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Investigating Institutional Aspects of Multi-Agency Transit Operations-Review of the Literature

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CALIFORNIA PATH PROGRAM  
INSTITUTE OF TRANSPORTATION STUDIES  
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# **Investigating Institutional Aspects of Multi-Agency Transit Operations— Review of the Literature**

**Amy Lam**

**Mark A. Miller**

**California PATH Working Paper  
UCB-ITS-PWP-2002-3**

This work was performed as part of the California PATH Program of the University of California, in cooperation with the State of California Business, Transportation, and Housing Agency, Department of Transportation; and the United States Department Transportation, Federal Highway Administration.

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

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**Amy Lam**

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**March 1, 2002**

## **ACKNOWLEDGEMENTS**

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## **ABSTRACT**

Transit systems have traditionally been developed independently from one another, certainly across different regional jurisdictional boundaries, however, even within the same regional jurisdictional boundary where the ramifications of this are most significantly felt. Little attention has been given to coordination, integration, or interoperability between and among systems. As a result, customer satisfaction, market share and public transit relevance has continued to decline. This report, which presents the findings from our literature review of the topic of multi-agency transit operations, describes the motivation for fundamental change in transit operations and the need to enhance coordination among transit agencies. Significant institutional barriers to coordination are identified, along with the role of various stakeholders in either facilitating or inhibiting inter-agency coordination among transit operators. It is found that intelligent transportation systems (ITS) can play a substantive role in the enhancement process of inter-agency coordination within the transit industry in terms of providing a customer-focused and streamlined public transportation system. Intelligent transportation systems can also help in eliminating institutional barriers because it can be seen as a medium through which transit agencies can coordinate with other agencies in order to reap the benefits of implementing ITS on a regional basis. Two particular aspects of transit operations, namely customer information dissemination and fare collection, have the proven capabilities to help encourage coordination among transit service providers.

The report also discusses in detail, the factors that have contributed to successful examples of coordination of multi-agency transit operations and the two primary mechanisms through which such coordination has been performed: formal and informal models. Most important of these factors appear to be the establishment of a common vision among all stakeholders, leadership and persistence of individuals, and the ability to seize the opportunities provided by new technologies such as ITS to improve multi-agency transit operations.

Keywords: transit operations, institutional issues, regional coordination

## **EXECUTIVE SUMMARY**

Transit systems have traditionally been developed independently from one another, certainly across different regional jurisdictional boundaries, however, even within the same regional jurisdictional boundary where the ramifications of this are most significantly felt. Goals and objectives have tended to remain separate and little attention has been given to coordination, integration, or interoperability between and among systems with the existence of discernable brand loyalty barriers among others. As a result, customer satisfaction, market share, and public transit relevance has continued to decline. With coordination becoming an ever more important and essential component for regional transit as a backdrop, we have been motivated to undertake this project, whose objective is to study the institutional aspects of multi-organizational transit operations to understand, through case studies, what multi-agency transit operational frameworks have been developed, their relative level of effectiveness, the institutional gaps and barriers that have been resolved, and the contribution intelligent transportation systems have/can make to resolve these barriers, and to develop a generic model or set of models can be proposed for California.

This report presents findings from the literature review considering the motivation for fundamental change in transit operations, the need to enhance coordination among transit agencies, significant institutional barriers to coordination and the role of various stakeholders in either facilitating or inhibiting inter-agency coordination among transit operators. The role intelligent transportation systems play in bridging these gaps and resolving these issues across different transit operational systems is also discussed.

For the past thirty years, the organizational structure, operations and management of public transportation systems have largely remained unchanged in a rapidly changing economy and society. As we have progressed into the information age, the need for fundamental change is increasingly clear. Motivation for fundamental changes in transit operations and for increased coordination among transit operators originate from chronic problems associated with existing business processes and organizational structures. Public transportation service providers in many regions of the United States, whether urban or suburban, have been experiencing a declining

market share and relevance in the provision of mobility to the traveling public. Although in recent years, transit ridership has increased marginally in some regions of the United States because of population growth, the growth apportioned to single-occupancy vehicle trips far exceeds that of transit passenger trips. Other critical issues inherent in current public transportation systems include fragmented roles and responsibilities among transit operators leading to a poor public image, lack of responsiveness to changes in market demand, and the limited adaptability to changes resulting from the enormous growth of the information-age. Several factors that have contributed to economic and societal changes have also had significant implications for local transit agencies in terms of maintaining transit's relevance and ability to serve society. The urgency to satisfy changing societal needs and to increase the relevance of transit services have become driving forces for a shift toward greater coordination and interoperability among transit operators.

Transit operators are now responsible for not only managing their own assets in their provision of transit services, they are also responsible for managing mobility and access for customers across different service districts. The shift to focus strategically on customer service (quality, service and convenience) becomes inevitable and essentially drives fundamental changes in business operations and organizational structure among transit operators. Sometimes the use of assets owned and operated by former competitors and the creation and expansion of partnerships among operators can serve to be more responsive to customer needs than through a single operator.

Not only do customers expect improvements in transit operations and coordination, the federal government's expectation for fundamental change is clearly established by the enactment of Intermodal Surface Transportation Efficiency Act in 1991 and the Transportation Equity Act for the 21<sup>st</sup> century in 1998.

Although there is widespread, consensual expectation for improved coordination among transit agencies, significant institutional barriers hinder the regional extent of such coordination. Some of these barriers include: satisfaction with the status quo, inertia and overall resistance to change, lack of a common vision among interdependent agencies, increasingly political nature of

transportation decision-making that complicates the redistribution of power, authority, and control in any coordination format, inflexible funding arrangements and most important of all, lack of an enabling environment to foster fundamental change. Most of these barriers are deeply rooted in existing individual organizational frameworks of transit agencies that govern the interaction among them. The institutional landscape under which public transportation services are provided is complex and involves many stakeholders with varying influence on the decision-making process. In the provision of transit services, an inter-governmental partnership among federal, state, local, regional and legislative authorities is needed with the common goal of serving the traveling public. Regarding transit funding, the federal government covers most of the capital investment whereas paying customers along with state and local governments cover most of the operating costs. The division of responsibilities among various stakeholders for providing transit services is as follows: (i) federal government sets the overall policy, objectives and institutional framework for providing transit services, (ii) most states now act as funding partners by participating actively in transit planning and resource allocation, (iii) local governments for counties and municipalities either directly own and operate or indirectly fund local transit investment, (iv) metropolitan planning organizations (MPOs) provide technical advice, rank projects and write fiscally constrained long-range plans, (v) legislative bodies enact legislation that dictates the public policy environment under which transit services are planned and operated. These governmental bodies play a significant role in the reconciliation of the institutional landscape that is more open to fundamental change.

