly Pass	14	26.4%
Monthly Pass	47	88.7%
Discounted Multi-Rides	23	43.4%
Stored Value	9	17.0%
Other Options	20	37.7%
TOTAL	53	100.0%

Note: Question permitted multiple responses

electronic registering fareboxes are a part of their existing fare collection equipment. Magnetic card swipe readers are the next most widely used in terms of fare collection with 32.7 percent of the respondents indicating that these are part of their existing equipment. Nonregistering fareboxes are used by only 28.8 percent of the agencies. In terms of fare issuing equipment, ticket vending machines (TVMs) appear to be the most widely utilized. Of the 52 agencies responding to this item, 34.6 percent indicate that TVMs are part of their existing equipment. A relatively small percentage of the responding agencies indicate that read-write equipment (both smart card and magnetic media) is used. The category of other equipment includes turnstiles, ticket validators, and token vending machines.

PLANS FOR NEW FARE COLLECTION SYSTEM

Each of the agencies surveyed was asked to indicate the media technologies and equipment that it is likely to use within the next 3 years. The emphasis of these questions was on emerging technologies such as stored value, smart cards, and proximity cards (contactless smart cards).

Fare Media Technologies

The media technologies that the respondents indicated they are likely to use within the next 3 years are summarized

TABLE A-5 Percentage of fares paid with prepaid media

Type of System	Percentage Prepaid Fares
Bus Only	40.0
Light Rail/Streetcar	49.6
Commuter Rail	53.3
Rapid Rail	57.5
Average	46.0

TABLE A-6 Present fare collection system: equipment

Equipment	Agencies Responding	
	Number	Percent
Non-Registering Fareboxes	15	28.8%
Ticket Vending Machines	18	34.6%
Electronic Registering Fareboxes	43	82.7%
ATM Machines	2	3.8%
Magnetic Card Swipe Readers	17	32.7%
Smart Card Reader/Writer	3	5.8%
Magnetic Card Reader/Writer	9	17.3%
Other Equipment	9	17.3%
TOTAL	52	100.0%

Note: Question permitted multiple responses

in Table A-7. Forty-one agencies provided responses as to planned media technologies. The magnetic-stripe stored-value card was the most often cited technology with 70.7 percent. Contactless and contact smart card technologies are expected to be implemented by 34.1 percent and 29.3 percent of the respondents, respectively. More than 24 percent of the respondents are planning to use either credit or debit card technologies.

Fare Collection and Issuing Equipment

The fare collection and issuing equipment that the respondents indicated they plan to use within the next 3 years are summarized in Table A-8. Of the collection and issuing equipment that the respondents plan to implement, electronic registering fareboxes and TVMs represent the two largest categories with 66 and 54 percent, respectively. Just below these are magnetic and smart card read-write equipment. Forty-six percent of the respondents plan to use magnetic card reader-writers, while 44 percent plan to use smart card reader-writers. Other equipment planned for use includes ATM machines, multiuse debit cards, discount phone cards, and credit/debit TVMs.

TABLE A-7 Plans for media technologies

Media Technologies	Agencies Responding	
	Number	Percent
Magnetic Stripe (stored value)	29	70.7%
Contact Smart Cards	12	29.3%
Contactless Smart Cards	14	34.1%
Credit Cards	10	24.4%
Debit Cards	10	24.4%
TOTAL	41	100.0%

Note: Question permitted multiple responses

TABLE A-8 Plans for collection/issuing equipment

Equipment	Agencies Responding	
	Number	Percent
Electronic Registering Fareboxes	33	66.0%
Ticket Vending Machines	27	54.0%
Magnetic Card Swipe Readers	18	36.0%
ATM Machines	8	16.0%
Magnetic Card Reader/Writer	23	46.0%
Smart Card Reader/Writer	22	44.0%
Other Equipment	8	16.0%
TOTAL	50	100.0%

Note: Question permitted multiple responses

FARE SYSTEM COSTS

The survey respondents were asked to provide the costs in actual or estimated dollars for the following: producing and distributing fare media, fare collection and processing, and revenue lost through theft, fraud, counterfeiting, etc. In addition to providing the costs in dollars, respondents also provided the percentage of total fare revenue that each of these costs represented. The three categories of costs as a percentage of total fare revenue are presented by type of system in Table A-9. Each cost category is discussed separately below.

- *Production and Distribution*—As a percentage of total fare revenue, the cost of producing and distributing fare media represents approximately 2.5 percent for all of the survey respondents. Rapid rail systems have the highest relative costs. Fare media production and distribution costs for rapid rail systems are 7.4 percent of total fare revenue. Commuter rail systems are the next highest with 2.7 percent. Bus-only and light rail systems are approximately the same, with production and distribution costs that are slightly more than 1 percent of total fare revenue.
- *Collection and Processing*—Of the three categories of fare system costs, the costs of fare collection and processing represent the largest portion with an average of all systems of 4.2 percent of fare revenue. Collection and processing costs are about equal for rapid rail and commuter rail systems at approximately 9 percent. Light rail system collection and processing costs are 3.4 percent of total fare revenue. Bus-only systems have the lowest collection and processing costs. Bus fare collection and processing costs are 1.9 percent of total fare revenue.

TABLE A-9 Comparison of fare system costs

Type of System	Cost as a Percent of Total Fare Revenue		
	Producing and Distributing	Collection and Processing	Theft, Fraud & Counterfeiting
Bus Only	1.1%	1.9%	0.3%
Light Rail/Streetcar	1.2%	3.4%	0.9%
Commuter Rail	2.7%	9.2%	1.3%
Rapid Rail	7.4%	9.1%	1.7%
AVERAGE	2.5%	4.2%	0.8%

- *Theft, Fraud, and Counterfeiting*—All of the responding systems estimate the level of revenue lost to theft, fraud, counterfeiting, etc., to be very low—less than 1 percent. Rapid rail systems report the highest level of lost revenue (1.7 percent) followed by commuter rail systems (1.3 percent). Light rail systems report that just under 1 percent of revenue is lost through theft, fraud, counterfeiting, etc. Bus systems report the lowest level of lost revenue at 0.3 percent.

RATING OF GOALS FOR IMPROVING FARE SYSTEM

Each of the survey respondents was asked to rate 14 goals related to improving its fare system. Each goal was rated on a scale of 1 to 5 of overall importance—1 being not important and 5 being very important. The results of the ratings were compiled by goal by type of system to arrive at a mean rating. The mean ratings for each goal are presented in Table A-10, and the overall ratings are shown in Figure A-1. The table includes the average rating for all respondents as well as the mean rating by type of system for each goal. Each is discussed separately below.

All Systems

Overall, the highest rating of 4.6 was given to the goal of improving the convenience for riders. Immediately below rider convenience was improving the ability to collect needed data with a rating of 4.3. The following are the five highest rated goals for all systems:

- Improve the convenience of riders,
- Improve the ability to collect needed data (e.g., origin and destination data),
- Improve the ease of administration of fare collection by bus operators and other personnel,
- Improve fare system security and accountability (e.g., reduce fare abuse, fraud, and theft), and
- Improve card reader-writer reliability.

The remaining goals were rated within a range of 3.5 to 3.8, indicating that these goals also are relatively important. The only two exceptions were the goals for integrating payment with other transportation providers and integrating payment with nontransportation uses, which rated 2.7 and 2.5, respectively. This would indicate that the responding agencies feel these goals are of less importance.

Bus-Only Systems

Among bus-only systems, the goals for improving rider convenience and improving the ability to collect data were rated equally at 4.5 indicating that the bus systems hold these to be the two most important goals. The following are the five goals rated highest by bus systems:

- Improve the convenience of riders,
- Improve the ability to collect needed data (e.g., origin and destination data),
- Improve the ease of administration of fare collection by bus operators and other personnel,
- Improve the ability to integrate with other on-board technologies (e.g., AVL or APC system), and
- Improve card reader-writer reliability.

With two exceptions, the remaining goals were all rated within a range of 3.2 to 3.8. Integrating payment with other transportation services and integrating payment with nontransportation uses were rated 2.6 and 2.5, respectively.

Light Rail and Streetcar Systems

As with bus-only systems, light rail systems rated the goal of improving rider convenience the highest, giving it a 4.6 rating. The next highest was a 4.5 rating given to improving the ease of administration. The following are the five goals rated highest by light rail systems:

- Improve the convenience of riders,
- Improve the ease of administration of fare collection by bus operators and other personnel,

TABLE A-10 Rating of goals for improving fare systems

	Mean Rating						
Type of System	Improve Card Reader/Writer Reliability	Improve Fare System Security & Accountability	Improve Ability to Collect Needed Data	Maintain Ability to Use Existing Fare System Equipment	Improve Ability to Integrate with Other On-Board Technologies	Improve Ability to Modify Fare Structure and Policies	Reduce Cost of Producing & Distributing Fare Media
Bus Only	3.9	3.8	4.5	3.8	4.0	3.7	3.7
Light Rail/Street	4.0	4.4	3.8	4.0	3.6	3.8	3.4
Commuter Rail	4.3	4.0	4.8	4.7	3.8	4.3	4.0
Rapid Rail	3.8	4.1	3.8	3.5	3.2	3.9	4.1
ALL SYSTEMS	3.9	4.0	4.3	3.8	3.8	3.8	3.8

	Mean Rating						
Type of System	Reduce Cost of Fare Collection & Processing Equipment	Improve Convenience for Riders	Improve Ease of Admin.	Improve Throughput	Create "Seamless" Regional Transit Travel	Integrate Payment with Other Transp. Services	Integrate Payment with Non-Transp. Uses
Bus Only	3.8	4.5	4.4	3.5	3.2	2.6	2.5
Light Rail/Street	3.3	4.6	4.5	3.6	3.5	2.6	2.5
Commuter Rail	4.0	4.5	3.0	3.0	4.3	3.5	2.3
Rapid Rail	4.0	4.6	4.0	3.8	4.1	2.6	2.7
ALL SYSTEMS	3.8	4.6	4.2	3.6	3.5	2.7	2.5

- Improve fare system security and accountability (e.g., reduce fare abuse, fraud, and theft),
- Improve card reader-writer reliability, and
- Maintain ability to use existing fare system equipment.

The goals rated lowest by light rail systems were integrating payment with other transportation services (2.6 rating) and integrating payment with nontransportation uses (2.5 rating). The remaining goals for improving fare systems were rated within a range from 3.3 to 3.8, indicating that these are relatively important to light rail systems.

Commuter Rail Systems

The goals most important to commuter rail systems are improving the ability to collect needed data (4.8 rating) and maintaining the ability to use existing fare system equipment (4.7 rating). The following are the six most important goals for commuter rail systems responding to the survey:

- Improve ability to collect needed data (e.g., origin and destination data),
- Maintain ability to use existing fare system equipment,
- Improve the convenience of riders,
- Improve ability to modify fare structure and policies,
- Improve card reader-writer reliability, and
- Create "seamless" transit travel in the region.

The last three in the list above were rated by commuter rail systems as having equal importance. Each was given a 4.3 rating. With only one exception, the remaining goals were considered to be relatively important, with ratings ranging from 3.0 to 4.0. The lowest rating of 2.3 was given to the goal for integrating payment with nontransportation uses.

Rapid Rail Systems

The most important goal for rapid rail systems is that of improving the convenience for riders, which received a rating of 4.6. Three goals shared the next highest rating of 4.1—reducing the cost of producing and distributing fare media, improving fare system security and accountability, and creating "seamless" regional transit travel. The following six goals were considered most important by rapid rail systems:

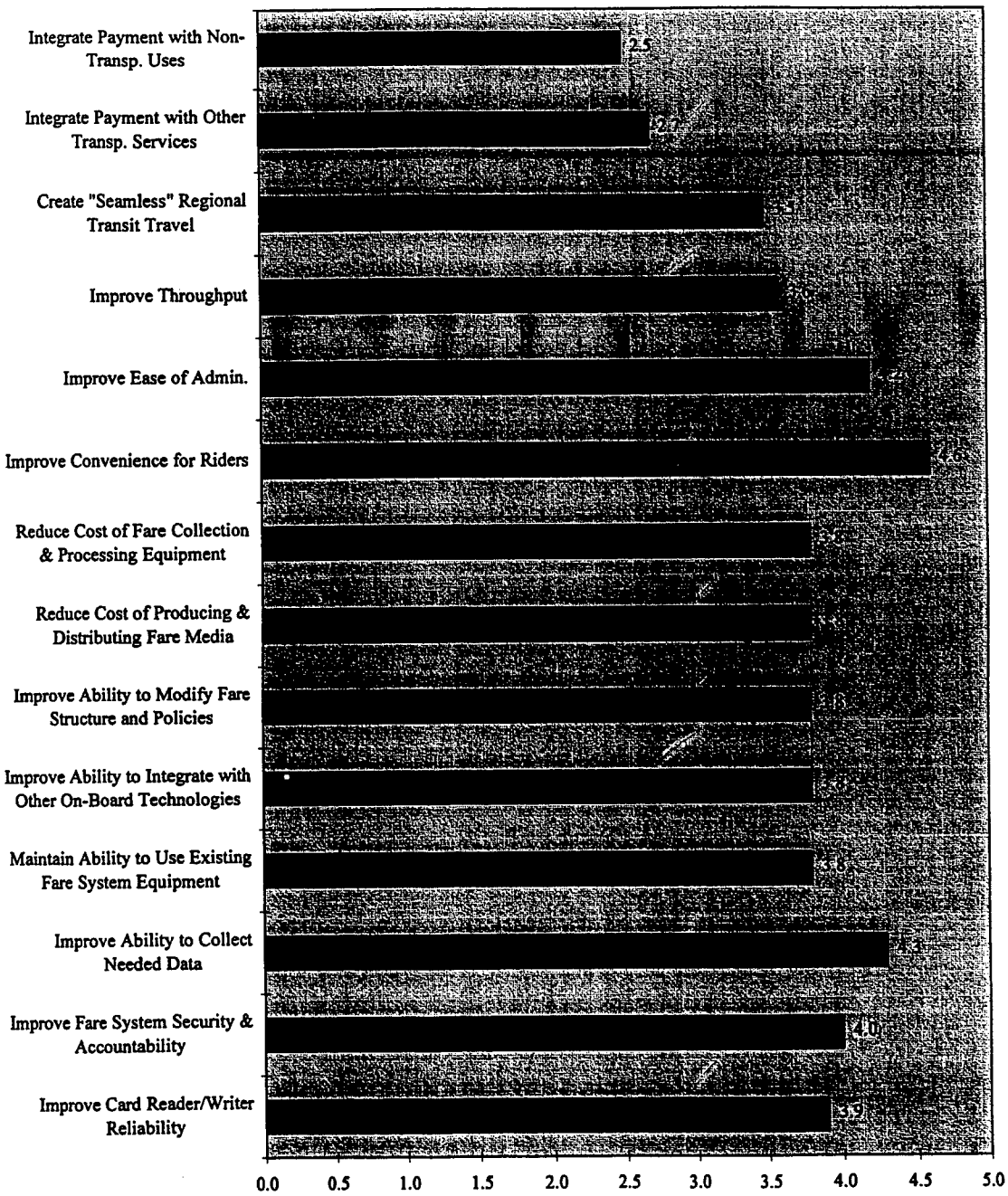

Figure A-1. Rating of goals.

- Improve the convenience of riders,
- Reduce the cost of producing and distributing fare media,
- Improve fare system security and accountability (e.g., reduce fare abuse, fraud, and theft),
- Create "seamless" transit travel in the region,
- Maintain ability to use existing fare system equipment,
- Reduce cost of fare collection and processing equipment, and
- Improve ease of administration of fare collection by bus operators and other personnel.

The last two goals in the list above were given equal importance by rapid rail systems. Each received a rating of 4.0. The goals rated lowest by rapid rail systems were integrating payment with other transportation services (2.6 rating) and integrating payment with nontransportation uses (2.7 rating). The remaining goals received ratings within a range of 3.2 to 3.9.

RATING OF ISSUES AND CONCERNS RELATED TO POTENTIAL MULTIPLE-USE ARRANGEMENTS

Respondents were asked to rate issues related to "multiple use" arrangements according to the same scale used for the goals for improving fare systems. Multiple use was defined as the use of media (e.g., a smart card) for the services of more than one entity (e.g., transit system, retail outlet, and bank). Six issues were rated. The ratings for each of these issues by type of system are presented in Table A-11 and shown in Figure A-2.

All Systems

Institutional issues were rated as the most important for all systems. Institutional issues received a rating of 4.2. The next most important issues were cost issues and card technology issues, each receiving a 3.8 rating. The following list presents each of the issues in the order of importance from most important to least important.