The traveling public, the common customer of separate transit agencies, is the ultimate link that brings transit agencies and various levels of governments together in a collaborative effort to improve the existing public transportation system. Once customers make known their traveling needs and how the transit system can be better coordinated to provide efficient and convenient services, local transit agencies need to be responsive to the public's demands. Transit operators will ultimately benefit from increased interagency collaboration in terms of more cost-efficient and effective operations, decreased operating costs and increased customer satisfaction.

After identifying the institutional barriers to coordination, along with the role of various stakeholders in either facilitating or inhibiting inter-agency collaboration among transit



operators, it is also evident from the literature that intelligent transportation systems (ITS) can play a substantive role in the enhancement process of inter-agency coordination within the transit industry by providing a customer-focused and streamlined public transportation system. ITS and particularly Advanced Public Transportation Systems (APTS) can be utilized to improve personal safety through on board surveillance cameras and silent alarm/covert microphone, to provide customer information using traveler s information systems, and to coordinate fare payment using smart card technologies. Intelligent transportation systems provide the technological tools that give transit organizations the opportunity to measure individual customer needs against the quality of services rendered. Real-time information that links market requirements (i.e. customer needs) with service quality results in customer-based performance measures that help increase accountability of transit agencies to their customers. Knowledge of the traveler s experience can then be incorporated into the strategic planning and design of transit operations to improve the quality and efficiency of service.

ITS can also help in eliminating institutional barriers because it can be seen as a medium through which transit agencies can coordinate with other agencies in order to reap the benefits of implementing ITS on a regional basis. Two particular aspects of transit operations, namely customer information dissemination and fare collection, have the proven capabilities to help encourage coordination among transit service providers.

After analyzing the potential of ITS to encourage interagency coordination, the report then classifies interagency coordination formats into two categories, namely formal and informal coordination. Specific successful case studies are then discussed for both types of coordination. Formal coordination generally involves the creation of a regional organization that is specifically designed to facilitate cooperation among many transportation agencies, regardless of whether the coalition is developed for a specific project or for long-term, regional management of the transportation system. Another characteristic of formal coordination is the existence of either (a) formal agreement(s) reached by all the member agencies or legislation that dictates roles and responsibilities of each agency within the coalition. The decision-making process of formal coordination, however, can range from centralized control by a single organization to a collaborative, consensus-based format.

Successful case studies of formal coordination discussed in the report include: Hamburg, Germany, *Transport for London*, Netherlands/Dutch National Railways, Greater Vancouver Transportation Authority (GVTA), San Francisco Metropolitan Transportation Commission (MTC), SMART Corridors Program in San Francisco Bay Area, and NY-NJ-CT TRANSCOM. Contributing factors essential to successful formal coordination as shown in the case studies may include the following:

- Established tradition of cooperation among agencies;
- Single source of responsibility for strategic planning and general policy guidance: a regional organization with strong leadership;
- Clear division of roles and responsibilities among agencies
- Strong policy or legal framework requiring coordination;
- Long history of centralized control
- Established common goal and vision: customer-oriented approach and regional perspective to providing an effective transportation system;
- Availability of suitable technologies to spur institutional and operational changes;
- Consensus- and compromise-driven decision making process

The second category of interagency collaboration is informal coordination. Instead of achieving interagency coordination via a well-structured coalition or a regional organization, informal coordination provides an alternative approach to encouraging cooperation among agencies on an ad hoc basis. Recent studies suggest that the more informal linkages between organizations may better serve the public's interests than a large central authority. Successful case studies of informal coordination that are discussed include: AC-BART Busbridge Emergency Agreement and BART-AC, San Francisco MUNI and SamTrans Routing Arrangements.

Contributing factors to successful *informal* coordination include the following:

- Interorganizational interdependence;
- Mutual trust and similar corporate values among agencies;
- Culture of reciprocity (people should help those who have helped them);
- Personal contacts and networks serve as informal channels;

- Chance or serendipity: often informal relationships develop outside of individuals work and in turn, provide further opportunities for informal coordination at work
- Willingness to permit informal channels as facilitated by management style of each agency, i.e. agency executives allowing subordinates to make operational decisions and to coordinate service with personnel from other agencies
- Motivation to coordinate: organizations will coordinate if there are extrinsic benefits for all parties involved such as expedited services as well as intrinsic benefits such as increased customer satisfaction and ridership
- Lower turnover of personnel allows organization to retain institutional memory , i.e., knowledge of previously established informal ties

Informal coordination is the cumulative result of many individual decisions that work under conditions favoring development of informal ties. Informal channels provide the means through which coordination can occur, sometimes without any direct or formal procedures. Informal mechanisms can address transit needs that arise from inherent interdependencies among particular operators.

The key factors helping to create an enabling environment for interagency coordination appear to be the establishment of a common vision among all stakeholders, leadership and persistence of individuals, and the ability to seize opportunities provided by new technologies to improve multi-agency transit operations.

The next phase of the project is to select regionally-based sites and then perform more issue-specific case study analyses with respect to the level of coordination used among the transit agencies with each of these case study regional sites.

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## 1.0 INTRODUCTION

Transit systems have traditionally been developed independently from one another, certainly across different regional jurisdictional boundaries, however, even within the same regional jurisdictional boundary where the ramifications of this are most significantly felt. Goals and objectives have tended to remain separate and little attention has been given to coordination, integration, or interoperability between and among systems with the existence of discernable brand loyalty barriers among others. Yet more recently there have been attempts to enhance inter-agency coordination. Moreover, intelligent transportation systems can play a substantive role in this enhancement process. For example in the San Francisco Bay area, the following four intelligent transportation system applications have contributed to bridging institutional gaps among the myriad of public transportation agencies in the Bay Area and illustrate different approaches that can be taken to help establish and encourage coordination, integration, and interoperability among regional transit agencies:

- *TravInfo*<sup>®</sup> advanced traveler information system currently transitioning between Field Operational Test and full scale regional deployment
- *TransLink*<sup>®</sup> Smart Card Demonstration Project allowing for a single electronic fare card among the major Bay Area transit properties
- *TranStar* online trip planning tool on the Internet
- *Transitinfo.org* Web site provides links to the Web site of each participating transit agency

In this project, our aim in studying the institutional aspects of multi-organizational transit operations is to understand what multi-agency transit operational frameworks have been developed, their relative level of effectiveness, the institutional gaps and barriers that have been resolved and those remaining, development of a generic model or set of models for California, and an understanding of the role intelligent transportation systems play in bridging these gaps and resolving these issues across different transit operational systems.

Accounting for institutional barriers between and among transit agencies within a given region plays an important role in determining the effectiveness of that region's transit service providers. Thus, an inquiry into these institutional barriers and gaps and the ways in which transit agencies deal with them and work to resolve these issues is essential to gain a more complete understanding of the multi-agency transit setting.

The approach taken during this project consists of three phases. First, a general or high-level assessment of the relevant issues has first been ascertained through a review of the literature. The second phase will be conducted through an analysis of primarily Web-based data on regional transit coordination issues for our selected regional case study sites. The third and final phase will consist of follow-up analyses through an institutionally focused survey to be administered to the organization members, i.e., transit properties and coordinating agencies for some of the regionally-based case studies.

The remainder of this report documents our review of the literature. Section 2 discusses the motivation and need for change toward enhanced levels of coordination within the transit industry. Section 3 discusses institutional barriers to coordination followed by the role of stakeholders in coordination in Section 4. Discussion of the ways intelligent transportation systems may contribute to resolving institutional barriers is presented in Section 5. The two primary mechanisms for coordination, formal and informal, are discussed in Sections 6 and 7, respectively. Section 8 presents key factors to support enhanced coordination. Finally, the remaining project tasks are briefly summarized in Section 9.

## **2.0 MOTIVATION FOR FUNDAMENTAL CHANGE AND THE NEED FOR COORDINATION**

For the past thirty years, the organizational structure, operations and management of public transportation systems have largely remained unchanged in a rapidly changing economy and society. As we have progressed into the information age, the need for fundamental change is increasingly clear and exigent. Motivation for fundamental changes in transit operations and for increased coordination among transit operators originate from chronic problems associated with



existing business processes and organizational structures. Public transportation service providers in many regions of the United States, whether urban or suburban, have been experiencing a declining real market share and relevance in the provision of mobility to the traveling public. Although in recent years, transit ridership has increased marginally in some regions of the United States because of population growth, the growth apportioned to single-occupancy vehicle trips far exceeds that of transit passenger trips. Other critical issues inherent in the current public transportation system include fragmented roles and responsibilities among transit operators leading to a poor public image, lack of responsiveness to changes in market demand, and the limited adaptability to changes resulting from the enormous growth of the information age. The urgency to satisfy changing societal needs and to increase the relevance of transit services have become driving forces of a paradigm shift toward greater coordination and interoperability among transit operators. According to the New Paradigms Project conducted by the Transit Cooperative Research Program (TCRP Report 53 — See Reference 1), the current and emerging circumstances require fundamental reinvention of how public transportation services are organized, designed and delivered. <sup>1</sup> The study also concluded that [w]ithout changes in the enabling environment [as fostered by progressive transportation policies such as fundamental changes in existing institutions, statutes, regulations, financial resources and public attitudes], the transportation system would continue down the path of incremental change, <sup>2</sup> rather than enable the kind of paradigm shifts that would bring us to a truly sustainable transportation system. ( 1). The following sections (2.1-2.7) examine each motivating factor of fundamental change in greater detail.

## **2.1 Marginal Performance, Declining Market Share, Stagnant Ridership**

Vehicle-miles of traveled (VMT) by personal vehicles has increased approximately 131% from 1970 to 1995 whereas population only increased by 32% during the same time period in the

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<sup>1</sup> Quote cited by Reference 1 is originally found in Innovation Briefs, Volume 8, Number 7, September/October 1997.

<sup>2</sup> Quote cited by Reference 1 is originally found in A Paradigm for Addressing Change in the Transportation Environment by Deen, Thomas B. and Skinner, Robert E., Jr. TR News, Transportation Research Board, September — October, 1994, pp.11-13, Washington, DC.

United States (Reference 2). As a result of the dramatic increase in travel demand while increases to center-line road capacity over the same period has only increased 6%, widespread congestion remains a major concern of urban and suburban areas and higher expectation is then placed on the role of transit to relieve congestion and increase the efficiency of existing transportation networks. Although public expectations of the quality and scope of transit services are rising, the performance of public transportation has only been marginal as indicated by long-term stagnant ridership statistics. Since 1900, two peak periods of high transit use in the range of 17 to 23 billion passengers per year were observed. These are namely during World War I and the post-War economic boom period (1915-1929) and the period during and beyond the Second World War (1942-1949) (Reference 3). Since the end of the second peak period, ridership quickly declined for the next 25 years due in part to the growth of the suburbs, which was encouraged by the government's policies favoring low-density suburban growth such as under-priced fuel and subsidized single-family housing mortgages. It appears that the post-World War II decline in transit use has ended and ridership is more or less stable, which when coupled with continued population growth, the effective transit market share is still probably declining given that more of the increased population uses the private vehicle or other modes of transportation rather than transit. From the 1995 National Personal Transportation Survey, less than 10% of all passenger trips in North American cities are made by public transit. Modal split of trips to work by transit in the year 1992 was only 5.1%.

Service overlaps and network gaps between service boundaries, lack of coordinated schedules and lack of a coordinated regional single-fare system have resulted from different transit operators providing services within overlapping service boundaries in a region and have all contributed to a sub-optimal performance of transit (4).

The San Francisco Bay Area with twenty-four transit operators serving nine counties is a classic example of the complexity of service operations when a large number of players are involved in the provision of public transportation services. Service overlaps and network gaps are often found in such a region. For instance, the rail transit operator in the Bay Area, Bay Area Rapid Transit (BART), has parallel surface transit in much of its service network with other local service transit providers, such as Alameda and Contra Costa County Transit (AC Transit). There

are also network gaps between the boundaries of service areas for these two transit service providers where no transit services are provided.

## **2.2 Fragmented Roles and Responsibilities; Poor Public Image**

With uncoordinated transit operations in the complex political arena made up of transit operators, governmental agencies at various levels (local, regional, state, and federal), policy-making organizations and regulatory agencies, the responsibility for funding, operating, guiding and regulating public transportation services for various service areas are often overlapping and fragmented. The complex fragmentation of roles creates a critical barrier against coordination and public responsiveness. Often the complicated transportation decision-making processes confuse the traveling public, who lacks a complete understanding of the organizational structure and division of responsibilities among different agencies. These agencies are therefore perceived as limited in accountability and responsiveness to the changing needs of the public.

Contradictory goals, agendas, policies and regulations often limit the agencies ability to reduce cost and increase revenue while raising quality and range of service from the perspective of the transit rider.

Fragmentation of responsibilities among transit agencies also makes it unclear which organization should be in charge of bringing fundamental change and state-of-the-art information technology into an urban transportation arena. This fragmentation again hinders the ability of the agencies to adapt and respond quickly to changing transportation needs via service integration and performance improvements.

## **2.3 Public Need for Increased Accountability and Responsiveness**

There is broad-based public concern for governmental accountability in which [S]pecific suggestions included consolidating planning agencies and plans, consolidating transit service providers, and defining clearer authority for each transportation agency. Participants [of MTC s

public outreach campaign] also requested more regional leadership from MTC. ( 5). The public demands greater responsiveness from local transit organizations including:

- Enhanced knowledge of today s travel markets;
- Greater variety and differentiation in products and services;
- More effective delivery processes;
- Higher level of integration across services and organizations; and
- Increased accountability in where and how service is provided ( 1)

Note: MTC is the acronym for the San Francisco Bay Area s Regional Transportation Planning Agency, namely, Metropolitan Transportation Commission.