- Institutional issues (e.g., maintaining control over the fare system, including the ability to modify fare structures),
- Cost of providing electronic fare media and/or of participating in a multiple transit use or joint banking and transit program (e.g., need to buy new equipment or high unit cost of smart cards),
- Card technology issues (e.g., need to accept technology selected by other agencies),
- Privacy issues for riders (e.g., addressing rider concerns with use of electronic fare media),
- Clearinghouse and settlement issues (e.g., related to apportioning revenues among participating agencies), and
- Legal and regulatory issues (e.g., constraints on agency's ability to enter into agreements with other entities).

The privacy and clearinghouse issues were rated equally important, with a 3.6 rating.

Bus-Only Systems

Bus systems rated institutional issues as the most important (4.0 rating). Cost issues and card technology issues were next in order of importance, each with a rating of 3.7. The following list presents the issues in order of overall importance.

- Institutional issues (e.g., maintaining control over the fare system, including the ability to modify fare structures),
- Cost of providing electronic fare media and/or of participating in a multiple transit use or joint banking and transit program (e.g., need to buy new equipment or high unit cost of smart cards),
- Card technology issues (e.g., need to accept technology selected by other agencies),
- Privacy issues for riders (e.g., addressing rider concerns with use of electronic fare media),
- Clearinghouse and settlement issues (e.g., related to apportioning revenues among participating agencies), and
- Legal and regulatory issues (e.g., constraints on an agency's ability to enter into agreements with other entities).

Light Rail and Streetcar Systems

Light rail systems rated institutional issues and clearinghouse settlement issues as the most important (4.3 rating). Cost issues and privacy issues were rated equally important by light rail systems. Each was given a 3.8 rating. The following list presents the issues in order of importance to light rail systems.

Table A-11 Rating of issues and concerns related to potential multiple-use arrangements

	Mean Rating					
Type of System	Cost Issues	Card Technology Issues	Institutional Issues	Legal/ Regulatory Issues	Privacy Issues for Riders	Clearinghouse/ Settlement Issues
Bus Only	3.7	3.7	4.0	3.3	3.5	3.4
Light Rail/Street	3.8	3.3	4.3	3.3	3.8	4.3
Commuter Rail	4.5	4.5	4.8	4.5	3.8	4.0
Rapid Rail	3.6	3.8	4.6	2.9	3.6	3.8
ALL SYSTEMS	3.8	3.8	4.2	3.3	3.6	3.6

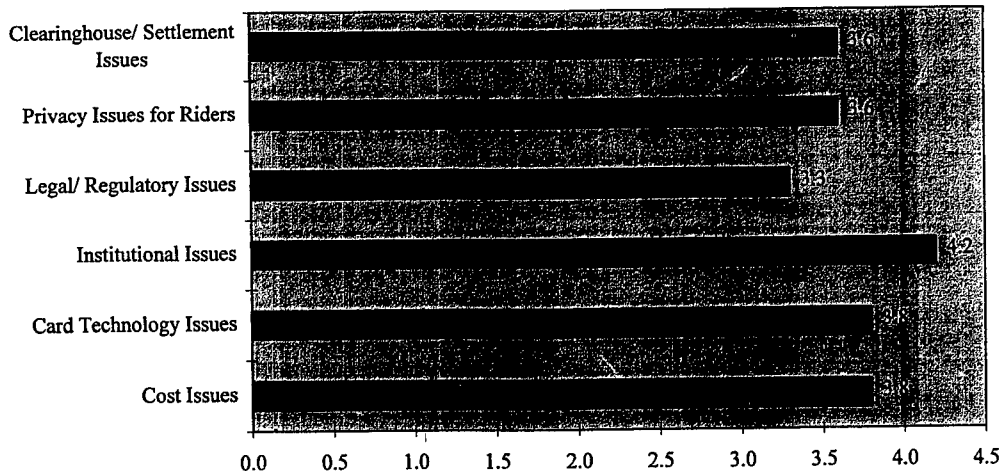

Figure A-2. Rating of multiple-use issues.

- Institutional issues (e.g., maintaining control over the fare system, including the ability to modify fare structures),
- Clearinghouse and settlement issues (e.g., related to apportioning revenues among participating agencies),
- Cost of providing electronic fare media and/or of participating in a multiple transit use or joint banking and transit program (e.g., need to buy new equipment or high unit cost of smart cards),
- Privacy issues for riders (e.g., addressing rider concerns with use of electronic fare media),
- Card technology issues (e.g., need to accept technology selected by other agencies), and
- Legal and regulatory issues (e.g., constraints on an agency's ability to enter into agreements with other entities).

Card technology issues and legal and regulatory issues were rated equally at 3.3.

Commuter Rail Systems

Institutional issues also were rated most important by commuter rail systems. Institutional issues received a rating of 4.8. Cost issues, card technology issues, and legal and regulatory issues were rated equally important. Each was given a rating of 4.5. The following list presents the various issues in order of importance to commuter rail systems.

- Institutional issues (e.g., maintaining control over the fare system, including the ability to modify fare structures),
- Cost of providing electronic fare media and/or of participating in a multiple transit use or joint banking and transit program (e.g., need to buy new equipment or high unit cost of smart cards),
- Card technology issues (e.g., need to accept technology selected by other agencies),
- Legal and regulatory issues (e.g., constraints on an agency's ability to enter into agreements with other entities),
- Clearinghouse and settlement issues (e.g., related to apportioning revenues among participating agencies), and
- Privacy issues for riders (e.g., addressing rider concerns with use of electronic fare media).

Rapid Rail Systems

Institutional issues received a rating of 4.6 from rapid rail systems and were therefore considered the most important of the issues. Rated equally at 3.8 were card technology issues and clearinghouse/settlement issues. The following list presents the issues in their order of importance to rapid rail systems.

- Institutional issues (e.g., maintaining control over the fare system, including the ability to modify fare structures),
- Card technology issues (e.g., need to accept technology selected by other agencies),
- Clearinghouse and settlement issues (e.g., related to apportioning revenues among participating agencies),
- Cost of providing electronic fare media and/or of participating in a multiple transit use or joint banking and transit program (e.g., need to buy new equipment or high unit cost of smart cards),
- Privacy issues for riders (e.g., addressing rider concerns with use of electronic fare media), and
- Legal and regulatory issues (e.g., constraints on an agency's ability to enter into agreements with other entities).

Cost issues and privacy issues for riders were rated as equally important, at 3.6.

SUMMARY

A survey of North American transit agencies was undertaken as part of Project A-14 to identify fare collection practices and costs, plans for use of emerging fare technologies, goals related to improving the fare collection system, and issues related to multiple use arrangements. The key findings are as follows:

- *Prepayment is very widespread.* Almost 90 percent of the responding agencies offer monthly passes, and 26 percent have weekly passes as well. Over 43 percent offer discounted multiple-ride options. The average percentage of fares paid with one of these prepaid media is 46 percent; for the largest agencies (those with rapid rail), the average is 58 percent.
- *The use of electronic fare payment methods has spread slowly to date, but is expected to increase over the next few years.* The survey revealed that relatively few transit agencies in North America currently have electronic fare payment systems: 15 percent use magnetic stored-value media and 6 percent use smart cards; 17 percent use credit cards, but all but one of these are for purchase of fare media. In contrast, 50 percent of the respondents use tokens. However, many agencies feel that they "are likely to use" electronic media within the next 3 years: 26 percent indicated likely use of contactless smart cards, 22 percent contact cards, and 54 percent magnetic stored-value cards. A number of agencies reported more than one of these, particularly magnetic and one of the two types of smart card.
- *Agencies consider a wide range of fare collection goals to be quite important, although multiple use is not considered very important.* The highest rated goals are "improve convenience for riders" (4.6 of a possible 5 in terms of relative importance), "improve ability to collect needed data" (4.3), "improve ease of administration" (4.2), and "improve fare system security and accountability" (4.0). The lowest rated goals are "integrate payment with nontransportation uses" (2.5) and "integrate payment with other transportation services" (2.7). All of the other goals presented were rated as being relatively important (3.5 to 3.9).
- *Regarding possible multiple use arrangements, all of the issues and concerns presented were considered relatively important.* Agencies rated "institutional issues" the most important issue; it received an average of 4.2 out of a possible 5 in terms of relative importance. "Legal and regulatory issues" was the lowest rated item, but it received an average of "3.3." The other issues were rated about the same (3.6 to 3.8).

Thus, based on the survey results, many transit agencies (over half of the respondents) are considering new fare technologies for the relatively near future; the options under consideration include smart cards and the use of stored-value in general. These plans are consistent with the importance placed on fare system goals such as customer convenience, ease of administration, data collection capabilities, and security and accountability. However, while "create seamless regional travel" is considered relatively important, most agencies do not view multiple use as a major goal at the present time.

A copy of the survey follows.

Memorandum

DATE: March 26, 1996

TO: Selected Transit Agencies

FROM: Daniel Fleishman, Principal Investigator

RE: Fare Collection Survey (for TCRP Project A-14, *Potential of Multipurpose Fare Media*)

Background

The Transit Cooperative Research Program (TCRP) is administered by the Transportation Research Board, a division of the National Academy of Sciences. TCRP sponsors research in a broad range of areas related to public transportation. One of these studies was the recently completed Project A-1, *Fare Policies, Structures and Technologies.* This study, led by Multisystems, Inc., involved a comprehensive assessment of current practices and emerging developments related to the establishment of transit pricing parameters and the selection and application of fare collection technologies. Another example is the current Synthesis Project SA-8, a synthesis of *Bus Transit Fare Collection Policies and Practices,* being carried out by Booz-Allen & Hamilton.

Multisystems, assisted by Dove Associates and Mundle & Associates, is now undertaking a study on the potential of multiple use media and the emerging convergence of banking industry and transit fare payment technologies. TCRP Project A-14, *Potential of Multipurpose Fare Media,* will identify issues/concerns on the part of transit agencies and financial institutions, assess customer and financial implications associated with various approaches, monitor emerging developments, and assess the potential of increasing the role of the banking industry in transit fare payment and collection. This research is intended to provide both transit and financial services professionals 1) an understanding of the nature of the costs and potential benefits of such arrangements, as well as the issues that must be addressed in forging new alliances; and 2) specific guidelines to best allow each to pursue common interests in the payments arena. These guidelines will detail the major issues and explain the steps that need to be taken in developing and implementing effective and efficient multiple use payment arrangements.

The Transit Agency Survey

As part of this effort, the research team is conducting a survey of selected North American transit agencies, to find out about current fare collection practices and costs, plans for use of emerging technologies, and agency goals for improving fare collection systems. Finally, we are also interested in agency concerns regarding possible "multiple use" payment arrangements. Agency input is important as we seek to identify the most important fare collection issues for different sizes and types of transit systems, and to assess possible approaches for improving the efficiency and effectiveness of transit fare collection.

We would like your help in this effort. Please complete the attached brief questionnaire and mail or fax it to us at the following address. We would like to receive your response within two weeks of your receipt of this package, if at all possible. Feel free to call us if you have questions about the survey or the study in general. Thank you for your assistance!

(Please note that this effort is separate from TCRP Synthesis Project SA-8, for which you may have received a fare survey recently. We urge you to complete both questionnaires. The two studies are addressing different aspects of fare collection.)

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cschweiger@multisystems.com

TRANSIT SYSTEM FARE COLLECTION SURVEY

This survey is being conducted as part of TCRP Project A-14 (Potential of Multipurpose Fare Media).
Please complete the following questionnaire , and mail or fax it to :

Daniel Fleishman
Multisystems, Inc.
10 Fawcett St.
Cambridge, MA 02138
Fax: 617/864-3521; Telephone: 617/864-5810

Thank you for your cooperation!

SURVEY RESPONDENT INFORMATION:

Contact Person:
Telephone/Fax:
Agency Name and Address:

TRANSIT SYSTEM DESCRIPTION:

A) Modes (please check appropriate boxes):

- ☐ Bus
- ☐ Rapid Rail
- ☐ Light Rail/Streetcar
- ☐ Automated Guideway/People Mover
- ☐ Paratransit/Demand Responsive

B) Please indicate annual ridership for the entire system:

PRESENT FARE COLLECTION SYSTEM -- MEDIA AND PAYMENT OPTIONS:

C) Please check the appropriate types of fare media you now accept:

- ☐ Cash
- ☐ Tokens
- ☐ Magnetic stripe swipe cards
- ☐ Credit cards
- ☐ Debit cards
- ☐ Magnetic stripe stored value cards
- ☐ Smart cards
- ☐ Other type(s) of other fare media:

D) Please check the available payment options:

- ☐ Weekly pass
- ☐ Monthly pass
- ☐ Discounted multiple rides
- ☐ Stored value
- ☐ Other payment options:

E) Please indicate the percentage of fares paid with prepaid media: %

PRESENT FARE COLLECTION SYSTEM -- EQUIPMENT:

F) Please check all of the following types of fare collection/issuing equipment that apply:

- ☐ Non-registering fareboxes
- ☐ Ticket vending machines
- ☐ Electronic registering fareboxes
- ☐ ATM machines
- ☐ Magnetic card swipe readers
- ☐ Smart card readers/writers
- ☐ Magnetic card readers/writers (ticket processing units/validators)
- ☐ Other fare collection/issuing equipment that applies:

PLANS FOR NEW FARE COLLECTION SYSTEM:

G) Please check the fare media technologies that you are likely to use within the next 3 years:

- ☐ Magnetic stripe stored-value cards
- ☐ Contact smart cards
- ☐ Contactless smart cards
- ☐ Credit cards
- ☐ Other media
- ☐ Debit cards

H) Please check the fare collection/issuing equipment that you are likely to use within the next 3 years:

- ☐ Electronic registering fareboxes
- ☐ Ticket vending machines
- ☐ Magnetic swipe readers
- ☐ ATM machines
- ☐ Magnetic card readers/writers
- ☐ Smart card readers/writers
- ☐ Other fare collection/issuing equipment you are considering:

FARE SYSTEM COSTS:

I) Please indicate the cost of producing and distributing fare media:

Actual or estimated dollars: Percent of total fare revenue: %

J) Please indicate the cost of fare collection/processing:

Actual or estimated dollars: Percent of total fare revenue: %

K) Please indicate the amount of revenue lost through theft, fraud, counterfeting, etc.:

Estimated dollars: Percent of total fare revenue: %

RATING OF GOALS FOR IMPROVING FARE SYSTEM:

L) Please indicate the importance of the following issues by circling the appropriate number:

<---------- IMPORTANCE ----------->

Not important — Very important

1. Improve card reader/writer reliability and reduce maintenance requirements.
   1 2 3 4 5
2. Improve fare system security and accountability (e.g., reduce fare abuse, fraud, theft)
   1 2 3 4 5
3. Improve ability to collect needed data (e.g., origin/destination data)
   1 2 3 4 5
4. Maintain ability to use existing fare system equipment
   1 2 3 4 5
5. Improve ability to integrate with other on-board technologies (e.g., AVL or APC system)
   1 2 3 4 5
6. Improve ability to modify fare structure and policies
   1 2 3 4 5
7. Reduce the cost of producing and distributing fare media
   1 2 3 4 5
8. Reduce the cost of fare collection/processing equipment
   1 2 3 4 5
9. Improve the convenience of riders
   1 2 3 4 5
10. Improve the ease of administration of fare collection by bus operators and other personnel
    1 2 3 4 5
11. Improve throughput
    1 2 3 4 5
12. Create "seamless" transit travel in the region (if there are multiple operators)
    1 2 3 4 5

13. Integrate transit payment with payments for other transportation services (e.g., parking, tolls)
    1 2 3 4 5
14. Integrate transit fare payment with payment media for non-transportation uses (e.g., small purchases, telephone calls)
    1 2 3 4 5
15. Other:
    1 2 3 4 5

RATING OF ISSUES/CONCERNS RELATED TO POTENTIAL "MULTIPLE USE" ARRANGEMENTS:

(i.e., a single card that can be used for 1) yours and other neighboring transit systems, and/or 2) transit as well as retail, banking or other non-transit transactions)

M) Please indicate the importance of the following issues by circling the appropriate number:

<---------- IMPORTANCE ----------->

Not important — Very important

1. Cost of providing electronic fare media and/or of participating in a multiple transit use or joint banking/transit program (e.g., need to buy new equipment or high unit cost of smart cards)
   1 2 3 4 5
2. Card technology issues (e.g., need to accept technology selected by other agencies)
   1 2 3 4 5
3. Institutional issues (e.g., maintaining control over the fare system, including the ability to modify fare structures)
   1 2 3 4 5
4. Legal/regulatory issues (e.g., constraints on agency's ability to enter into agreements with other entities)
   1 2 3 4 5
5. Privacy issues for riders (e.g., addressing rider concerns with use of electronic fare media)
   1 2 3 4 5
6. Clearinghouse/settlement issues (e.g., related to apportioning revenues among participating agencies)
   1 2 3 4 5
7. Other:
   1 2 3 4 5

APPENDIX B

EXAMPLES OF MULTIPURPOSE PROGRAMS

TRANSIT-ORIENTED PROJECTS

MARTA/VisaCash Project
Central Puget Sound Regional Fare Integration Project
Greater Cleveland Regional Transportation Authority Multiple Use Project
New York MTA MetroCard/Multiple Use Project
Guelph Mondex Project

ELECTRONIC PURSE PROGRAMS

Mondex Program
Banksys-Proton Program
Danmont Program
Swiss PTT – Postcard Program

MARTA/VISACASH PROJECT

Project Background/Overview

VisaCash is the company's stored value/electronic purse product. VisaCash was introduced in Atlanta in conjunction with the 1996 Olympic Games, making it the first stored value smart card open system program to be launched in the United States. Visa announced in March 1995 that it had formed an alliance with three major Atlanta banks to develop a stored value card program: First Union, Wachovia, and NationsBank. These three banks operate more than 400 branches in the metropolitan Atlanta market and represent approximately 55 percent to 60 percent of the consumer transaction account market share there. The other major bank in Georgia, SunTrust, was subsequently invited to participate, but declined.

The three banks enrolled a range of retail and other establishments to accept the card. A key element of the rollout was the installation of card accepting devices in the rail stations of the Metropolitan Atlanta Rapid Transit Authority. For MARTA, the pilot project was intended to test the institutional and operational feasibility of an "open" multiple use arrangement, in which the agency does not produce the media, but rather participates as a "merchant." As of mid-1997, MARTA had decided to continue its participation through an agreement with one of the banks, First Union. At that point, the other two banks were no longer officially participating in the VisaCash pilot. First Union planned to enlist additional merchants, with a focus on "chip zones"; these will be high concentrations of merchants close to MARTA stations. The overall pilot, with a focus on the transit application, is reviewed below.

Project Development and Implementation

Due to the limited time available to implement the program, Visa licensed the Danmont electronic purse system that has been operational in Denmark since 1993. Danmont was only supporting a disposable card, but the Georgia banks wanted a reloadable card that could also access customer's transaction accounts. Visa claims that while it has continued to utilize the Danmont system as the foundation for the VisaCash product, it has made significant changes in support of the reloadable card. Visa had been piloting the system in its employee cafeteria at its corporate headquarters since May 1995.

Operating Structure and Card Distribution

During the pilot, Visa served as the network operator, performing transaction clearing and settlement for all the financial institutions. The banks were responsible for card management functions, and merchant solicitation and servicing, as well as transaction processing and settlement. Since merchants transmit individual transactions as part of the settlement process, the VisaCash system is regarded as "off-line, accountable" under the Regulation E definitions originally proposed by the Federal Reserve Bank.

Due to the short implementation period, Visa and the three Georgia banks worked to develop a showcase program. First Union was the most aggressive of the banks in terms of merchant solicitation and card issuance and initially projected that it would sign 5,000 merchant locations before the Summer Games. First Union planned ultimately to issue one million disposable and 300,000 reloadable cards. First Union has sold cards at all 93 of its metro Atlanta branches; cards are available in $10, $20, $50 and $100 increments. First Union has also deployed a number of card vending machines (CVMs) in high traffic areas.

Wachovia Bank began selling its cards at all its metro Atlanta branches in mid-May 1996 and subsequently began to sell cards from a designated branch in other Georgia cities. NationsBank began selling cards in May at branches, and through CVMs in MARTA stations. As at First Union, cards

were available in $10, $20, and $50 denominations from both Wachovia and NationsBank. NationsBank attempted to appeal to the card collector market with 18 different cards. NationsBank was the only bank allowing telephone orders with payment by check, money order, or Visa credit card.

Merchant Solicitation

The banks targeted the standard cash-intensive merchants (i.e., fast food, gasoline, and telephone) to accept the card. First Union signed an early agreement with the two local payphone providers, BellSouth and LCI, to retrofit approximately 1,000 payphones around the Olympic venues. Excluding these phones, it is estimated there were fewer than 500 merchant locations accepting the card as of the start of the Olympics. First Union's initial merchant group is shown in the following table.

Food	*Gasoline*	*Other*
Burger King	Texaco	United Artists
Domino's Pizza	Crown	BellSouth
Dairy Queen	E-Z Serve	LCI Payphones
Dunkin Doughnuts	Amoco	MARTA
Baskin-Robbins		General Cinemas
Legal Bagel		
Blimpie		
Chick-Fil-A		
Pollo Tropical		
Jaffa Gate		
Daka Restaurant		
Hardee's		

Merchant Pricing

Visa established an interchange fee of 1.2 percent of the purchase amount, plus $.02 per transaction. On an average transaction amount of $2.50, the interchange fee would total $.05. The interchange fee is the amount that the acquiring bank must pay to Visa for handling the transaction. The final fee to the merchant is individually negotiated, but is estimated to be approximately 2.5 percent of the purchase amount—a rate that is only slightly below the average discount rate charged for credit card transactions. A number of merchants complained that the pricing was too high, but many temporarily accepted the pricing structure in order to be part of the Olympic event. Merchants felt that they would also benefit from Visa and bank advertising of the locations accepting the card.

MARTA Application

MARTA retrofitted turnstiles at each of its 36 rail stations to accept the card, but the bus fleet was not modified to accept the card. Two turnstiles at each station entrance, a total of 132 turnstiles, were modified to accept the VisaCash card; each bank was assigned one-third of the stations. Card terminals were manufactured by Hot Payment Systems of Denmark. Cost to retrofit the turnstiles was absorbed by Visa, with transit officials estimating hardware and software costs at $1 million. Initially, NationsBank installed approximately 30 card vending machines in the high volume rail stations; these have been replaced by vending machines from First Union (a total of 36 in 21 stations, as of mid-1997). CVMs accept currency or Visa cards and dispense $10, $20, and $50 cards. MARTA's costs for accepting the card include the discount (transaction) fee to the bank for each smart card transaction (a negotiated figure), a bank account fee (a flat monthly account maintenance fee), a transfer fee (approximately $.12 per transfer of funds from First Union to MARTA's own bank), and telecommunications and equipment maintenance costs. In negotiating a discount fee rate with the bank, MARTA sought to keep its overall cost per transaction lower than what it has calculated to be the current cost for processing cash and tokens.

Intense operational testing of the complete system was performed in May 1996, and the system was opened for use that month. There was an initial problem with the card accepting devices, as people tried to insert coins or other MARTA fare media into the slots. The slots were subsequently modified to combat that problem, and the signage identifying the use of the VisaCash card was increased. The usage and results to date of the pilot project are discussed below.

Project Results

A total of 4,200 terminals had been installed by August at participating merchant locations (including MARTA). It is estimated that, during the Olympics, VisaCash was used for more than 200,000 transactions, accounting for over $1 million; this translates into an average of 11,000 transactions per day, with an average value of approximately $5.50 per transaction. However, this represents only 2.6 transactions per terminal per day. A key reason for this low usage rate was apparently the dispersed nature of the accepting merchants; these locations were spread across the city.

Regarding user awareness and acceptance of VisaCash, surveys undertaken during the Olympics indicated that approximately 70 percent of Atlanta residents were aware of the card, and about 21 percent reported that they would probably or definitely buy or use the card. Among those who did use the card, 84 percent were "satisfied" or "very satisfied" with the product. The chief benefits of using VisaCash were seen as "avoiding the need to carry cash" (28 percent) and "avoiding the need to count out change" (24 percent).

Transit would seem to be an attractive use of a stored value card, as MARTA usage accounted for roughly 25 percent of the total usage during the Olympics. As expected, MARTA usage peaked during the Olympics, then dropped considerably. The peak usage was nearly 18,000 uses per week, during the first week of August 1996. Immediately after the Olympics and during the subsequent Paralympic Games, the weekly usage volume dropped to about 6,000. By Septem-

ber, usage decreased to a consistent 2,000 transactions per week level, although in the first several months of 1997, usage slowly declined to about 800 per week.

MARTA officials believe that the pilot program has provided themselves, Visa, and the participating banks with a valuable learning experience. MARTA has identified the following as significant lessons/findings from the pilot program:

- A successful card transaction takes approximately 1.75 seconds from the time the card is inserted until it is released to the cardholder. While this is slower than contactless technology, it does represent a time savings to the rider who would normally first have to go to a token vending machine to obtain a token and then go through the faregate.
- Since the VisaCash card does not support any discount fare payment programs (weekly/monthly passes), it is used primarily by the occasional MARTA rider. To enhance the likelihood of the card being carried by the occasional MARTA patron, the card must be accepted by various merchants frequented by the patron to increase the ability to be used as a substitute for coin and currency.
- Balance readers should be available in the stations so that cardholders can check their balance before entering the faregate area. Some of the card issuers did offer, at an additional cost, a hand-held balance reader that also served as a key fob.
- The smallest denominated card that could be purchased from the card dispensers in the MARTA stations was $20. In order to make the card a more attractive alternative to low-income or infrequent riders, MARTA officials would like to see the minimum amount decreased to either $5 or $10, but understand that the cost of the card stock is an issue in this decision.
- MARTA believes that more liberal timeframes should be provided for the expiration date of the card. Short periods of card validity discourage potential riders from purchasing the cards as they fear they may not be able to completely utilize all the value on the card before it expires.
- The banks should support both reloadable and disposable stored value cards. The disposable cards would be targeted to the tourist, occasional, and low-income patrons; while the reloadable card would be intended for the patron who has a local banking relationship.
- The chief complaint from cardholders has been the lack of merchants accepting the card. While there were 4,200 terminals that accepted the VisaCash card at its high point, the merchants were distributed all around the metro Atlanta area. MARTA would like to see its stations used as points of concentration, with the banks soliciting merchants in the immediate area of the rail stations—as well as at sports arenas.
- The operating system for the card dispensers should contain some type of fraud management system (e.g., velocity files and usage parameters) to readily detect stolen credit cards being used to purchase VisaCash cards for later conversion to cash.

The participants also learned a great deal with regard to the design and operation of the card acceptance device at the faregate including the following:

- The card acceptance device must be designed so that the card acceptance slot will not accept foreign objects (e.g., coins and tokens). As noted earlier, the MARTA card acceptance devices had to be modified early in the program due to the frequency of the malfunctions being created by this type of event. Should a foreign object be inserted, it should fall through the card acceptance device to a reject bin.
- The card slot should be located in a distinctively different location from the slots for tokens, coins, and magnetic stripe paper tickets. The identification of each slot area should be clearly labeled to minimize the incidence of customers using the wrong slot.
- The operating system should support the identification of each card acceptance device as a separate terminal to aid in the identification of the specific card acceptance device for accounting and maintenance purposes.

Current Status

One of the key outcomes of the pilot project was the demonstration of the feasibility of a transit agency entering into a multiple use arrangement with financial institutions. Although the pilot project was limited in scope—i.e., not all turnstiles were outfitted, and no buses were included—and Visa and the banks subsidized the capital costs, the successful implementation of the project has provided a useful test of the institutional feasibility of the concept. MARTA feels that the trial has been successful enough to pursue a continuation of the basic arrangement.

In early 1997, MARTA issued a Request for Proposals to enter into an agreement with a single bank to continue the program for another year. MARTA selected and has reached agreement with First Union Bank for the project. Under the terms of the agreement, First Union is responsible for the following areas:

- Card Dispenser Terminals—Installation, servicing, and maintenance of the card dispensers. First Union has equipped all the MARTA stations with card dispensers that accept currency, and debit and credit cards for payment. Cards are available in $10, $20, and $50 denominations.
- Card Acceptance Devices—First Union is responsible for the maintenance of the card acceptance devices and is servicing the units under a depot maintenance program.
- Transaction Processing/Settlement—First Union acquires all the transactions from the MARTA card acceptance devices and forwards the transactions through the Visa settlement system.

Visa has termed the post Olympics program as Phase II of the Atlanta VisaCash program. Wachovia has elected not to

participate in the program any longer and with the loss of the MARTA contract, it would appear that NationsBank has taken a very passive position. In parallel with Phase II, MARTA is undertaking a comprehensive fare collection study looking at the most appropriate type of system; this study is considering such issues as open versus closed systems, disposable versus reloadable cards, contact versus contactless cards, the nature of discounts, and financing approaches.

CENTRAL PUGET SOUND REGIONAL FARE INTEGRATION PROJECT

Project Background

The Central Puget Sound Fare Integration Project (CPSFIP) was instituted in April 1994 to create a seamless fare system that would enable transit customers to easily transfer between the region's diverse transit systems as well as between bus, ferry, rail, and vanpool modes. Motivation for this effort comes from continued residential growth and the development of major employment centers outside the traditional CBD, which are dispersing travel patterns throughout the region. Census data from 1990 indicated that more than 200,000 commuters lived and worked in different counties of the Central Puget Sound area (Feasibility Study, Draft Report). Moreover, off-peak, inter-county travel is increasing, which suggests a need for a regional fare medium that accommodates various transit market segments.

Project sponsors also hoped that new fare technologies would help them improve member agencies' fare collection equipment and capabilities via a multiuse or multipurpose fare medium. This goal was bolstered by the Regional Project Evaluation Committee's efforts to repackage several agency proposals, an effort that resulted in Section 9 and CMAQ grants for the region which provided core funding. The $500,000 Section 9 grant was awarded to King County Metro for project management and clearinghouse design.

The CPSFIP's near-term mission was to invest in a fare collection system that would reduce barriers to mobility while recognizing existing service boundaries and fare policies. In the longer term, the CPSFIP hoped to address organizational policies in such a manner that would improve service connections, identify and select a single fare medium and related technology and support services, and establish one regional fare structure based on distance or regional fare zones.

The Fare Integration Project was not the first effort to establish a regional fare system. From 1985 to 1990, the region's transit service providers participated in a "flash" pass program. Unfortunately, pass sales never exceeded 2,400 per month and hit a low of 150 when the program was terminated. Two reasons are cited for termination: the bilateral sales agreements were too complex and program administration costs exceeded the benefits to customers; and, one of the participating agencies, Community Transit, whose service area is north of Seattle, implemented direct service to the Seattle CBD and the University of Washington District (also within the city limits of Seattle), reducing the need for its Snohomish County residents to have a regional pass and the transfer convenience it previously conferred. When the regional pass was eliminated, several tailored pass programs involving the Washington State Ferries (WSF) and several surface transit providers were implemented which continue to this day. As noted below, WSF has taken a parallel path on fare technology development.

Project Development and Planning Process

In April 1994, transportation agencies throughout the Central Puget Sound region created a Regional Fare Coordination project to study the potential for implementation of smart card fare technology among the various interrelated transportation systems in the region. The Regional Fare Integration Planning Team (RFIPT) consisted of representatives of Community Transit (CT), Everett Transit (ET), King County Metro (Metro), Kitsap Transit (KT), Pierce Transit (PT), Washington State Ferry System (WSF), the Regional Transportation Authority (RTA), Puget Sound Regional Council (PSRC), and the Cascade Project (representing Amtrak). As noted above, these efforts were funded in part by a $500,000 Section 9 grant to Metro for project management and clearinghouse development. In addition, PT and ET received an $839,000 CMAQ grant to procure fare collection systems that would be capable of integrating with a regional fare system.

The RFIPT, led by Metro, began work in April 1994 under the direction of the Puget Sound Regional Council's (PSRC) Transit Operators Committee (TOC). The team met 16 times in just over a year. Its work included contracting with two consultants to identify and evaluate fare collection equipment alternatives; conducting eight focus groups with bus drivers and transit customers; holding two fare integration workshops for staff at each of the participating agencies; and, hosting equipment demonstrations given by 10 vendors. The team's charge was to explore the feasibility of planning and developing a regionally coordinated fare system. Working with the PSRC's TOC, a set of 24 regional fare integration goals was developed that guided the team's work. Those goals were divided into project implementation goals and project enhancement goals. The former category was further divided into: regional transportation, customer, and partnership goals; operations and maintenance goals; and financial and administrative goals (*Regional Fare and Technology Integration: Feasibility Study Draft Report*).

RFIPT efforts resulted in a draft Regional Fare and Technology Integration report in July of 1995. Starting with candidate "read/write" technologies—magnetic insertion, magnetic swipe, and smart cards—the team concluded that contactless read/write smart card technology was the pre-

ferred alternative. After the draft report was issued, the RFIPT was directed "to complete the feasibility analysis phase of the project by undertaking an assessment of specific needs, issues, concerns related to current fare program elements, and potential impacts and opportunities associated with the implementation of a new smart card fare collection system" (*Regional Fare and Technology Integration: Feasibility Study Draft Report*, p. 1).

In January 1996, the team issued the *Regional Fare and Technology Coordination for Central Puget Sound: Final Report Phase I Feasibility Study*. It further specified 36 detailed business needs organized into eight categories: customer service; operations needs and issues; fare program administration; special transportation services; interconnection/integration of fare collection and other on-board systems; equipment maintenance; ridership and transfer data; and integration of farebox and fare collection system data.