## **2.4 Restructuring Economy and Society**

Economic and societal restructuring may be seen from the following trends: (1) the shift from industrial or manufacturing to service and information- and service-based economy, (2) growing income gap among workers, (3) commuting patterns more dispersed spatially and temporally with more flexible work schedules and more sprawl occurring at the urban fringes, (4) increasing proportion of women in the labor force and (5) increased diversity in demographics. Tables 1 to 7 list the facts of the restructuring economy and society and their corresponding implications for local transit agencies. Note that these tables are directly extracted from Reference 1 (TCRP Report 53) that summarized findings of Reference 6 (TCRP Report 28, Transit Markets of the Future: The Challenge of Change ).

**TABLE 1 Implications of the Shift from Manufacturing-Based to Service-Based Economy**

<b>Facts</b>	<b>Implications</b>
<ul style="list-style-type: none"> <li>▪ 1970 — 1990: 73% growth in service jobs nationally; 2% growth in manufacturing jobs</li> </ul>	<ul style="list-style-type: none"> <li>▪ The most rapidly growing job market cannot be served effectively with traditional transit</li> </ul>
<ul style="list-style-type: none"> <li>▪ 72% of civilian employees are in the services sector</li> </ul>	<ul style="list-style-type: none"> <li>▪ Traditional transit services do not provide convenient access to typical service employment sites</li> </ul>
<ul style="list-style-type: none"> <li>▪ Retail trade expected to replace manufacturing as second largest employment category</li> </ul>	<ul style="list-style-type: none"> <li>▪ Traditional transit services do not adequately cover typical service job hours and schedules</li> </ul>
<ul style="list-style-type: none"> <li>▪ Service sector job growth is diffused/dispersed, not concentrated</li> </ul>	<ul style="list-style-type: none"> <li>▪ The most rapidly growing job market cannot be served effectively with traditional transit</li> </ul>
<ul style="list-style-type: none"> <li>▪ Service businesses tend to be smaller in size</li> </ul>	<ul style="list-style-type: none"> <li>▪ Diffused travel demand and less concentrated trip-making reduces the efficiency of traditional transit services</li> </ul>
<ul style="list-style-type: none"> <li>▪ In more densely developed old or urban areas, the effect on travel behavior of the shift to a service-oriented economy may be less pronounced</li> </ul>	<ul style="list-style-type: none"> <li>▪ Density and development mix continue to support traditional transit systems and sources</li> </ul>

**TABLE 2 Implications of Growing Income Gap**

<b>Facts</b>	<b>Implications</b>
<ul style="list-style-type: none"> <li>▪ Service sector requires both highly paid knowledge workers and low paid support workers, resulting in a growing wage gap</li> </ul>	<ul style="list-style-type: none"> <li>▪ The traditional low-income transit dependent population will grow and require service</li> </ul>
<ul style="list-style-type: none"> <li>▪ 70% of service workers are not in well-paid jobs</li> </ul>	<ul style="list-style-type: none"> <li>▪ Service-oriented job access will be diffused/dispersed</li> </ul>
<ul style="list-style-type: none"> <li>▪ The wage gap will result in growing numbers of low-income workers concentrated in minority populations</li> </ul>	<ul style="list-style-type: none"> <li>▪ Inattention to transportation needs of low-income persons may have large public costs in other areas — health welfare, unemployment, law enforcement, etc.</li> </ul>

**TABLE 3 Implications of Increasingly More Dispersed Commuting Patterns**

<b>Facts</b>	<b>Implications</b>
<ul style="list-style-type: none"> <li>▪ 25% of workers have a flexible work schedule</li> </ul>	<ul style="list-style-type: none"> <li>▪ Traditional fixed route, fixed schedule transit services are of limited usefulness to increasingly large part of the work force who have a temporally dispersed commuting pattern</li> </ul>
<ul style="list-style-type: none"> <li>▪ 90% of new jobs created monthly are involuntary part-time jobs</li> </ul>	<ul style="list-style-type: none"> <li>▪ Places and hours of employment change regularly</li> </ul>
<ul style="list-style-type: none"> <li>▪ 40% of all women workers do not have a typical day-shift job</li> </ul>	<ul style="list-style-type: none"> <li>▪ Access to jobs must be available over non-standard hours</li> </ul>
<ul style="list-style-type: none"> <li>▪ The rise in the flexible labor force reflects economic hardship</li> </ul>	<ul style="list-style-type: none"> <li>▪ The ability to pay for transportation is diminished for a major segment of the job market</li> </ul>

**TABLE 4 Implications of More Women in the Work Force**

<b>Facts</b>	<b>Implications</b>
<ul style="list-style-type: none"> <li>▪ Over 60% of all women have paid employment</li> </ul>	<ul style="list-style-type: none"> <li>▪ Women's travel is more likely to include linked or chained trips that increase auto dependency in the absence of useful options</li> </ul>
<ul style="list-style-type: none"> <li>▪ Less than 33% of married women were employed in 1960; in 1990, the figure is nearly 60%</li> </ul>	<ul style="list-style-type: none"> <li>▪ Auto dependence has grown in a key sub-market</li> </ul>
<ul style="list-style-type: none"> <li>▪ By 1990, more than 44% of all mothers returned to work before their babies were 6 months old</li> </ul>	<ul style="list-style-type: none"> <li>▪ Changing family structure is reinforcing auto dependence</li> </ul>
<ul style="list-style-type: none"> <li>▪ Work force participation by women is higher among minority groups than for whites, but is increasing for all groups</li> </ul>	<ul style="list-style-type: none"> <li>▪ Income and ethnic characteristics may provide a counter balance to gender in terms of transit's appeal</li> </ul>

The increasing diversity in demographics is a direct result of some the following factors:

- Growth in the aging population

- Growth in single parent households
- Growth in single-adult households
- Migration and immigration

All of these factors have significant implications for the relevance and role of traditional transit services. The above demographic trends are examined in Tables 5 - 7 along with the implications they have on the part of local transit agencies to respond effectively to changing demographics.