The final report's primary recommendation was that the different regional fare collection systems should be integrated by adopting a contactless smart card fare medium. Potential benefits cited include "improved convenience for the purchase and use of fare media; increased ridership and usage of the transit system; opportunities for expanding employer programs and retail sales, and reduced administrative effort for transportation agencies, employers, and retail sales outlets; reduced operator workload and increase operator safety and security; and, improved ridership and revenue data collection and management." The final report was accompanied by an extensive technical appendix.

Current Status

In April 1996, the CPSFIP released a Request for Proposals (RFP) for a prototype contactless smart card equipment demonstration. The objectives of the resulting demonstration were to raise public awareness, to obtain feedback from customers, operators, and maintenance personnel, and to test the smart card in high electromagnetic environments in electric trolley and ferry terminal operations. Six proposals were received, and CPSFIP selected integrator AES Prodata to undertake the demonstration project. The demonstration project, implemented in October 1996 and running through March 1997, included revenue service tests (using SONY contactless cards with AES Prodata card accepting devices) on two Metro Custom bus routes and one Pierce County Seattle Express route. The successful bidder (AES Prodata) was also charged with demonstrating and obtaining feedback through meetings and focus groups.

The RFP clearly stated that the demonstration project "will be used to assist public agency staff with identifying general features and functions to be included as part of the regional system implementation, but will not be used as a basis for detailed technical specification development." The equipment and cards reportedly worked well, and no significant problems were reported.

In July 1996, King County released an RFP seeking "proposals from qualified consultants to plan, design, and specify, in collaboration with participating agencies, the services and equipment necessary to implement a coordinated, regional fare collection system incorporating smart card technology." The system design, for which $10.5 million has been budgeted for implementation, was scheduled to be completed in mid- to late-1997. The project was organized into three work phases: business and alternatives analysis; detailed system design and specification; and implementation.

The resulting system design is expected to be implemented by the agencies and introduced to the public as a "closed" system, that is, used only by participating agencies for sale of transit fares and related agency functions such as parking and concessions. System design will allow for future negotiations with private sector partners to establish an "open" system where the fare media, configured to contain an "electronic purse" that can store value as currency or fares, can be used for retail or banking uses as well. The overall goal of the design is to procure a multipurpose fare media system that can recognize various fare structures among the agencies, while maintaining the ability to handle a regional fare structure if one is developed in the future. Additional card configurations suggested in the RFP included fixed period pass, "right to ride" pass with billing back to sponsoring agency, and a stored ride function.

The consultant, the IBI Group, was also retained by the Washington State Ferries to study the impact of smart card technology and produce its own recommendations regarding the potential impact on its particular business activities.

Issues to be Addressed

Beyond the obvious difficulty of coordinating the goals and objectives of numerous transit providers and agencies spread over a highly diverse region as well as a host of technology-related concerns, a number of key issues related to implementation have been and will continue to be confronted. These include the following:

- identification of and agreement on fare technology, especially given the rapid pace of technological advancement
- identification of and agreement on fare policy goals, including coordination of fare policies of member agencies and establishment of inter-system fare policies
- identification of and agreement on business objectives
- creation of a structure or entity for resolution of clearinghouse procedures and policies, including the possibility of private sector involvement in the operation of the clearinghouse
- adoption of common customer service policies relative to the use of smart cards, such as travel data privacy, restoration of lost card value, "bad pass" listings of lost/stolen/canceled cards, operator response to a

malfunctioning card or partial payment and inter-system transfers
- integration of agency-specific applications of the smart card into the regional system
- conversion from a "closed" to an "open" system
- managing any revenue "float"
- establishing and maintaining relationships with selected third-party sales outlets.

These and other issues are being addressed in the ongoing system design effort.

Cost and Benefits Anticipated

A comprehensive analysis of the cost impacts of implementing a multipurpose fare system was undertaken as part of the CPSFIP. Implementing the fare program is expected to cost around $10.5 million, depending on the actual equipment chosen and other implementation issues such as compatibility with existing equipment. This estimate includes assumed unit costs of $5 to $10 for cards and $2,000 for card accepting devices.

Based on using Metro as the test case, the study estimated that the impact of the recommended smart card system on Metro's fare collection operating and maintenance costs could range from an increase of $139,000 (roughly 4 percent of the total annual current cost) to a reduction of $309,000 (over 9 percent of the current total). The estimated impact on the existing cost elements is savings of $495,000 to $804,000 per year (at full system implementation), or 14 to 22 percent of these elements. The cost categories in which significant savings were projected include information production, pass program administration and sales, general accounting, and customer service office. The study estimated that new cost elements (e.g., clearinghouse expenses and costs for operating/maintaining new on-board equipment) would add between $405,000 and $635,000 per year, or 14 to 19 percent of the current total. The net impact of the new system on Metro's costs also includes an estimate of new revenue expected, as discussed below. (More precise estimates should result from the ongoing system design study mentioned above.) In addition, as yet unquantified operating cost savings could result from reduced dwell times and improved running times if sufficient numbers of cash customers switch to smart cards.

Some of the costs above can be mitigated by providing smart cards in a cost-effective manner by, for example, (1) having customers pay for the cost of the cards themselves; (2) providing incentives (e.g., in the form of discounts or bonuses) for users to hold onto them for an extended period; or (3) having an outside entity, such as a bank, provide the cards and clearinghouse responsibilities that go with them. The CPSFIP study assumed an average card life of 5 years. It also recommended consideration of a charge for the card, perhaps $5 to $10.

The feasibility study concluded that implementation of a smart card program could generate a 20 percent increase in the number of passes sold through the region's Employer Pass Subsidy Program, resulting in an annual revenue increase of $450,00 to $750,000. Another potential benefit is reduced fare abuse/evasion. Estimates for savings from reduced fraudulent pass use range from $120,000 to $180,000 per year, assuming that smart cards would cut pass-related fraud by 50 percent.

The study assumes that the smart card technology would result in an income producing financial float from a non-refundable "buffer" (envisioned to be $5 to $10) on each card by requiring the customer to pay the cost of the card itself, and, and stored value held on a card. Potential income was estimated to be $43,000 to $65,000, assuming an annual return of 5 percent, from these three components of float: $600,00 to $750,00 per year on the fare buffer; $400,000 to $600,000 per year on the value stored on cards; and a loss of float on existing pre-paid fare media of $150,000.

Plans for Future Expansions of the Program

The major potential future change to the smart card system would be the creation of a regional, distance- or zone-based fare structure that would involve all of the participating transit operators and provide truly seamless travel for the customer. As for expansions, non-transportation uses of the electronic purse component of the technology is also possible, as is private participation in the fare media applications and clearinghouse functions.

Summary and Conclusions

The Central Puget Sound Fare Integration Project has enjoyed active cooperation from all of the region's transit providers. Such cooperation was promoted by the Section 9 funding provided to King County Metro to manage the project, which created a responsible party and allowed it to staff ongoing efforts and pay for needed consultant support. CMAQ funding for two of the other major transit service providers was also critical. The impetus for this effort came from fast-paced residential and commercial growth in the area, increasingly dispersed travel patterns, and mounting traffic congestion.

Major conclusions from this review include the following:

- Regional cooperation, having a dominant service provider in Metro, and the fact that most regional transit service is still focused on Seattle helped keep the project on track.
- Even with excellent interagency cooperation and previous experience with a regional fare system, the smart card development process can take 2 to 5 years from initiation to installation.

- The project benefited from early development of joint business needs and identification of technological versus policy solutions for each.
- Besides selection and testing of the technology, there are numerous institutional, management, operations, and customer service concerns that must be resolved.
- Private sector participation is critical in project development and testing, but remains an outstanding issue regarding fare system clearinghouse functions and alternate card applications.

GCRTA (CLEVELAND) MULTIPLE USE PROJECT

Background/Overview

The Greater Cleveland Regional Transit Authority (GCRTA) has been exploring new fare collection approaches for the past couple of years, in an effort to attract new riders while reducing fare collection costs. Through consideration of alternative technologies, the RTA staff became interested in smart cards and multiple use possibilities. In 1996, RTA embarked on a two-pronged approach, involving (1) a consultant study of program options and (2) meetings with potential system integrators/vendors. The results of these efforts and the current project status are reviewed below.

Project Development

Following staff consideration of alternative fare technologies, the RTA retained the Volpe National Transportation Systems Center and Multisystems to conduct a study of smart cards and potential multiple use partners and arrangements. Between the fall of 1996 and early 1997, the consultants undertook the following tasks:

- Identify RTA goals and needs
- Identify and interview potential multiple use partners (i.e., entities that would either accept an RTA-issued card, issue a card that could be used on RTA services, or co-issue a card with RTA)
- Identify system institutional and financing alternatives
- Develop technology recommendations
- Develop recommendations for a demonstration and general implementation

The results of these tasks are summarized below.

Identify RTA Goals and Needs

RTA staff identified its primary goals or needs for the new fare system as follows: delight the customer and increase ridership, reduce fare queues, reduce maintenance time and costs, get employee buy-in, capture new revenue, produce better ridership data, develop an "open" system (if possible), and leverage existing vendor relationships (if possible). The staff does not expect to achieve all of these, and it was noted that several of the items (i.e., increase ridership, capture revenue, develop open system, and leverage existing vendor relationships) will be a function of the specific type of partnership or arrangement ultimately developed. Nevertheless, these were identified as the guiding goals in developing a new system.

Identify Potential Partners

In seeking to develop a smart card-based system, it was decided that a multiple use partnership with one or more local entities would be appropriate, given the capabilities of smart cards to facilitate such a program and the potential for cost savings, new ridership, and/or new revenues. Because of the high unit costs of smart cards, the benefits of a multiple use program were seen as an important element in establishing a cost-effective smart card system.

The entities considered potential partners fall into two basic categories: those that might be interested in accepting an RTA-issued card for payment and those that could conceivably issue a card that could be used on RTA services; in either case, the partner could perhaps co-issue a card with RTA. The organizations in the former category included retailers (e.g., drug stores and grocery stores), restaurants, a laundromat (which already has its own smart card), neighboring transit agencies, medical centers, sports stadiums (e.g., Cleveland Indians and Cleveland Cavaliers' facilities), and museums (e.g., Rock and Roll Hall of Fame). Potential card issuers included banks (i.e., KeyCorp, NationalCity, and BankOne), the Ohio Department of Human Services, colleges (i.e., Cleveland State University, Cuyahoga Community College, and Case Western Reserve), and a major gasoline retailer (BP). The focus was on entities that are well served by RTA bus or rail routes.

Each of the prospective partners was contacted and many were interviewed by staff and/or members of the consulting team. There was considerable interest, at least on a preliminary basis, from most of those entities contacted. A number of them were considering or in the process of developing stored value card programs of their own, and several had initiated discussions regarding potential partnerships with one or more of the others. Meanwhile, in parallel to RTA's own discussions with these outside entities, prospective smart card system integrators that had met with RTA to express their interest in providing equipment, cards, and support services began to contact potential multiple use partners on their own.

Thus, the timing is appropriate for RTA to be pursuing multiple use partnerships, and the consulting team found there to be considerable potential in several directions in establishing a multiple use arrangement. As discussed below,

one of the key next steps for this program is for RTA to pursue commitments from one or more prospective partners. The nature of the partner(s)'s interest—i.e., card acceptor versus issuer—will largely dictate the appropriate type of arrangement; these possible arrangements are reviewed in the next section.

Identify Institutional and Financing System Alternatives

The consultant team identified the basic institutional alternatives for the smart card system, as follows:

- *Closed transit-only system*—RTA issues a card that can be used only for transit service. This option was not recommended, given the relatively high costs of a smart card system.
- *Closed multiple use system*—RTA issues a card that can be used for payments at participating merchants.
- *Open system*—RTA accepts a card issued by an outside entity; RTA could also co-issue a card.

The advantages of the closed multiple use option are that RTA would maintain full control over all aspects of its fare collection system, while being able to benefit from outside revenue—i.e., transaction fees from participating merchants—and increasing its market penetration. The disadvantages of this approach could well include the need for RTA to assume responsibility for all risks and costs, as well as for recruiting and developing agreements with the participating merchants. However, the risks and recruitment responsibilities could end up being shared, depending on the financing approach negotiated with the system integrator; this is discussed below.

An open approach would mean lower fare collection costs and risks for RTA and would create even greater market penetration and ridership; if RTA were a co-issuer, the agency would presumably share in the additional revenue stream as well. The disadvantages of an open system would include a potentially more complex partnership agreement and possibly less flexibility for RTA in terms of pricing, in addition to loss of direct control over the issuance of media. Based on the preliminary assessment of the options, the consultant study suggested that RTA could pursue either basic approach—that the most appropriate option would largely be a function of the specific partner(s) recruited and the type of arrangement in which they are most interested.

With regard to procurement and financing arrangements, the consultant team identified three basic alternatives, as follows:

- Traditional procurement approach: RTA contracts for the whole system—or for individual system elements—and retains all revenues (i.e., fares, float, unused value, and any merchant-related fees).
- Partnership: RTA forms a partnership with a turnkey integrator/financial entity; the integrator finances the system, and RTA pays for the system through a transaction fee (e.g., on card uses or total boardings) and/or a percentage of the fare revenue.
- Open system: RTA pays a transaction fee to the card issuer, but retains its own fare revenue.

The second and third option would relieve RTA of the need for a large capital outlay. At least one interested integrator proposed such a financing arrangement; this proposal suggested a transaction fee on each boarding on RTA services, with a threshold minimum number of transactions. However, this proposal also assumed that RTA would receive a portion of the transaction fees collected from participating merchants. Other interested integrators were also planning to submit proposals and were expected to propose similar arrangements. Still to be resolved, however, were two key legal issues that would affect such arrangements: (1) can RTA enter into fee-based "franchise" agreements with vendors and (2) can RTA collect fees from outside entities (i.e., participating merchants). RTA was looking into these questions.

Despite the receipt of unsolicited proposals, RTA was leaning toward issuing a Request for Proposals following recruitment of one or more multiple use partners. This issue had not yet been resolved as of this writing.

Develop Technology Recommendations

Whereas the basic technology—smart card—had been identified at the beginning of the project, a number of technology-related issues had to be resolved. These issues—and the preliminary recommendations—can be summarized as follows:

- *Specific type of card technology*—Contactless cards are recommended for transit, while contact cards will be used by other industries; thus, a combi-card (contactless and contact interfaces) was recommended for a multiple use program. In addition, a magnetic stripe may be useful, depending on the needs of specific partners. Even with combi-cards, a dual reader that can process both contact and contactless cards may be useful over the longer term to ensure maximum flexibility in terms of reading commercial contact cards (i.e., for people who do not have combi-cards).
- *Interoperability*—It was recommended that RTA require (1) the ISO standard and EMV-compliant contact interface and (2) multiple contactless or combi-card vendors and that they incorporate emerging FTA/industry specifications for contactless and combi-cards.
- *Degree of integration with RTA's on-vehicle systems*—For existing fareboxes, integration of the smart card readers is desirable, although it may not be necessary for

the demonstration period; the ability to achieve full integration may depend on which integrator is selected and the timing of implementation. Over the long term, it is desirable to integrate the readers with all systems, including AVL, APC, and others.

Develop Recommendations for Demonstration and System Implementation

The first phase of the program would be a limited demonstration to allow evaluation of the multiple use concept. The basic objectives of the demonstration would include (1) evaluate the partnership issues and feasibility of the agreements, (2) familiarize RTA staff and community with the technology and the multiple use concept, (3) identify RTA training requirements, and (4) demonstrate and evaluate the technology. It was recommended that the demonstration be implemented on one or two rail or bus lines serving the location(s) of the partners recruited.

Regarding the plan for developing and implementing the multiple use program, the consultant team identified the following next steps for RTA:

- *Obtain management commitment and dedicate sufficient resources* (e.g., assign project manager and coordinate interdepartmental efforts)
- *Secure funding* (e.g., pursue federal demonstration/evaluation funds and possible cost-sharing interest of partners)
- *Pursue multiple use partnerships* (e.g., recruit partner(s) for demonstration and develop multiple use agreements)
- *Develop demonstration design and solicit vendor interest* (e.g., identify routes/merchant locations and identify schedule, and issue Request for Interest)
- *Develop RFP and implement demonstration* (e.g., identify functional/technical requirements for equipment, card technology, and clearinghouse; issue RFP; select vendor and finalize multiple use partner arrangements; and enroll cardholders—both RTA riders and merchant patrons)
- *Evaluate the demonstration and develop long-term plan* (e.g., estimate market potential, identify additional partners, and tie in with RTA's overall marketing initiatives)

Summary and Current Status of Project

Based on a study of the potential for introducing a multiple use smart card program in Cleveland, it was recommended that GCRTA pursue either a closed or open multiple use arrangement. It was determined that good opportunities exist for both types of program, and it was felt that such a program would dovetail with RTA's overall marketing initiatives, particularly the commitment to optimizing customer convenience. Regarding the choice of closed versus open approach and the nature of the demonstration to be implemented, the study concluded that the specific partners recruited and the resulting arrangements would dictate the requirements of both a demonstration and a long-term program direction.

The preliminary recommendations were presented to RTA's senior management in February 1997. As of mid-June, RTA was planning to proceed with the project and was continuing to meet with interested integrators. RTA issued an RFP in June 1997 for a consultant to assist in the design and implementation of a demonstration project. A consulting team led by Multisystems was selected, and the demonstration design began in September 1997.

NYMTA METROCARD/MULTIPLE USE PROJECT

In 1990, the New York Metropolitan Transportation Authority announced that it was implementing an automated fare collection (AFC) program throughout its rail and bus system that would be based on a magnetic striped card.

The rail and bus system carry an average of 1.5 billion passengers each year. While the AFC system was justified primarily on the basis of reduction of fare evasion, the majority of the $660 million in capital expenditures was devoted to improvements in the electrical and communications infrastructure of the system. The NYMTA approved an evaluation of the fare card as a prepaid card for use by transit customers for fare payment as well as the purchase of goods and services from merchants in the areas around the transit system. The evaluation, which included merchant and consumer research, as well as an operational/technical analysis, resulted in a positive recommendation for the MTA to pursue this endeavor. The MTA created a subsidiary, the MTA Card Company, in 1994 for the express purpose of promoting the existing stored value card (MetroCard) and to explore other card technologies and business opportunities. After considerable study by card security experts, the MTA was advised that the existing magnetic stripe media was not secure enough from counterfeiting and alteration to operate in an open payment system. Based on this conclusion, the MTA began examining the utilization of a smart card electronic purse.

Development of Joint Venture for Multiple Use Card

In 1994, the Card Company issued an RFP for the formation of a joint venture to develop and operate a stored value payment system capable of supporting magnetic stripe and smart card technologies. The Card Company and its partners would be required to provide the following key functions:

- card management
- customer service and marketing

- data processing
- settlement
- merchant service
- terminal management

After a considerable period of review and discussions, the MTA selected Chase Manhattan as the preferred partner and began negotiations. The group envisioned a continuation of the magnetic stripe technology for infrequent and unbanked riders along with the development of a smart card electronic purse for frequent riders and for extended use. The system was envisioned as including the entire NYC metropolitan area and perhaps eventually expanding to other transit properties throughout the United States.

Card Distribution

The system was seen as utilizing a number of card types, as indicated below.

Card Type	*Technology*	*Usage*	*Reloadable*
Paper	Magnetic stripe	Transfers, 1–2 rides	No
PVC	Magnetic stripe	Transit only	Yes
PVC	Integrated circuit	Transit, electronic purse, other applications	Yes

Card distribution would be accomplished through various channels, including:

- financial institutions
- merchants
- self-service vending machines
- subway stations
- mail order

All of the bus fareboxes and subway station turnstiles would be retrofitted to incorporate a smart card reader device in addition to the magnetic stripe read/write assembly that is being installed as part of the original AFC program. Given its tight budgetary restraints, the MTA was seeking funding by the other participants in the venture for this expense. While the MTA preferred a contactless card, the movement of the financial services industry to adopt the contact card standard led Chase to encourage the use of that technology.

Current Status

Unfortunately, despite intense efforts, negotiations between Chase and the MTA were terminated in May 1996, as the two sides were unable to reach agreement on the amount and structure of fees to be paid. Following the termination of discussions with Chase, the MTA disbanded the MTA Card Company subsidiary. Since then, the MTA has focused its efforts on improving the penetration and usage of the magnetic striped MetroCard. In mid-1997, the MTA changed its fare policy structure to allow riders free transfers between the subway and bus system for a two hour period that commences when the card is swiped to begin the trip. The origination station/bus is stored on the card and checked when the card is swiped at the next entry point to ensure it is a valid transfer.

The MTA had brief discussions with the two banks—Chase and CitiBank—participating in the Visa/Mondex stored value pilot scheduled for an October 1997 launch in the Upper West Side of Manhattan. It was determined that the limited geographical area of the pilot program did not offer a strong synergy with the Transit Authority's bus/subway routes, and the MTA elected not to participate in the pilot program.

GUELPH MONDEX PROJECT

Mondex Canada was formed in May 1995 by Canadian Imperial Bank of Commerce (CIBC) and Royal Bank as a licensee of the Mondex stored value system. The group wanted to develop a national showcase for the Mondex product modeling a mature environment and to be used as the first stage of the Mondex Canada rollout. Mondex selected the town of Guelph, Ontario, as its pilot location. Guelph is approximately 90 km west of Toronto and has a population of 100,000 and a retailer base of approximately 550 merchants. The town is representative of the overall Canadian population and also contains a university. Guelph has a small transit system consisting of a 47-bus fleet that operates within the city. The fare structure is a flat fare, although students currently enrolled at the University of Guelph ride free by displaying their student ID card.

As of June 1997, there were over 5,000 cardholders, with an overall goal of 8,000 to 10,000 cardholders. The current cardholders have loaded their cards with more than $500,000 in value. The program has successfully penetrated the merchant community, with more than 500 merchants (90+ percent) accepting Mondex as a form of payment. The two major banks in Guelph, CIBC and Royal, have modified their 36 ATMs to accept the Mondex card for loading value. Canada Bell equipped 250 pay phones to accept the card for payment as well as to be used as a reload terminal.

The city buses were equipped with Mondex terminals which began operating in late March 1997. Mondex Canada believes that transit participation is one of the keys to a successful consumer proposition and to the success of the pilot program, as it shows the capabilities of Mondex beyond the typical retail merchant. The type of terminal for the buses was studied closely. The buses currently utilize GFI fare boxes that are approximately 15 years old. Mondex estimated that it would cost almost $5 million ($100,000 per bus) to develop and install a fully integrated terminal. A terminal that was partially integrated was estimated to still cost $20,000 per bus. Due to the cost, Mondex elected to use a Mondex-certified Fortronics device in a stand-alone mode operated by the customer.

Once the terminal decision was made, the installation became the focus, with research as to the power source and

location. Mondex began beta testing the terminal in January–February 1997. The terminal was installed on the grab bar and runs off the bus's electrical power using a power adapter. During the beta test, the terminal was unlabeled and the only transactions were performed by bank employees.

Mondex identified early on that the bus drivers were critical to the success of the transit portion of the pilot program. There was some apprehension as to the drivers' reaction as their union has been working without a contract for more than 2 years. Mondex personnel knew they had to completely sell the drivers and provide thorough training since they would be working by themselves without anyone to oversee their performance or to provide assistance. Thus, Mondex provided a high level of support to the drivers. They provided each driver with a pocket-sized reference card. They conducted a mystery rider program and provided incentives to drivers. Mondex frequently conducted formal debriefing sessions with the drivers and union to gain a complete understanding of their questions and concerns.

The bus program went live to the public in late March 1997 and the initial results have been positive. Guelph Transit cites the following advantages to its participation in the program:

- Allows for the direct transfer of funds from the terminals to its Mondex account. The transactions held in the terminal are transferred to an "accumulator card" which is then placed in a Mondex phone where the value information is transferred to Mondex and the value is credited to Guelph Transit.
- Reduction of currency handling: although usage to this point has averaged about five fares per bus per day, the transit agency and Mondex hope to increase this penetration level to 10 percent by the end of 1997.
- As hard currency is replaced with Mondex's electronic currency, the risk to the driver's safety as a target for robbery is lessened.
- Allows Guelph Transit to learn about stored value cards and smart card technology for other possible applications within the transit agency.

Mondex, likewise, has learned from the preliminary results of the pilot. Key findings/lessons to date include the following:

- An integrated terminal will be more efficient, but is economically unfeasible at this point.
- The transaction retrieval process for settlement must be improved, as the current process offsets any cost savings.
- Transit is a major application, but the issues over "who pays?" must be resolved.
- The contact card requires a 2- to 3-second transaction time, which is too slow. Mondex Canada is looking at a faster contact transaction or a contactless card solution for a national rollout.
- The consumer will drive the acceptance of stored value cards in the traditional retail environment.
- The "cash-only" merchant benefits the greatest from the program.

Mondex Canada continues to flourish and has emerged as the dominant stored value system in Canada. In June of this year, Bank of Montreal, National Bank of Canada, Toronto Dominion Bank, Canada Trust, HongKong Bank of Canada, the Credit Union Central of Canada, and the Bank of Nova Scotia (Scotiabank) all announced plans to join Mondex Canada. This membership represents all the major banks in Canada and accounts for 90 percent of Canada's consumer banking relationships. The overall worldwide Mondex program is discussed further in the next section.

MONDEX PROGRAM

From its creation in 1990, Mondex has steadily moved forward in the development and implementation of its stored value smart card program. Following the 1996 purchase of 51 percent of Mondex by MasterCard International, seven American companies (Chase, Wells Fargo, Dean Witter/Discover, AT&T, First Chicago NBD, Michigan National Bank, and MasterCard) jointly established Mondex USA to market the program in the United States. Mondex had earlier created a series of license holders in various parts of the world, including the following:

- Great Britain—National Westminister Bank, Midland Bank, Bank of Scotland
- Canada—Royal Bank of Canada, Canadian Imperial Bank of Commerce
- Far East—Hong Kong Bank and Shanghai Bank

Mondex seeks to become a world-wide "branded" stored value product; this is in contrast to Proton, for instance, which licenses its technology, but not its name, to issuers.

Product Features

Mondex has been developed internally and is considered by its proponents as a "true" form of electronic money. The basic Mondex product is a smart card that is linked to an account. Card balance can be checked with a reader the size of a key fob. At present, a maximum of 500 pounds (US$750) can be kept on the card. Customers may also obtain a "wallet" which is the size of a small handheld calculator and provides a number of capabilities:

- check balances
- view last ten transactions of card that is inserted in the wallet
- transfer value from a card and either temporarily store it in the wallet or transfer it to another card

Value can be added to a card at an ATM or a designated screenphone. Mondex is working on the capability to add

value through the Internet using a personal computer with a card reader.

Cards will be exchanged every 2 years to provide for security enhancements. No refunds will be given for lost or stolen cards, although cardholders will be reimbursed for damaged cards. Since merchants will transmit only a total amount during the settlement process, the Mondex system would be regarded as an "off-line, unaccountable" under the definitions originally proposed by the Federal Reserve Bank. Under current proposed Federal Reserve regulations, the product would be exempt from Regulation E.

Usage and Pricing

Mondex launched its pilot program in the town of Swindon, England, in July 1995, initially projecting a cardbase of 40,000 cardholders. Swindon has a population of 170,000 and is located in southern England. The town has an excellent telecommunications infrastructure and is located in the center of the country's high tech area. As of early 1997, about 10,000 cards had been issued. This represents 20 percent of the customer base of the National Westminster and Midland Banks. Mondex is seeking to make the card issuance process more efficient and will market the program to non-issuing institutions promoting the fact that the consumer does not have to switch banks to participate.

Mondex has signed up approximately 750 merchants in Swindon, out of an original target of 1,000. At the present time, the retailer is required to utilize a separate terminal to accept cards, but Mondex is working to develop a single terminal that will also handle credit card magnetic striped cards. Transactions are stored individually in the terminal, and the merchant can print out a transaction register if desired. At settlement, the retailer inserts the card into the terminal, where the value of the transactions is transferred to the card. The merchant can then transmit the total to the bank for deposit or use the card for the purchase of goods and services.

Mondex is in the process of developing its overall pricing strategy, and the particular approach may well differ from one location to the next. The original pricing strategy, introduced in Swindon, has been dependent on cardholder revenues as its primary revenue source, since merchant transaction processing has been optional. In Swindon, customers are given the card for free for 6 months and then charged a monthly fee of L1.50 (US$2.25). Customers with wallets are charged L3.50 (US$5.25) per month after 6 months. Merchants are charged a rental fee for their terminals; this fee is negotiated with each merchant. Settlement fees are also charged, but the merchant is under no obligation to report these transactions.

Current Status and Transit Application

Mondex is aggressively working to establish its program throughout the world. In late 1996, Mondex issued 10,000 cards to students and staff at the University of Exeter in southwest England to enter the university card market. The card is used as an ID and library card, as well as for student voting and building access. Mondex seeks to expand the program to other universities, military bases, and large employment centers. Wells Fargo Bank has been conducting a trial at one of its corporate locations in California with 500 cardholders and approximately twenty merchants; the bank is expected to launch a public program in 1997. As described above, there is currently a pilot in Guelph, Ontario, initiated by the Royal Bank and CIBC. Two pilots are under way in Hong Kong, and one is planned for New Zealand. The card will also be used in the joint Chase/Citibank MasterCard/Visa pilot planned for New York City in late 1997. Mondex is very interested in transit applications and has been involved in discussions with many transit agencies in North America. The Guelph pilot represents the first use of the card for transit.

BANKSYS—PROTON PROGRAM

The electronic purse program, Proton, developed by the Belgian banking association, Banksys, currently ranks as the most successful electronic purse program in the world having performed more than 800,000 transactions. Banksys was created in 1989 from a merger of two competing debit card programs with the mission of authorizing and acquiring EFT transactions on behalf of the Belgian banks. Banksys is owned by the Belgian financial institutions that serve the 4 million households and 10 million people in the country; although there are approximately 60 banks in Belgium, the five major banks control approximately 80 percent of the market. Banksys owns and operates the 1,000 ATMs installed in the country, although the machines are serviced by bank personnel. Banksys also operates an online POS service throughout the country with a cardbase of 6 million cards. The Proton program currently has a terminal base of approximately 14,000. Cards are loaded through ATMs or through the approximately 300 reload terminals located at bank branches; approximately 3,000 reload locations are available in Belgium, with the expectation that this will reach 13,000 by the end of 1998.

System Development

Banksys has been responsible for the development of all aspects of the electronic purse program, including terminal production. Unlike most other programs that develop specifications and certify terminal manufacturers, Banksys has been the exclusive supplier in Belgium for both magnetic stripe and smart card terminals. The supply of terminals is viewed by Banksys as a key source of revenue. Banksys has now sold its system to operators of electronic purse programs in other parts of the world including the following:

- Holland—pilot began in October 1995
- Switzerland—pilot to start in 1996

- Australia—Quicklink pilot started in late 1995
- Brazil—Banco de Brasil ran a short pilot in October 1995 and is looking to expand its program.
- Canada—the Bank of Montreal and Toronto Dominion Bank planned to begin testing the system (as the *Exact* card) in Kingston, Ontario, in late 1996.

American Express has recently licensed the Proton system for use in the United States. Unlike Mondex and VisaCash, Proton licenses its technology, but not necessarily its name.

Cardholder and Merchant Base

The Proton electronic purse program was launched in February 1995 in two cities, Leuven and Wavre, located outside of Brussels. With an eligible population of 50,000 cardholders in the pilot area, Proton has achieved a 62 percent penetration rate with more than 30,800 cardholders. Cards are loaded through ATMs or through the approximately 300 reload terminals located at bank branches. All banks operating in the pilot cities are equipped to issue and reload cards. A national rollout of the program in Belgium was initiated in February 1996; as of early 1997, there were roughly 800,000 cards in circulation in Belgium, with plans for 7 million by the year 2000. In January 1997, Banksys began issuing cards combining debit functions with EP, and the ultimate plan is that all existing debit and credit cards will have a chip added to the card and will support the EP.

The pricing decision on the card fee is left to the individual bank, with some charging up to US$5 to obtain the card; the typical bank customer in Belgium pays US$20 annually for a debit card. During the first 6 months of the pilot, each cardholder had reloaded his/her card 2.7 times with an average load value of US$52. A national rollout of the Proton program began in February 1996. Beginning in 1997, all existing debit and credit cards will have a chip added to the card and will support the electronic purse.

Banksys has been able to establish a strong merchant base, with a 34 percent penetration rate. As of February 1996, card acceptance terminals were operating in approximately 1,500 of the 3,600 possible merchants. Additionally, there are more than 100 payphones and vending machines that have been equipped to accept the Proton card. As of the end of February 1996, more than 868,000 purchase transactions had been completed. The average transaction amount has been US$6.00. Retail shop transaction amounts have averaged US$7.60, while the vending machine average amount is US$1.20. Plans call for the integration of the Proton terminal into the existing POS terminal to provide the merchant with a single terminal solution. Banksys has recently expanded its program to the university in Leuven.