**TABLE 5 Implications of Growth in the Aging Population**

<b>Facts</b>	<b>Implications</b>
<ul style="list-style-type: none"> <li>▪ The elderly are the fastest growing component of U.S. population</li> </ul>	<ul style="list-style-type: none"> <li>▪ Requirements for access, assistance and travel options will increase</li> </ul>
<ul style="list-style-type: none"> <li>▪ In 1990, more than 25% of the population was over 60 years old</li> </ul>	<ul style="list-style-type: none"> <li>▪ The work trip and services designed to accommodate it are no longer important</li> </ul>
<ul style="list-style-type: none"> <li>▪ By the middle of the next century [the 21<sup>st</sup> century], it is possible that 50% of the population could be over 50 years old</li> </ul>	<ul style="list-style-type: none"> <li>▪ Safety is of increasing concern because of reliance on personal vehicles</li> </ul>
<ul style="list-style-type: none"> <li>▪ In 1992, 90% of men and 70% of women were licensed drivers</li> </ul>	<ul style="list-style-type: none"> <li>▪ Reliance on personal vehicle use into old age is taken for granted</li> </ul>
<ul style="list-style-type: none"> <li>▪ The elderly tend to remain in locales where they lived while working</li> </ul>	<ul style="list-style-type: none"> <li>▪ Personal services may not be as easily accessed by the elderly</li> </ul>
<ul style="list-style-type: none"> <li>▪ 2 of every 5 poor households were elderly in 1990</li> </ul>	<ul style="list-style-type: none"> <li>▪ Two key transit sub-markets are converging</li> </ul>

**TABLE 6 Implications of the Growth in Single Person and Single-Parent Households**

<b>Facts</b>	<b>Implications</b>
<ul style="list-style-type: none"><li>▪ 1969 to 1990 households grew 50% and population grew only 21%</li></ul>	<ul style="list-style-type: none"><li>▪ The increase in households increases auto ownership and use</li></ul>
<ul style="list-style-type: none"><li>▪ Both single person and single-parent household growth</li></ul>	<ul style="list-style-type: none"><li>▪ These households take more trips than households with two adults</li></ul>
<ul style="list-style-type: none"><li>▪ Work and household schedule demands on single adults are more severe than two adult households</li></ul>	<ul style="list-style-type: none"><li>▪ These households are less likely to use transit</li></ul>

**TABLE 7 Implications of Migration and Immigration**

<b>Facts</b>	<b>Implications</b>
<ul style="list-style-type: none"><li>▪ Trends show migration from the northeast and Midwest to the south and west</li></ul>	<ul style="list-style-type: none"><li>▪ Movement is away from transit intensive regions to those that have less transit intensity</li></ul>
<ul style="list-style-type: none"><li>▪ Migration is focused on metropolitan areas</li></ul>	<ul style="list-style-type: none"><li>▪ Transit can be effective in these settings</li></ul>
<ul style="list-style-type: none"><li>▪ Immigration is focused on the south and west</li></ul>	<ul style="list-style-type: none"><li>▪ Transit is less intensive in these regions</li></ul>
<ul style="list-style-type: none"><li>▪ Immigrant workers tend to have low income</li></ul>	<ul style="list-style-type: none"><li>▪ They represent a traditional transit market that is growing</li></ul>
<ul style="list-style-type: none"><li>▪ Immigrants employment patterns and job sites tend to be scattered</li></ul>	<ul style="list-style-type: none"><li>▪ Typical travel patterns are difficult to serve via transit</li></ul>

Although the transit-dependent population such as low-income service workers, minority groups, and new immigrants, remain steadfast customers of the public transportation system, all the other trends of this restructuring economy and society create unfavorable conditions for transit to expand its market share. Flexible work schedules, telecommuting, increased proportion of women in the work forces, growth of single-parent household result in resistance to transit appeal as a convenient and accessible transportation mode. As the relevance of transit decreases in light of these strong societal changes, public transportation agencies see a need to take a



proactive role in effectuating fundamental changes within their operational paradigms with the goal to provide effective service coordination, resource allocation, market research and appropriate service planning. Otherwise, the industry as a whole will likely continue to see a declining market share, profitability and relevance in its provision of mobility and access to the traveling public. It is recommended that each agency consider a reorientation of its focus and implement fundamental changes (1, 6).

## **2.5 Need for Customer-Oriented Business Practices**

As the performance of public transportation systems continues to decline and relevance of transit in meeting changing societal needs diminish, the private service sector has shifted its focus with heightened attention to the needs of the customer at all levels of businesses in market-driven operations. In many cases, this fundamental shift in vision accompanied by appropriate changes in operations has been rewarded with greater productivity, responsiveness and profit. Transit operators are now responsible for not only managing their own assets in their provision of transit services, they are also responsible for managing mobility and access for customers across different service districts. The shift to focus strategically on customer service (quality, service and convenience) becomes inevitable and essentially drives fundamental changes in business operations and organizational structure among transit operators. Sometimes the use of assets owned and operated by former competitors and the expansion and creation of partnerships among operators can serve to be more responsive to customer needs than through a single operator.

## **2.6 Emergence of New Information Technologies**

Current technological advances such as the emergence of new information technologies have allowed private industry to increase productivity, experiment and implement new business operations and processes, and improve responsiveness to market demand. Often these technologies provide the stimulus for fundamental changes in the organizational structure of organizations to shift from a traditional hierarchical (top-down) framework to virtual networks of

managers, employees, customers, suppliers, associates and shareholders (1). Local public transportation service providers, however, have remained structured in terms of the classic hierarchical model (1).

In the information age the ability to capitalize on the opportunity to use new information technologies in transit operators business practices to encourage and facilitate fundamental change will significantly maximize their performance. According to Reference 7, the rapid rise of new information technologies calls for a new Information-Age Paradigm that focuses on whole system collaboration, flexibility and adaptation, employee involvement and empowerment, information and most importantly people, namely the customers.

With the public increasingly expecting the ability to access real-time information and desiring more of a seamless quality to their transportation needs, information technologies such as intelligent transportation systems (ITS), particularly advanced public transportation systems (APTS), can be successfully deployed to assist transit operators in becoming more responsive to customer needs and improve interoperability among service providers. Specific examples of how ITS can enhance coordination among operators in providing a seamless network of travel are discussed in Section 5.0 of this report.

## **2.7 New Policy Framework (Federal Government s Expectation for Change)**

A new policy framework was established by passage and enactment of federal legislation, the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991 and the Transportation Equity Act for the 21<sup>st</sup> century (TEA-21) in 1998. These legislative acts clearly state the federal government s expectation for changes as [ISTEA] embodies one of the President’s top domestic agenda items: the renewal of our surface transportation programs to address the changing needs for Americans will create jobs, reduce congestion, and rebuild our infrastructure. It will [also] help maintain mobility. ( 8). Both ISTEA and TEA-21 allowed for greater flexibility in the use of federal funds than previously possible to respond to changing markets. Prior to these two legislative acts, a more rigid budget structure reinforced the independence of transit operators, regional transportation planning agencies, local, state and federal governments that serve the

public. ISTEA empowered MPOs[, which have long participated in setting funding priorities for transportation improvements in each urban region,] to directly choose how a significant share of the available federal funds will be spent. (9). ISTEA also called for substantial public involvement in transportation planning, mainly through the MPO s planning process. The role of MPOs in bringing out fundamental changes in the institutional framework of public transportation is discussed in Section 4.1.4.