Security/Privacy

While Banksys does receive a record of all transactions performed by a card, it only retains the transaction record to verify the card balance and then discards the specific transaction information. This process allows Banksys to detect a card where value has been loaded in an unauthorized manner. A limited transaction history is maintained in the card, and this permits refund of the card value. This procedure was implemented to avoid any concerns by cardholders that a record of their cash purchases would be maintained. It is unclear as to how the Federal Reserve Board would classify this system since it has the capability to store all the transaction and be an "accountable" system.

Transit Application

Banksys is operating stand-alone terminals on a number of buses operating in the pilot city of Leuven. Under the current configuration, the bus operator must key in the amount of the fare which is then approved by the customer. Banksys hopes to integrate this process into the farebox at a later date. Banksys also planned to install automated ticketing machines at a number of bus terminals by the end of 1997. Banksys recently announced a joint venture with ERG (parent of AESProdata) to introduce transit/EP projects in 11 countries in southeast Asia; a key aim of this venture is to introduce combi-cards for the transit market in 1998.

DANMONT PROGRAM

Danmont represents the world's first multi-issuer, open card system. Danmont was established in mid-1991 as a joint venture between the Danish banking association and the telephone company. The original study included the mass transportation group, but they elected not to participate in the initial stages of the program. Danmont began with a pilot program in the town of Naestved in September 1992. The pilot only supported a disposable memory card, with self-operated terminals (e.g., vending, phones, and parking meters). Based on the success of the pilot, national implementation was begun in March 1993. The program is currently operational in 39 cities throughout Denmark and is expected to be available throughout the country (in 104 cities) by the end of 1997.

System Development and Operating Structure

The system has been developed internally. Implementation of the Danmont system can be divided into five stages as follows:

- Phase 0: Pilot program using disposable, memory cards for an e-purse application
- Phase 1: National rollout using disposable, memory cards in an e-purse application
- Phase 2: National rollout of a reloadable card in an e-purse application

- Phase 3: National rollout of an IC card supporting a limited number of additional applications
- Phase 4: National rollout of an IC card supporting fully functional, multiple applications

Phase 0 has been completed and Phases 1, 2, and 3 are underway.

As the system operator, Danmont is responsible for technology standardization, marketing, transaction clearing, and security functions. Danmont does not engage in terminal or card manufacturing, but does certify all card and terminal suppliers as operating in compliance with the Danmont-issued specifications. While generic advertising is provided by Danmont, card issuers and merchants are encouraged to do their own advertising as well. As noted earlier, Danmont has licensed its system to Visa as the foundation for the VisaCash program in the United States.

Cardholder Base and Merchant Base

Although the Danmont system will support a reloadable card, only disposable cards are being issued by the financial institutions at this time. Danmont claims that its consumer research showed that only 4 percent of cardholders desired a rechargeable card. Sources indicate that economic advantages of disposable cards have been found to be higher than expected and the banks do not wish to negatively impact this source of revenue. More than 250,000 disposable cards have been sold since the start of the program. Cards can be purchased at banks and post offices and through a limited number of card vending machines. The average transaction amount is US$1.00, but this average is heavily affected by the large number of self-service terminals. Until recently, the system only supported self-service terminals that were equipped with a telephone line for automated transaction settlement. Based on consumer demand, stand-alone terminals in cafeterias, convenience stores, and fast food restaurants have been added.

Transit Application

In late 1995, the Copenhagen mass transit system began a trial program of accepting the Danmont card for the purchase of fares. If successful, all 143 ticketing machines of the Danish State Railway (DSB) will be retrofitted to accept the card. A total of 18 automated vending machines (AVMs) have been installed at four major stations. Transit management supported the addition of this payment type, but want the trial to validate the customer's acceptance of the product. A number of payphones at the transit station have accepted the Danmont card since the introduction of the program. In general, Danmont continues to move forward with its plan to improve the functionality of its program by offering various card types and increasing the number of outlets accepting the card.

SWISS PTT—POSTCARD PROGRAM

In 1991, the Swiss Post, Telegraph and Telephone (PTT) launched a smart card electronic purse program in Biel/Bienne, Switzerland, partnering with Ascom Autelca, a supplier of terminals with experience in chip card programs. At launch, 13,000 consumers were outfitted with the card. Now, more than 1.3 million Swiss consumers carry the PTT Postcard. For almost the last 2 years, the Postcard has been co-branded with the MasterCard logo, giving the card wider acceptance than it had originally received. Consumers are not charged fees with their PTT accounts, unlike bank checking accounts, driving usage of the card even higher.

A second project, which was scheduled to begin in March 1996, will introduce a prepaid phone card to be used at payphones and other POS terminals in Switzerland, Germany, and the Netherlands. The card will not be linked to an account and will take the place of the existing optical card system currently used in Swiss payphones.

Applications

A wide variety of applications were involved in this pilot program. For instance, 7,500 payphones have since been installed and/or modified to accept the PTT Postcard, allowing call payment with the smart card involving direct debit of consumer PTT accounts. Unisys provided the servers which manage the PTT's information systems' communication and transactions. Ascom Autelca, the original technology partner for this trial, provided the telephones needed to expand this application. The number and distribution of terminals in the pilot program are as follows.

Types of Terminals	*Applications/Locations*	*# of Terminals*
Debit-on-line terminals	Retail outlets Postal counter Supermarkets	155
Electronic Purse Terminals	Public transportation	10
	Rural transportation	10
	Payphones	30
	Food/Beverage Vending Machines	3
	Terminals in cinemas, swimming pools, staff canteens, fast food restaurants	18
Revolving Credit Terminals	Taxis	2
	Restaurants	2
Identification	Post Office	n/a

Transportation applications included the purchase of fare cards from terminals at rail and bus stations throughout Biel/Bienne. Another transportation application involved using the revolving credit application on the cards to pay for the expensive cab rides in Switzerland. Approval for a revolving credit transaction only involved verification of

identity. The transaction value was debited from the PTT account at the time of the next value upload.

Key Pilot Findings

The pilot program in Biel/Bienne demonstrated that a PTT-integrated, multifunctional, reloadable electronic purse was not only feasible in the field, but profitable and successful. The system operated at costs lower than originally expected, indicating that such a system could be run profitably. Vendor and consumer acceptance of the card product was varied. Service providers gave mixed reviews—vending providers found the Postcard to be a relief from dealing with high coin volumes; other POS vendors felt the card was not flexible enough to accommodate high value transactions. Cardholder acceptance rates were approximately 15 percent. Many cardholders were only aware and accepting of the debit-on-line application on their card and not the identification, electronic purse, or revolving credit applications. These types of transactions involve behavioral modifications that seem to be burdensome. In spite of these findings, usage of the card for 'cash' transactions rose; turnover rates and transaction volumes both increased by over 50 percent.

EPS/SmartCash

Electronic Payment Systems (EPS) was formed in 1992 to provide transaction processing support for the MAC automated teller machine network and to develop additional card and electronic banking products and services; MAC is the third largest shared EFT network in the United States, handling more than 1.2 billion transactions in 1995. EPS is currently owned by the following five banks:

- Banc One Corporation
- CoreStates Financial Corporation
- KeyCorp
- National City Corporation
- PNC Bank Corporation

In April 1994, EPS announced that a smart card test involving "hundreds of thousands of consumers" would be launched in Delaware in 1995. In August 1994, EPS announced plans to form SmartCash as a nationwide business venture that would develop, implement, finance, and manage stored value, smart card programs. The Delaware test was scaled back to a two zip code area that would involve approximately 200 merchants and 50,000 cardholders to be launched in 1995. Statewide rollout would follow one year later. In early 1995, EPS announced that due to the efforts required in the creation of the SmartCash organization, the Delaware test was being pushed back to early 1996. The program was later pushed back further. In short, despite a number of announcements over the last two years, EPS has yet to launch its open system program.

System Development and Operating Structure

EPS has utilized a third party, Touch Technologies Inc. (TTI) of Phoenix, to do the system development work on the stored value system. Gemplus (cards) and Danyl (vending machines) have been working with TTI in the overall development effort. EPS began a pilot of the initial system in the CoreStates and EPS employee cafeterias in February 1995. In September 1996, EPS began conducting demonstrations of the full system for member institutions.

Since merchants will transmit individual transactions as part of the settlement process, the SmartCash system would be regarded as an "off-line, accountable" under the definitions proposed by the Federal Reserve Bank. EPS plans to serve as the network operator and essentially "franchise" the SmartCash program to other parts of the country. Major payment systems players, in addition to the EPS owners, were included in the original SmartCash consortium: MasterCard, Bank of America, Chase, Chemical, Wachovia, First Union, Wilmington Trust, NationsBank, GemPlus, and VeriFone.

Transit Application

A planned project using SmartCash cards on buses at the Delaware Authority for Regional Transportation (DART) has been on hold since mid-1995, pending finalization of the SmartCash system. The original plan for the project was that cardholders participating in the pilot program would be allowed to use their cards on any of the 135 DART buses operating in the Newcastle County (Wilmington) to pay their fare. The U.S. Department of Transportation had agreed to fund the cost of the farebox modification on the bus fleet. Due to the hold on the project, the bus fareboxes have not yet been modified. As of Fall 1996, no implementation schedule had been established. EPS does have a strong interest in participating in the transit fare payment market, however, and has begun to actively explore other potential transit applications.

APPENDIX C

FINANCIAL INSTITUTION SURVEY

Dove Associates recently (1995) conducted a survey of 98 of the largest U.S. debit card issuers to examine their perspectives on smart cards; 49 responses were received and included in the analysis (four additional responses arrived too late to be included in the analysis). Figure C-1 shows the distribution of respondents by debit program size. The objectives of the survey were to understand

- Debit card issuers' predispositions and attitudes toward smart cards,
- What options were being considered, and
- How they would approach smart card-based products.

Specific issues included

- How urgent is the need (i.e., how soon do issuers need a product)?
- How will issuers develop a product (e.g., third-party, in-house, or EFT network)?
- Will issuers want to start with a closed or open system card?

The major findings of this survey are summarized below.

Most respondents indicated that they were generally interested in participating in smart card programs, but that they would require a higher level of comfort with the business case economics before they would begin issuing cards. That more than 50 percent of those contacted responded to the survey indicates a strong interest in this subject by leading debit card issuers (across a wide range of debit card base sizes).

The first key finding of the research was that 90 percent of the respondents believe that smart cards with stored value could conceivably account for 10 percent of their customers' small dollar purchases within a period of less than 5 years. Figure C-2 shows the distribution of responses to the following question: If you issued smart cards to your customers today, can you estimate how long it might take for 100% of their small dollar purchases to be conducted with smart cards?

Another key finding was that nearly three-fourths of the respondents were favorably disposed toward smart cards; only six respondents believe that "Smart cards are a solution looking for a problem." Respondents' general predisposition toward smart cards is illustrated in Figure C-3, which indicates that most believed that the cards "look to have great potential."

On the other hand, while issuers expressed a strong general interest in smart cards, they also expressed concerns about the business case, particularly the cost of the cards themselves. Issuers are very concerned about the uncertainty of the payoff from what many consider to be a major investment. They want to know who will pay to upgrade all the devices so that the customer can actually use the card. The

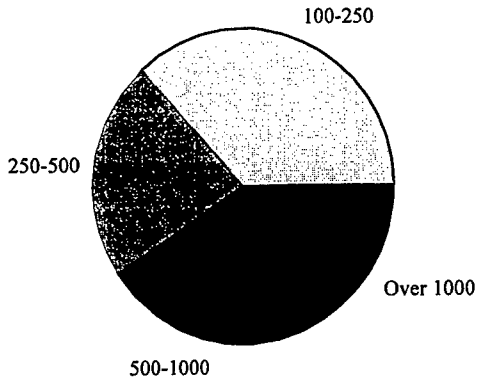

Figure C-1. Distribution of respondents by program size (thousands of cards issued).

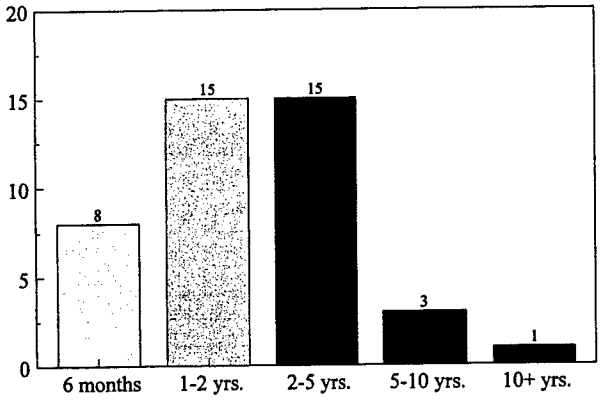

Figure C-2. Distribution of responses—10% of small dollar transactions.

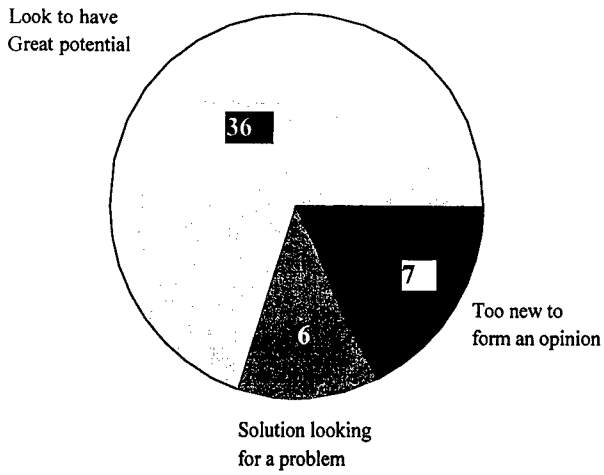

Figure C-3. Respondents by predisposition toward smart cards.

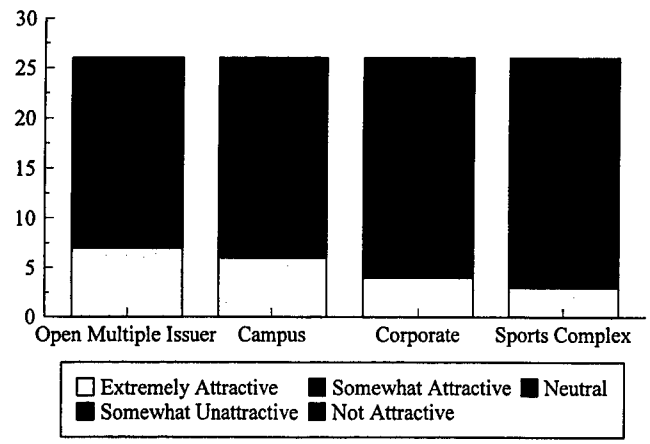

Figure C-5. Preferred venue.

bottom line is "What is the justification for financial institutions to spend $3 to $6 per card compared with $0.10 today?" Respondents believed that this technology would be really useful if it stored the customer's "life history," instead of simply $20.

Slightly more than one-half of the respondents plan to be participating in a smart card program within the next 2 years, as shown in Figure C-4. Open systems are the most preferred venue by those financial institutions that plan to offer a smart card with stored value in the next 2 years. However, as shown in Figure C-5, none of the respondents considered any of the four venues mentioned to be unattractive.

The opportunities to gain market share and create new revenue streams were the most frequently cited advantages of participating in a smart card program, as shown in Table C-1.

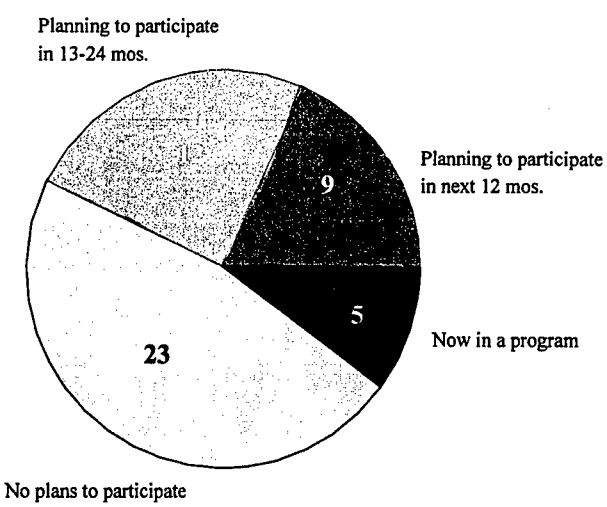

Figure C-4. Respondents by program status.

The level of fraud risk and noninterest income potential are the most important issues identified by the respondents. The magnitude of the initial investment is also very important, as show in Figure C-6. Cost concerns were almost unanimously cited as a disadvantage of issuing smart cards, as shown in Table C-2.

For those financial institutions not planning to participate in the next 2 years, the primary reason identified was a perceived lack of customer demand, as shown in Figure C-7.

Increased customer demand and merchant acceptance are "participation triggers," as shown in Table C-3.

ATMs were identified as the most important location for reloading value onto smart cards, followed by bank terminals and merchant terminals, as shown in Table C-4.