### **3.0 INSTITUTIONAL BARRIERS TO COORDINATION**

Coordination is hindered by various institutional barriers that are deeply rooted in existing individual organizational frameworks of transit agencies that govern the interaction among them. Some of the barriers to coordination include: satisfaction with the status quo, inertia and overall resistance to change, lack of a common vision among interdependent agencies, increasingly political nature of decision-making that complicates the redistribution of power, authority, and control in any coordination format, inflexible funding arrangements and most important of all, lack of an enabling environment to foster fundamental change.

#### **3.1 The Status Quo**

Often parties, including, managers, technicians, members of the transit labor force, politicians and policy-makers resist reform and fail to realize the urgency of the circumstances for fundamental change at the local level. They lack the understanding of the need to coordinate and what measures should be undertaken to facilitate cooperation among different stakeholders within the public transportation domain. Most importantly, individual transit operators fail to recognize the interdependencies within their relationships with other transit operators. These interdependencies are attributable to the common clientele operators often share since the customer s entire trip can involve more than one operator and one service area. An individual transit operator can no longer afford to think in terms of serving each of its customers effectively by only concentrating on the section of their trips within that operator s service boundaries, but instead it needs to coordinate with other operators to successfully integrate service for the

customers' entire trips. The shift from individual service provider to collective mobility manager is essential to assuring responsiveness to customer needs (7).

Resistance to fundamental change may come from attitudes of both employees and management personnel who are satisfied with the status quo format of transit operations. To overcome this barrier, the key element to increase coordination among transit operators is the role of leadership from both the local level of individual operators and the regional level of metropolitan planning agencies. The role of stakeholders in fostering fundamental change will be discussed further in Section 4.0.

### **3.2 Lack of a Long-term Common Vision**

Coordination, involving fundamental changes in the institutional framework and organizational culture of agencies, needs to be facilitated at two levels:

- Broad, long-term strategic vision level, and
- Key business processes and day-to-day operations level in designing the specifics of service delivery — a more tactical level.

Although the long-term, strategic vision should guide and direct the day-to-day operations, transit operators remain driven by [the] short-term imperative to match service levels to annual budgets rather than by broader impacts and outcomes no one is yet held accountable for attaining long-term goals and transportation organizations generally have been unable to balance a long-term strategic mission with day-to-day operating responsibilities. (1).

A new long-term common vision needs to be established among local transit operators to broaden the range of services provided, to improve the quality of transit, and to increase the effectiveness of these services from the customer's standpoint. The common vision that strategically focuses on management of customer service will encourage coordination, drive fundamental changes in business practices and organizational structures and maybe even create partnerships among operators in their common pursuit to provide mobility, accessibility, convenience and quality service to the customer. According to TCRP Report 53, [w]hen an

organization seeks to serve the user s full trip and addresses the broader outcomes of how these trips are to be served, partnerships are inevitable. (1). The effort and vision to fundamentally change the public transportation framework needs to be supported broadly by local transit operators, community leaders, policy makers and elected officials at the local, regional, state, and federal levels.

### **3.3 Politics of Redistributing Power, Authority and Control**

During the coordination process, redistribution of power, authority and control over resources among transit operators and other transportation authorities can be delicate and political since powerful or larger constituencies tend to have more control and power over the process and decisions made than smaller jurisdictions. The issues of who benefits more, who bears most of the costs and who has more decision-making power during this process will be controversial and could easily lead to the dissolution of any effort to coordinate. Should Metropolitan Planning Organizations take the leadership role in managing coordination, and thus have the central power to guide transit operators in this pursuit? Or should a flatter organizational structure be used to encourage coordination among operators? Answers to these questions will vary from region to region depending on the history and political context of the region s public transportation system.

Given the historical background of the United States political system, each local agency has retained much of its autonomy and become more resistant to top-down decisions that interfere with their local decision-making power. Therefore, it is generally more politically feasible to have an organizational structure that supports local autonomy rather than one that allows a leader-organization to dictate the responsibilities of each local agency. Although having a single organization to overlook the coordination process of many agencies is essential for managed interagency interaction, it is more likely that the local agencies will collaborate with each other on a consensus-based approach under the general guidance of the leader organization.

### **3.4 Separate and Restrictive Funding Mechanisms**

As briefly discussed in the latter part of Section 2.7, restrictive funding mechanisms that dictate the allocation of federal, state or local funds impede the ability of transit agencies to coordinate among each other and to focus on community-wide vision planning and interagency collaboration during [their] planning and programming processes (1). For instance, Metropolitan Planning Organizations (MPOs) historically do not have any direct authority over how federal funds are allocated for transportation investments since the federal government directly apportions the funds to local transit operators and/or to municipalities that own and operate public transportation services in their locality.

Although the passage of ISTEA in 1991 and TEA-21 in 1998 has allowed greater flexibility in the allocation of funds for various transportation uses, MPOs still lack real authority to mandate coordination among transit agencies. The funding mechanism, however, can be used by authorities as an incentive or as a control mechanism to either encourage or enforce coordination depending on the policy measures that are set out in the funding criteria. Therefore, increasing the flexibility of funding allocation is a step towards greater coordination.

### **3.5 Lack of an Enabling Environment**

The ability of transit agencies to respond to changing economic conditions and travel demand is compromised by a complex institutional environment that involves multiple players including federal, state, local organizations that have varied and competing responsibilities for funding, directing and regulating the provision of public transportation services for different jurisdictions, and service markets. Inconsistent and fragmented federal, state and local policies may retard the coordination process that needs to occur as a response to the changing operational context. As a prerequisite to any fundamental change, the public policy environment must be improved to eliminate inconsistencies and conflicts that dictate the process and nature of transit operations but restrict the possibility of any change.

The responsibility for providing the enabling environment necessary for coordination needs to be shared jointly by federal, state, regional, and local governments. The roles of each stakeholder in the establishment of a suitable environment to foster coordination are described in Section 4.0.

#### **4.0 ROLE OF STAKEHOLDERS IN COORDINATION**

The institutional landscape under which public transportation services are provided is complex and involves many stakeholders with varying influence on the decision-making process. Before discussing the role of each stakeholder group, a look at the general transit funding profile (1) may provide useful insights on the make-up of key transit players in terms of their monetary influence in the public transportation arena:

- Farebox revenue covering approximately 35 to 40 % of the operating costs are paid by riders;
- Federal funding covers, on average, 50 % of capital investment and 3 % of operating costs;
- State and local funding cover, on average, 13 % of capital investment and 22 % of operating costs;
- Other sources, including levied taxes dedicated to transit, cover approximately 24 % of capital investment and 16 % of operating costs.