In addition to the traditional questions, the study applied "conjoint analysis" to provide insight into the tradeoffs that issuers will make when choosing products or services. Conjoint analysis measures the "utility" or value that respondents derive from various product features. Respondents are asked to rate their interest in purchasing a range of product bundles referred to as conjoint profiles. Each profile includes different levels (e.g., prices and features) for selected attributes that constitute the product or service. By methodically repeating this process, it is possible to quantify those features that a respondent likes and dislikes and to determine the strength of that preference. The results provide a quantitative basis for strategic product decisions around features, pricing, and target markets, including

- How willing are respondents to trade one product feature for another?
- Which segments value various product bundles the most?

TABLE C-1 Advantages to a financial institution of issuing smart cards

What advantages do you think issuing smart cards provides a financial institution? For example, helping to make consumers' purchases more convenient?	Frequency of Mention
Technological advantages: • One card does it all • Lower overhead or transaction costs • Better security	26
Customer retention, increase in market share, improve image of bank, marketing to customers	25
Possible revenue, generation of fees	25
Customer service, convenience for customers	22
Other[1]	14

[1] 'New service for cash-intensive merchants,' 'reduction in teller lines,' 'no waiting for phone authorization,' 'joint venture opportunities with retailers (affinity cards),' 'no advantage.'

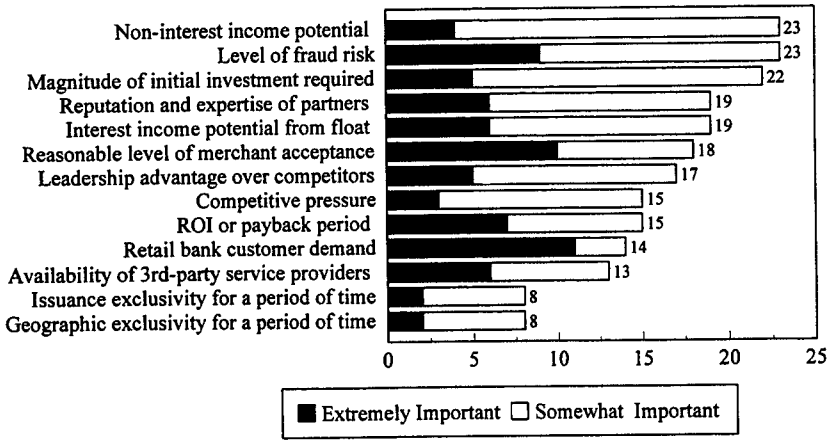

Figure C-6. Decision element importance.

TABLE C-2 Smart card disadvantages

What disadvantages do you foresee with issuing smart cards?	Frequency of Mention
Cost	40
Technological disadvantages, cost of technology	28
Lack of current standards, lack of a current supporting infrastructure	22
Low or not enough merchant acceptance	14
Low or not enough consumer demand	8
Other[2]	12

[2] 'Lack of consumer understanding (of smart cards),' 'lack of clarity on potential government regulations,' 'uncertainty of making profit...and when,' 'lack of clear reason to use the card,' 'unknown consumer acceptance,' 'do not see this as an issue.'

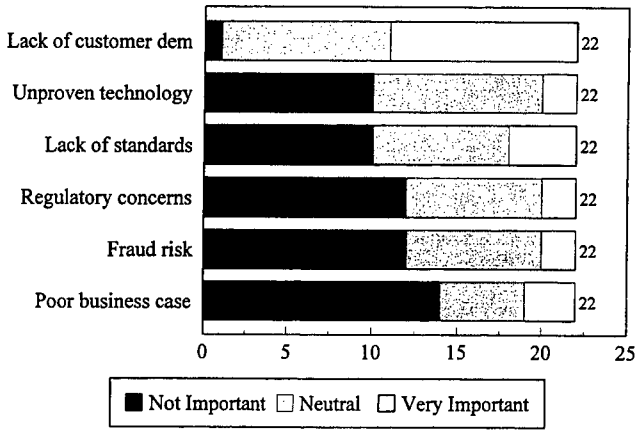

Figure C-7. Reasons for not participating in the next 2 years.

Conjoint analysis identified card cost to be the most important component of an issuer's decision; benefit to the financial institution is the second most important issue. When "Card Cost," "Float Management," and "Financial Institute (FI) Benefits" are combined, it is evident that business case economics will account for about one-half of a bank's smart card issuance decision, as shown in Figure C-8.

Leading banks indicated a strong likelihood of issuing smart cards if they could be delivered in the $3 to $6 per card cost range. A $6 card cost generated a 53 percent likelihood of participation from the largest institutions, and a 62 percent likelihood of participation from the smaller financial institutions, as shown in Figure C-9.

In summary, this research highlighted financial institutions' great interest in smart cards, particularly to create the opportunities to gain market share and to create new revenue streams. Three-fourths of the respondents thought that smart cards have great potential as a way for consumers to make purchases. More than one-half of the respondents were planning to participate in a smart card program or were already participating in a program. The respondents that were not planning to participate in a program within the next 2 years cited the lack of customer demand as the primary reason for not planning to participate. The most preferred venue for offering a smart card was an open system.

Technological advantages of a smart card were cited by the respondents as the most important advantage to financial

TABLE C-3 Participation triggers

What event would trigger a change in your plans and cause you to participate?	Frequency of Mention
Large increase in consumer demand	14
Improvement of current standards and infrastructure	10
Large increase in merchant acceptance	9
Reduced operating and setup costs	5
Other[3]	6

[3] 'Financial benefits,' 'competitive pressure,' 'the ability of an outside processor to support such a program,' 'a justification for the costs,' 'Someone to tell me why to use smart cards versus the debit cards.'

TABLE C-4 Reloading locations

Please identify all of the locations that you believe are important for reloading value onto Smart card electronic purses.	Frequency of Mention
ATMs	39
Bank terminals, banks	27
Merchant terminals	17
Computer device Smart Phones PC Interactive TV	16
Large organizations, frequented spots Shopping centers Transit stations Universities/corporations	5

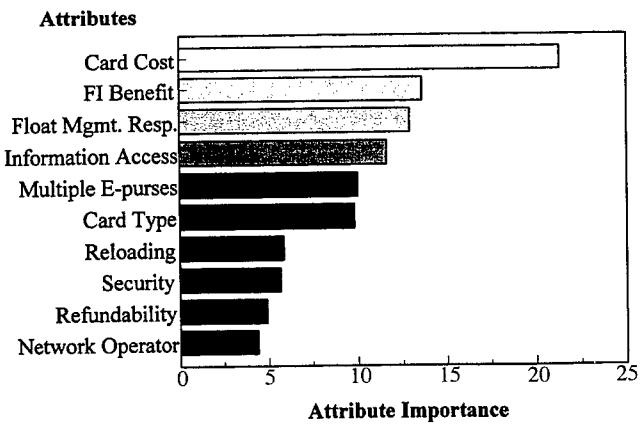

Figure C-8. Relative importance of each product feature.

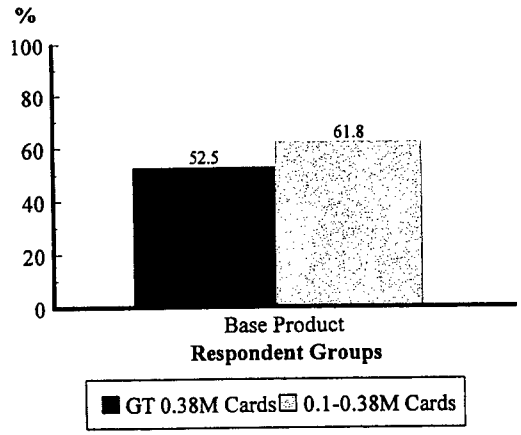

Figure C-9. Likelihood of issuing smart cards.

institutions, with customer retention and possible revenue ranked almost as high. Potential fraud and noninterest income potential are the most important issues for financial institutions. Card cost was the most important element of a potential issuer's decision, with benefit to the financial institution ranked second, and cost concerns were overwhelmingly noted as the number one disadvantage of issuing smart cards.

APPENDIX D

SUMMARY OF MULTI-USE PAYMENT MEDIA WORKSHOP

MULTI-USE PAYMENT MEDIA WORKSHOP: OVERVIEW

In order to facilitate direct discussion of the key issues and appropriate directions for multipurpose fare programs—as well as to disseminate preliminary findings from Project A-14—the project team held a day-long workshop on April 17, 1997, at the Transportation Research Board headquarters in Washington, D.C. The Multi-Use Payment Media Workshop brought together senior managers from various agencies and companies with an interest in smart cards and multiple use payment media. Participants included representatives of transit agencies, regional planning agencies, banks and other financial institutions, U.S. DOT, transit industry trade groups, smart card manufacturers, equipment vendors and system integrators, and research institutions and consultants. A total of 70 people attended the workshop: 60 invited participants and 10 representatives of the research team and TCRP.

The workshop began with a presentation summarizing the current status of key multi-use transit projects in place or under development around the world; workshop participants involved in each project were invited to provide any further update information. The remainder of the workshop was organized around three main sessions that examined the following topics as they relate to multi-use payment media. These topics were

- Institutional and Financial Issues,
- Legal and Regulatory Issues, and
- Technological Issues.

Presentations on each topic were delivered to all of the workshop participants. Each presentation identified a set of discussion questions and, following a presentation, the participants separated into four breakout groups to discuss the questions raised for that topic. Group assignments were developed so as to (1) include roughly equal distributions of representatives of each type of entity (e.g., transit agencies and financial institutions) and (2) achieve a geographic balance. Each group was assigned a moderator and recorder. The results of the individual group discussions on each topic were summarized and presented at the end of the workshop by the moderator for each group.

Organization of Summary Report

This Appendix summarizes the results of the workshop. The following sections present an overview of the key discussion issues within each topic followed by a summary of the discussion for each group. The last section presents an overall summary of the workshop, discussing the key observations, conclusions, and recommendations identified by the discussion groups.

FINANCIAL AND INSTITUTIONAL ISSUES

The key to establishing a successful multi-use payment system is to develop a system that addresses the needs of all parties involved (i.e., transit agencies, banks, merchants, and customers). The possible arrangements that are available generally fall into three categories—closed, transit-only systems; closed, multiple-use systems; and open systems. Each of these systems is summarized as follows:

- *Closed, Transit-Only System*—Fare media are issued by transit agency and usable on the agency's services. Support functions (e.g., card production and distribution, revenue reconciliation and settlement, equipment procurement, and maintenance) may be contracted out.
- *Closed, Multi-Use System*—Fare media are issued by transit agency and can be used for other purposes. As with transit-only systems, support functions may be contracted out. Partnerships with a financial institution, equipment vendor, or other private entity also are possible.
- *Open System*—The transit agency accepts media from multiple issuers. The transit agency may be a formal partner in the arrangement or a participating "merchant." As a formal partner, a transit agency would share in the benefits and risks. As a merchant, a transit agency would have reduced risks, but would have to pay transaction fees similar to merchants that currently accept credit and debit cards.

There are various advantages and disadvantages associated with each type of system. Which type of system is best suited for a particular transit agency depends primarily on the agency's goals for the multi-use payment system, as well as the nature of interest among potential local partners.

The following were identified as key discussion questions for the groups:

- What do transit agencies and financial institutions want out of a multi-use arrangement?
- Can goals of financial institutions be reconciled with those of transit agencies?
- How should transaction fees be determined and structured?
- How should revenues versus risks be balanced?
- How should revenues be shared in a partnership?
- How can partners structure a win-win situation?

Group Discussions

The groups generally addressed the above questions, but discussions tended to focus on the differing goals and objectives that transit agencies and financial institutions hope to achieve through multi-use payment arrangements. In addition to the goals, the discussions considered the concerns of each entity. Each group discussion is summarized below.

Group A

Most of the discussion in Group A focused on the transit side of the issue. From the discussion, it was apparent that either a closed, multi-use or an open system was preferred over a transit-only arrangement. The reasons centered mainly around the cost impacts. That is, a transit-only system would not provide as much opportunity for cost sharing as the other two systems. From the perspective of the transit agency, it is the cost impacts that are most important. In addition, it was noted that the goals and objectives of transit agencies and financial institutions are considerably different. Transit's major goals were seen as follows:

- Reducing operating costs—it was felt that smart cards would greatly reduce the costs associated with handling cash, tokens, and paper tickets
- Increasing data availability—it was felt that smart cards have the ability to provide more accurate ridership statistics than are currently available
- Reducing fraud—it was felt that smart cards would provide greater security by reducing the amount of cash handled
- Increasing ridership—it was felt additional trips could be realized from the use of multipurpose media because of convenience

The goals of banks and financial institutions were seen as consisting mainly of increasing revenues through the collection of transaction fees as well as additional revenue from the float.

As a result of the discussion, the group decided that more information was needed on the cost impacts of implementing a multipurpose system. Furthermore, the group felt that case studies of existing partnerships would be beneficial in helping agencies determine which particular arrangements might work best.

Group B

The Group B discussion focused on areas similar to the Group A discussion. There also was further discussion of the role of financial institutions. Transit's major goals and objectives were seen as follows:

- Transit agencies are looking for increased ridership, which translates into increased revenue.
- Operational efficiencies translate into lower transit costs (e.g., through reducing fraud, eliminating cash handling, and improving media distribution).
- Transit agencies are looking for improved data collection and more comprehensive data.

The discussion noted that transit agencies also are concerned with factors such as customer convenience and better coordination between operators and/or modes.

From the discussion of the financial institution goals and objectives, it appears that the key issue was the banks' desire to achieve a "critical mass" of users. That is, in order for banks to consider multi-use payment systems as worthwhile ventures, there would have to be a sufficient number of users. Transit alone would not provide enough users. Additional uses (e.g., retail) would be needed to make the venture worthwhile. As such, an open system would be the ideal arrangement from a financial institution's perspective.

Other goals and objectives and issues that were of concern to the financial industry included the following:

- Ability to increase use of other bank services (co-branding, cross selling),
- Ability to have customers use the card everywhere, and
- Ability to leverage existing infrastructure (e.g., ATMs) in order to minimize costs.

From the discussion of these issues, it appears that the primary concern of financial institutions is to ensure an adequate return on any investment into a multi-use payment system.

Group C

Group C felt that an open system should be the eventual goal for a multi-use payment arrangement. However, the participants from both the transit and financial industries voiced

many of the same concerns as the other groups about this type of arrangement. Among the transit agencies' concerns are

- Cost impacts,
- Increasing ridership, and
- Improving inter-operator transfers.

One key point brought out in the discussion was that an open system could help increase transit market share by making transactions more transparent to the user, thereby reducing consumer resistance to transit.

From the perspective of the financial industry, an open system was considered attractive for the following reasons:

- Transit provides a large market base, an opportunity to get cards into people's hands.
- Transit would provide a springboard from which other applications (e.g., retail) could be launched.
- Because of its existing market base, transit provides an attractive marketplace for new technologies.

One of the drawbacks of using smart card technology that was discussed was the issue of infrastructure. Currently, financial systems are using magnetic-stripe cards. The cost of replacing magnetic with any type of smart card technology was viewed as an inhibiting factor.

Group D

The Group D discussion was also divided into the goals and concerns of transit agencies versus those of financial institutions. The goals and objectives of a multi-use arrangement for transit agencies were seen as including the following:

- Reducing fare collection costs,
- Increasing ridership and revenue,
- Improving data collection, and
- Reducing congestion.

Among transit agencies' chief concerns is that any new media must accommodate the existing fare structure (e.g., transfers and zones), which is typically more complex than retail pricing. Also, transit agencies are concerned as to who will pay the transaction fees. Cost savings or additional revenues realized from a multi-use payment system would have to outweigh the cost of transaction fees if the transit agency were responsible for paying the fee. It is unlikely that the transit agencies would pass the fee on to the rider, considering the complex process involved in setting fares.

The goals and objectives of multi-use arrangements for financial institutions identified in the group include the following:

- Increasing revenues through fees and float,
- Automating payment mechanisms,
- Displacing cash, and
- Providing additional services to users.

From the financial industry's perspective, transit provides a large pool of high-volume, low-value transactions. However, this pool provides only a base from which the financial institution can expand the system to other merchants. In order to get retailers involved, a multi-use card will need a large distribution.

LEGAL AND REGULATORY ISSUES

The legal and regulatory issues of implementing a multi-use fare payment program are influenced by four factors—business structure, escheatment laws, Regulation E, and consumer privacy. Each of these topics is summarized below.