The transit funding structure reflects an inter-governmental partnership with the common goal of serving the traveling public. The funding distribution indicates that the federal government covers most of the capital investment for transit whereas customers along with state and local governments cover most of the operating costs.

#### **4.1 Role of Different Levels Of Government**

The extent of influence of different levels of government on public transportation services varies by location, by system size and by mode. Federal, state, local and regional governments all play essential roles in the design, delivery and coordination of public transportation services.

#### **4.1.1 Role of Federal Government**

The federal government sets the overall policy, objectives and institutional framework for the provision of transit services. While mass transit systems of California are predominantly funded by the state and local governments, a significant share of the funds, regulations and standards for the state's transportation facilities has derived from the national government. Federal transportation funds are particularly significant in that they represent a large component of the discretionary funding available to the state and its urban areas. (9).

Not only does it fund and finance planning, design, construction and to a smaller extent, operations of transit, the federal government also regulates transit operations and planning using specific guidelines and policy mandates. However, often regulations and policies restrict the ability of transit agencies to introduce new innovations and maximize profits, thus effectively discouraging any search for fundamental change and new operational paradigms. The federal government therefore must be willing and supportive in its partnership with transit agencies to foster an enabling environment for encouraging fundamental change in public transportation systems. To do this, the federal government can set policies allowing more flexible funding criteria and therefore, encouraging development of coordinated and regional intermodal transportation systems.

#### **4.1.2 Role of State Governments**

The role of state governments (state officials and state Departments of Transportation — DOTs) in local public transportation varies among localities. Most states now act as funding partners by participating actively in transit planning and resource allocation. They also provide funding levels relatively similar to that of local governments. Some states even direct state-operated transit programs.

The other significant role of state governments reside in their legal authority to organize transit organizations at a regional and local level and in their capacity to assist the distribution of federal funds to local agencies. State governments also set rules under which local governments can levy



specific taxes for transit investment in each locality. Therefore, state governments also take part in determining the institutional framework under which transit agencies provide public transportation services.

Although ISTEA and TEA-21 have assisted in refocusing the multimodal perspective for public transportation, rigid corporate cultures and pre-existing business practices among agencies have slowed the implementation of such a vision into reality. Therefore, the role of state governments again is similar to that of the federal government, in changing the existing environment and governance to support coordination efforts among transit service providers.

#### **4.1.3 Role of Local Governments**

Local governments for counties and municipalities either directly own and operate or indirectly fund local transit investment; therefore local officials and local transit organizations are at the forefront in planning, delivering, and governing transit services. In cases where regional authorities such as Regional Transportation Planning Agencies (RTPAs) own and operate local transit services, local officials usually serve as policy board members and influence transit services through policy decisions.

Other authorities at the local governmental level include the control of land use and development, the control of local infrastructure and public facilities investment, and the regulation of other transportation functions such as private service providers. These key functions of local governments have direct influence on how local public transportation systems are organized and subsequently utilized. As a result, local governmental policies can have a profound impact on transit riders' traveling experiences.

To introduce new paradigms of cooperative and coordinated operations into local public transportation, a reformulation and reconciliation of roles and responsibilities at the local level need to occur such that the institutional landscape is more open to fundamental change (1).

#### 4.1.4 Role of MPOs

Prior to ISTEA, the role of MPOs was basically limited to providing technical data and advice and writing long-range plans that were essentially toothless with no real authority.

Historically, the core functions of MPOs have been to:

- Establish and manage a level playing field for effective multimodal, intergovernmental decision making in the metropolitan area ( 10),
- Develop short-term regional investment programs and multimodal long-range plans,
- Evaluate transportation alternatives, and
- Conduct planning studies and public outreach programs.

Most MPOs lack direct authority to redistribute funds for transportation investments since, as previously mentioned, most federal funds are allocated directly to local jurisdictions or agencies. Although the MPO is responsible for coordinating the participation of different regional and local transit providers and local transportation agencies in the planning process, the MPO lacks the monetary power to enforce interagency coordination. Enactment of ISTEA and TEA-21 has, nevertheless, been a step towards greater flexibility in the allocation of funds, especially with discretionary funds that can be allocated for coordination and collaborative purposes in a multimodal context. Also, under ISTEA, MPOs were given the responsibility to carefully rank projects and write fiscally constrained plans that approve projects that already have or will have realistic funding sources. The MPOs now have the capacity to set budgetary priorities and to design an improvement program that is coherent and regionally-based. Therefore, MPOs can theoretically enforce regionalism and interagency cooperation through its power to allocate funding for projects and set priorities over the metropolitan area, usually consisting of multiple counties. MPOs can also provide the official forum for cooperative transportation planning and programming in urban areas ( 1) among separate transit agencies. Sometimes, MPOs have taken direct roles in system-wide operations and investment activity, particularly in areas of ITS planning and applications. Specifically, San Francisco s MTC has taken a central role in the research, development, procurement and deployment of ITS programs such as the TransLink<sup>®</sup> pilot program featuring the universal transit fare smart card and the web-based program, Take

Transit<sup>SM</sup> Trip Planner, that prepares personal transit itineraries across a whole array of Bay Area transit operators. MTC has also coordinated efforts of several transit operators to launch bus service across the Richmond-San Rafael Bridge, and from the Colma BART station to the San Francisco International Airport. ( 11)

Another way in which MPOs can contribute to interagency coordination is by providing operators with traveler demand information across existing gaps in the transit system due to inadequate linkages between transit agencies. This information from the demand side, i.e. customers, can be collected as part of the MPO s public outreach program since public involvement was a strong requirement of ISTEA. These gaps are often due to transit district boundary lines mirroring political boundary lines. Additional funds are needed to fill these service gaps but local transit operators would not give up a portion of their local service in order to provide a new regional route. As a result, transit services are at a gridlock: who should initiate change and be responsible for coordinating services across different jurisdictions and service boundaries? MPOs, responsible for managing the transportation system for the metropolitan area or region, appear to be the suitable candidate in taking a greater role in interagency coordination efforts.

One note of caution is that the makeup of MPOs might prevent them from becoming true regional organizations that would impose coordination requirements on local agencies although with their power of funding allocation, MPOs have the power to do so. Each MPO has a governing body that is selected by the local governments within its jurisdictional area, and MPOs are, for most states, cooperative, generally voluntary, intergovernmental organizations. Therefore, it is rather unlikely that MPOs will act as a regional regulator. Instead, it is more likely that MPOs will serve as a facilitator who collaborates with local agencies to take small steps towards greater interagency coordination.

#### **4.1.5 Role of Legislative Bodies**

As a prerequisite to the introduction of these new paradigms towards greater cooperation and interagency coordination, the public policy environment needs to be modified. Public policies

containing regulations and program objectives that dictate the shape, nature and process of local public transit planning and operations are often complex, inconsistent and conflicting. Greater flexibility is still required in funding mechanisms, division of responsibilities and organizational structures to allow local and regional agencies to experiment with new coordination efforts and paradigms. Legislative bodies may need to enact legislation that delegate more power to regional agencies to enhance their leadership and coordinator roles toward local transit operations.