- Business Structure—This refers to the working relationship among the various parties that are involved in a multipurpose payment system. Each party needs to carefully review any joint venture arrangement to ensure that the requirements of all parties are satisfied and that existing regulations do not preclude the public sector participants from operating in a competitive environment.
- Escheatment Laws—Escheatment laws are enacted at the state level and govern the transfer of abandoned property from holder to state. Banks and other financial institutions are familiar with these laws, but transit agencies need to be aware that funds left unspent on stored-value cards may be subject to escheatment laws. However, escheatment provisions can be legally avoided through the application of maintenance fees to remove dormant or low-balance accounts from the books.
- Regulation E—Regulation E establishes the rights, liabilities, and responsibilities of parties involved in electronic funds transfers (EFT) and provides protections to consumers using EFT systems. Although the Federal Reserve has held off on applying these constraints to stored-value cards for the time being, the ultimate application of Regulation E—if any—could dramatically affect the business case for a stored-value system.
- Consumer Privacy—The number one concern of consumers regarding the use of smart cards is the invasion of privacy that could result from that technology. A multipurpose payment application of smart card technology would be able to provide a tremendous amount of information to transit agencies. However, this increase in information must be balanced with the need to protect the cardholder's privacy.

Thus, the following discussion questions were addressed to the groups:

- What types of regulatory constraints represent barriers to multiple use arrangements?

- How will expired value and abandoned property laws affect the business case for stored value?
- How can cardholders' privacy concerns be addressed in multiple use programs?

Group Discussions

Based on the discussions of each group, it is apparent that the two most important issues were business structure and consumer privacy. The issue of escheatment was not considered paramount because the laws vary by state. Regulation E also was not considered to be a high priority since the Federal Reserve has not handed down definitive guidelines. However, most groups agreed that Regulation E was an area that transit systems needed to watch more closely in the future. Each group's discussion is summarized below.

Group A

The Group A discussion focused on the area of business structure—i.e., essentially a continuation of the earlier financial and institutional discussion. It was noted that the agreements entered into by transit systems as part of a multipurpose fare payment system must adequately define the roles of each participant. Also raised were the following concerns:

- How will costs, risks, and losses be shared among the participants in a multi-use system? How can transit agencies minimize risk?
- What are the core business conditions that transit must control?
- How will revenues of multi-use cards be shared?
- What types of financial industry regulations will come into play in a closed system involving a clearinghouse? Can transit agencies issue cards to be used in non-transit environments?

The group concluded that the roles and responsibilities that are part of the business structure of a multipurpose payment system need to be examined further.

Group B

The Group B discussion gave equal weight to the business structure and privacy issues. Regarding the business structure, the discussion focused on the fact that the expectations of transit systems and financial institutions are quite different. Some of the specific problems and concerns identified in discussing business structure include the following:

- The ability of a public agency to share the financial risks associated with implementation;
- The fact that transit agency boards concentrate on service to the public rather than infrastructure requirements;
- The fact that transit agencies have had the expectation that card costs and distribution costs will be covered by the card issuer; this has caused problems and misunderstandings in some early partnership attempts; and
- The fact that technology gets all the attention, although developing a business case is more important than identifying the best technology.

The group decided that, in order to begin to address these issues, transit agencies and financial institutions need to communicate their concerns. By doing so, they will be able to structure the roles and responsibilities in a way that addresses the needs of all participants. It was noted, however, that every partnership will be different; every financial institution and transit agency has its own requirements.

The discussion on the privacy issue centered on the need to balance the gathering of detailed trip information against not infringing on the privacy rights of the consumer. The overall consensus was that agencies should be proactive in addressing this issue: customers must be alerted to the fact that smart card technology has the capability of tracking enormous amounts of information. Therefore, customers ought to be given the choice of whether or not to have their transit usage tracked—i.e., anonymous transactions should be allowed. Of course, they must be made aware of the tradeoffs for anonymity: no refund would be possible for a lost or stolen card, and it would be difficult to offer the same types of frequent usage incentives. The group also felt that effective marketing and public information efforts probably would placate many of the fears that customers have regarding invasion of privacy.

In discussing Regulation E, it was pointed out that the Federal Reserve Board apparently is not going to impose any EFT-related regulations on stored value at the present time. Other regulatory agencies, including the Federal Deposit Insurance Corporation (FDIC), are still examining stored-value applications. In regard to deposit insurance in particular, it was noted that it is possible to have insured versus uninsured stored-value cards.

Group C

Group C determined that consumer privacy was the most important legal and regulatory issue, and the group agreed that up-front disclosure by the transit agency is the best way to mitigate consumer resistance. It was felt that additional strategies to reduce consumer resistance might include the following:

- Allow varying levels of anonymity to the consumer
- Alert the consumer to the benefits of tracking transactions (e.g., being able to obtain refunds for lost cards)
- Record transactions without recording the card number

As with Group B, the discussion concluded that the privacy issue could be effectively addressed through marketing and public information efforts. Although privacy is an extremely sensitive issue, the problems associated with it were not considered insurmountable.

In considering Regulation E, members of this group found the Federal Reserve Board ruling to be unclear; in fact, it was noted that the application of Regulation E is still somewhat confusing to the banking industry in general (e.g., does a bank need to send a customer a receipt following a home banking transaction?) With regard to the issue of escheat (abandoned property), the group noted that it was a state-by-state issue; in New York, for instance, the MTA was ruled to be an arm of the state government and was thus allowed to keep all expired value on the stored-value MetroCard. This will be less of an issue in general as agencies move increasingly to reloadable cards.

Group D

Group D also considered consumer privacy to be the most important legal and regulatory issue. As with other groups, this discussion centered on the need for transit agencies to be proactive in addressing the concerns of the riding public. Agencies do not need the identity of riders to track data, and they need to make the public aware that tracking trip information does not necessarily mean that the identity of passengers is also being tracked. The group suggested that an effective tool to address the public's concerns would be a "Customer Bill of Rights." This could take the form of a notice to the customer that is included with schedules, fare brochures, and system maps. The notice would inform the customer as to what type of data is tracked by the agency and the steps that the agency has taken to ensure that the customer's privacy rights will not be infringed. Finally, the group also discussed the possibility of allowing customers to sell their rights of privacy to the agency.

TECHNOLOGY ISSUES

The key technology issue in implementing a multipurpose payment system is the type of smart card that will be used. The types of smart cards that are available are summarized below.

- *Contact Cards*—These cards require a physical interface between the card and the reader. As a result, the transaction time is longer than contactless cards. However, the longer transaction time allows for multiple encryption keys and greater security. These cards can have a set value (i.e., prepaid) or value can be added (i.e., reloadable). The contact card is preferred by banks and other types of financial institutions because of its greater level of security.
- *Contactless Cards*—These cards communicate with the card reader via a low-level radio frequency (RF). This allows a faster transaction time, but also reduces the security of the card. As with contact cards, these can be prepaid or reloadable. At present, the cost of contactless cards is higher than that of comparable contact cards. The contactless card is preferred by the transit industry because of its faster transaction time and the absence of moving parts in card accepting devices.
- *Combi (or Dual Interface) Cards*—These cards combine the features of the contact and contactless cards and can take either of two basic forms: a "hybrid" card containing two microchips or a combi/dual interface card with a single chip. In each form the card can be used in either a contact or contactless environment. As a result, the faster transaction times required by transit systems and the greater security required by banks both can be accommodated.

Key discussion questions identified for the groups were as follows:

- What types of applications should be on the card, and what are the technical implications?
- What types of standards and specs are needed, and how should they be developed?
- What are the barriers to integration of smart cards into existing systems?

Group Discussions

Group A

The consensus in Group A was that combi-cards are the best solution to address the differing needs of transit agencies and financial institutions. The group noted that technology is not the limiting factor here; institutional and financial issues are currently the most critical factors affecting multi-use arrangements. The major technology-related concern discussed dealt with the issue of standards for the varying applications. The group felt that it is important to set "standards" for equipment across the transit industry, although uncertainties regarding future changes in the technology suggest that it is preferable to establish general guidelines (or functional requirements) rather than specific parameters. The transit industry should allow the technology vendors to devise the actual technical specifications.

Group B

The Group B discussion covered a range of technology issues, including the following:

- Combi-Cards—Are these just a transitional technology? Will faster contact card processors eliminate the need

for separate environments (i.e., contact versus contactless)?
- Security—How large is the gap between contact and contactless security levels?
- Specifications—Transit agencies need to define their requirements.

As in other groups, technology per se was not seen as the limiting factor in developing multi-use arrangements. For example, the use of contact cards at MARTA was discussed; it was pointed out that the use of contact cards there was not seen as an end solution, but rather an experiment in a changing environment. It was also noted that Visa is involved in the consideration of integrating contactless technology at some point. On the other hand, the assumption was stated that financial institutions will retain contact cards for the foreseeable future; consumers like the opportunity to accept or decline a transaction. Apart from the discussion of these topics, the group also saw the need for a collective demonstration project involving large and small transit systems. The goal of such a project would be to show that this technology could be implemented in systems of any size.

Group C

The Group C discussion focused on two areas: combi-cards and standards. Combi-cards were viewed as the best alternative for a multi-use card. As such, separate fund pools could be used depending on the application (i.e., transit, retail, or banking). Furthermore, it was suggested that these pools should be transparent to the user. That is, the customer should not have to transfer funds among various functions. Rather, the customer would have one purse that could respond to various applications having different security and speed requirements.

With regard to standards, the consensus among the group was that the federal government should not attempt to create a set of transit-specific standards. Rather, the financial industry ought to define the standards for the multi-use card. What is needed is a method for transit agencies to use and manage their "space" on the card.

Group D

Like other groups, Group D noted that multi-use applications are not constrained by technology, although the complexity and rate of change of the technology can make procurement difficult. The focus of the Group D discussion was on the issue of standards. Currently, standards for smart card technology do not exist, as each vendor has its own proprietary technology. As a result, transit systems get "locked into" a particular technology supplied by a specific vendor. An environment in which there were open standards would free transit systems from being trapped into an agreement with one particular vendor.

SUMMARY AND CONCLUSIONS

The purpose of bringing together representatives of the various types of entities concerned with implementing multi-use payment media was to facilitate identification and discussion of the key issues that need to be addressed in developing multi-use arrangements. Based on review of the discussions and feedback from many of the participants, the Multi-Use Payment Media Workshop was very successful in allowing the different entities to hear about and discuss other industries' concerns and goals related to introduction of joint payment programs as well as the introduction of smart cards in general. The workshop was attended by senior managers at most of the largest U.S. transit agencies, as well as officials representing a number of major financial institutions, government officials, researchers and consultants, card manufacturers, and system integrators. Thus, decision-makers associated with most of the existing, currently developing, and potential multi-use programs were able to develop a better understanding of the existing barriers as well as the next steps necessary to address these barriers and expand such programs.

Although the group discussions touched on a range of topics, and different groups produced somewhat differing recommendations on certain issues, there were a number of key observations and conclusions that were generally voiced within all of the groups. The key conclusions and recommendations from the workshop can be summarized as follows.

Goals and Objectives, Transit Versus Financial

All of the groups found merit in the basic concept of joint transit and financial institution payment programs. While it was acknowledged that financial institution participation could take various forms, including contract clearinghouse operation as well as full public-private partnership, most of the participants seemed to feel that an "open" payment system should be the ultimate goal for such programs. Transit systems should be able to reduce costs by reducing the amount of cash and paper media that are handled. Banks and other financial institutions have the existing infrastructure to handle the settlement and clearinghouse functions and will benefit from the potentially large user base that transit can provide. However, all of the groups expressed concerns that the basic goals and objectives of transit agencies and financial institutions with regards to a multi-use arrangement are inherently different and that this fact must be carefully considered. The major goals and objectives noted in the discussions, along with related concerns, are summarized in Table D-1.

While transit agencies are primarily concerned with maximizing operating efficiency and effectiveness (e.g.,

TABLE D-1 Summary of institutional and financial goals and concerns

ENTITY	GOALS/OBJECTIVES	CONCERNS
Transit Agency	Reduced operating costs Improved data collection (i.e., ridership statistics more accurate and current) Reduced fraud Increased market share and ridership Increased revenue Seamless (inter-operator) transfers	Customer acceptance Coordination among operators and/or between modes Cost impacts, including payment of transaction fees Ability of new media to accommodate existing fare structures Need for wide distribution network
Financial Institution	Increased revenue from transaction fees and float Achievement of critical mass of users Creation of large pool of high volume, low value transactions Increased use of other bank services Provision of additional services to users	Cost of replacing existing infrastructure with new technology Ensuring an adequate return on investment Need to get other merchants involved, since a multi-use card needs a large distribution and usage network Customer acceptance, based on ability to use in many locations

through reducing costs and increasing usage), and financial institutions are ultimately concerned with return on investment, Table D-1 reveals that the individual goals and concerns may not be as different as many of the participants initially suggested. Transit agencies are also interested in generating additional revenues (through increasing ridership as well as perhaps through multi-use arrangements), and financial entities are obviously concerned with increasing market share, as well as with containing expenses. What was made clear by the groups is that more information on cost and revenue impacts of multi-use arrangements is needed (i.e., through implementing and evaluating a range of pilot projects).

Major Requirements and Issues to be Resolved

Issues were discussed within three basic categories, Institutional and Financial, Legal and Regulatory, and Technological. All of the groups agreed that the most difficult issues to address fall under the former two categories, i.e., that technology-related issues can be more easily resolved at this point than those related to development of appropriate financial agreements and addressing certain regulatory concerns. The general consensus among the groups was that the following are the major requirements and issues to be addressed in developing multi-use payment programs.

Development of an Appropriate Business Structure

The groups all generally agreed that probably the key challenge in developing a successful partnership or other arrangement is to establish a workable business structure and financial agreement. This includes the need to (1) ensure that the roles and responsibilities of the participants in a multi-use program are clearly defined; (2) identify how the costs, risks, and benefits will be shared among the participants; and (3) ensure that federal or state regulations do not preclude the transit agency from participating in a joint public-private venture. A key aspect of any agreement will be the expected return on investment for the financial sector partner as well as identifiable benefits for the transit agency, as described under Goals and Objectives, above.

Dealing with Consumer Privacy Concerns

Smart card technology has the ability to store and track a vast amount of information pertaining to the consumer's usage habits. As such, the groups expressed concern that consumers will feel that their privacy rights are being violated when they use smart cards. On the other hand, it was also generally felt that consumer concerns regarding privacy rights can probably be largely mitigated through effective

marketing and public information efforts. For instance, it is important to point out that with anonymous transactions it may not be possible to provide refunds for lost or stolen cards. It was the general consensus among the groups that agencies should be proactive in addressing privacy concerns (i.e., by identifying the tradeoffs and perhaps giving consumers the choice as to whether or not to allow their detailed transaction information to be tracked).

Development of Standards and Guidelines for Multi-Use Programs

There was considerable discussion within all of the groups regarding the need for standards in payment media, although the specific recommendations differed somewhat from group to group and within groups. There was a general consensus that the absence of industrywide standards for smart card technology complicates procurement of new technology by transit systems, since this tends to result in an agency being "locked into" an agreement with a particular vendor. Furthermore, the lack of standards hinders interoperability in a region where transit operators are using equipment from different vendors.

With regard to recommendations, the smart card manufacturers and financial institutions generally expressed the desire for the transit industry to define their functional requirements for smart card applications. Currently, the manufacturers and financial institutions have to address the individual requirements of each transit system; establishing functional specifications for the transit industry would help both groups address the needs of individual transit systems more effectively. Three of the groups generally supported the notion that the transit industry should develop its own requirements or at least guidelines and should allow the vendors to design the actual technical specifications. The fourth group, however, was of the general opinion that the financial industry should be defining the standards for a multi-use card, although this group agreed that the transit industry does need guidelines for using and managing transit applications on open system multi-use cards.

Despite the lack of standards on both the transit side and the manufacturer side, however, the consensus among the groups was that the various applications within a multi-use system were not limited by the available technology. The use of combi-cards would address the needs of the transit industry for fast transactions using a contactless interface as well as the needs of the financial industry for transactions using a contact interface.

OVERALL CONCLUSIONS

While the workshop participants identified a number of important issues that need to be addressed in developing multi-use arrangements, no barriers were identified as being insurmountable. The discussion groups all seemed to feel that what is needed most at this time is demonstrations of the various types of multi-use arrangement—in a range of settings—accompanied by evaluations of the full range of costs and benefits. Several projects are in development in the United States and these will be observed closely by both the transit and financial industries over the next few years. A number of the workshop participants also felt that more meetings along the lines of this workshop (i.e., facilitating direct discussion among representatives of both the transit and financial industries) would be beneficial.

The major points raised during the workshop can be summarized as follows:

- Pilot projects, involving both large and small transit systems, are needed to determine the actual costs and potential benefits of multi-use payment programs to all parties involved.
- Consumer privacy is a serious concern. Agencies need to be proactive in addressing this issue.
- The roles and responsibilities of the project participants need to be defined early in the project development in order to develop a sensible operating structure and business arrangement.
- The combi-card is a suitable option for an open multi-use payment system, as it meets the needs for fast transaction for transit use and more secure transactions for financial use.
- The transit industry should define the functional requirements for multi-use payment media in order to enable the technology vendors and financial institutions to adequately address their needs.