#### **4.2 Role of Traveling Public**

As mentioned in Section 2.5, the most important driving force to fundamental change and interagency coordination is the imperative to meet changing customer needs and expectations. The traveling public, the common customer of separate transit agencies, is the ultimate link that brings transit agencies and various levels of governments together into a collaborative effort to improve the existing public transportation system. Therefore, public participation is critically important in the coordination process because only the riders themselves are most certain of what their traveling needs are and how the public transportation system can be better coordinated to provide efficient and convenient services to the customers at large. Thus, the customers needs ultimately shape the form of coordination that is best suited for a particular region.

In the new paradigm of the information age, public participation is essential to a process that strategically focuses on the management of customer needs to drive fundamental changes in an organization s structure and business operations. Public outreach programs organized by the MPOs may be refined to the level of detail such that public input can be effectively utilized in assisting agencies to cooperatively design, plan and operate transit services when customer needs call for such arrangements among operators.

#### **4.3 Role of Transit Operators**

Although the enabling environment provided by public policies, regulations, and legislation are largely outside the transit agencies control, they need to take a more proactive approach to

encourage and advocate for changes in the political environment so that greater interagency coordination can be facilitated. Ultimately, local transit agencies benefit from increased interagency collaboration in terms of more cost- efficient and effective operations, decreased operating costs and increased customer satisfaction. Transit operators, once realizing the need to coordinate, will do this through informal channels even if the enabling environment may not be ready. This form of interagency collaboration is further discussed in Section 6.0.

Once the public need for coordination is identified in the public outreach process, local transit agencies need to be responsive to the travelers demands. If accepted by transit operators, they will change their operating processes and maybe even corporate cultures accordingly to satisfy customers needs. The challenge for transit operators is to provide transit services under an array of policies and objectives from different governmental and regulatory agencies and satisfy the needs of the traveling public simultaneously.

With the enactment of ISTEA and TEA-21 and emergence of new information technologies, greater opportunities have been available for collaborative planning and delivery of transit services; however, the actual behavioral and organizational shifts within agencies have so far been marginal. This again reiterates the need for fundamental changes in the current operational and organizational framework under which transit services are provided.

## **5.0 HOW ITS CAN HELP TO RESOLVE INSTITUTIONAL BARRIERS**

In the struggle towards the goal of a seamless public transportation system, [n]ew information technologies can provide the critical link between allied service providers and customers. (7). Technologies such as ITS and particularly APTS can be utilized to improve personal safety such as on board surveillance cameras and silent alarm/covert microphone, to provide customer information using traveler s information systems, and to coordinate fare payment using the smart card technology. Intelligent transportation systems provide the technological tools that give transit organizations the opportunity to measure individual customer needs against the quality of services rendered. Real-time information that links market requirements (i.e. customer needs) with service quality results in customer-based performance measures that help increase

accountability of transit agencies to their customers. Knowledge of the traveler s experience can then be incorporated into the strategic planning and design of transit operations to improve the quality and efficiency of service.

ITS can also help in eliminating institutional barriers because it can be seen as a medium through which transit agencies can coordinate with other agencies to reap the benefits of implementing ITS on a regional basis. Two particular aspects of transit operations, namely customer information dissemination and fare collection, have the proven capabilities to help encourage coordination among transit service providers.

### **5.1 Customer Information: Traveler Information Systems**

Advanced traveler information systems (ATIS) provide travelers with real-time transit information including arrival and departure information, schedule updates, transit fare and pertinent transfer information. Information can be delivered to travelers in media such as interactive voice response telephone, television monitor, cable and interactive television, radio, electronic signs, kiosks at the transit stations, personal computers, handheld electronic device, pagers, and Internet. Traveler information systems can be categorized into pre-trip, in-terminal, wayside, and in-vehicle information systems (12). Regional multimodal traveler information systems merge transit information for different transit modes across several transit agencies in the region to enhance the ease of intermodal travel.

To provide transit information, Automated Vehicle Location (AVL) Systems technologies may use a computer tracking system with inputs from a Global Positioning System (GPS), signals from signposts and dead reckoning<sup>3</sup>. Real-time information regarding location of buses, scheduling changes, and service or route adjustments can be disseminated to the customer. The following examples of traveler information systems employed by various jurisdictions illustrate how ATIS can enhance the performance of public transportation.

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<sup>3</sup> Dead reckoning determines vehicle location by measuring distance traveled from a particular, known location and the direction of travel.

### *Puget Sound Area: BusView, MyBus, Ferry Cameras*

BusView, MyBus and ferry-based cameras are transit-related initiatives of Smart Trek, a \$13.7 million Model Deployment Initiative (MDI) demonstration project that provides traffic, transit (bus and ferry) information to travelers in the Puget Sound region of Washington State. Under the MDI Project, 25 northwest public agencies and private companies are directing 27 projects designed to build upon the region's significant investment in intelligent transportation system (ITS) infrastructure. ( 13). Smart Trek provides real-time transit arrival information over the Internet, at major transit centers, on computers, along with route, schedule and trip planning information.

Both Busview and MyBus relay real-time bus information to travelers. Busview tracks buses throughout King County Metro area and displays bus positions on a map in real time using a Java applet running on a computer. MyBus also provides information for each bus route, scheduled arrival time and depart status at each station in King County. This information can be accessed via [www.MyBus.org](http://www.MyBus.org) (web-based), a WAP<sup>4</sup> cell phone or a networked PALM. The MyBus Website states that the initiative provid[es] travelers with real-time transit information [while] making transit cool .( 14).

Ferry-based cameras placed at holding areas for cars and at the docks also deliver traveler information within a 10-minute lag at all the ferry terminals in the Puget Sound area.

### *Atlanta Traveler Information Showcase*

The Atlanta Traveler Information Showcase provides timely transportation information on multimodal travel options, including bus (Cobb Community Transit bus), rail (MARTA), and air travel using devices such as personal communication devices, in-vehicle navigation devices, on-line computer information services, interactive television in selected hotels, cable televisions and information kiosks (15). The Showcase was commissioned in preparation for the 1996 Summer Olympic Games and remained operational afterwards. Traveler information is available for both

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<sup>4</sup> The Wireless Application Protocol (WAP) is a set of global protocols for developing applications and services that use wireless networks. The WAP protocols are mainly based on already existing Internet protocols, but are optimized for mobile users with wireless devices. It allows the wireless user to serve the website on a WAP-enabled cell phone.

residents and visitors for trip planning. For instance, through interactive television, users can access train and bus operating hours and general transit information, wide-area travel (Amtrak, airlines, Greyhound) information, transit instructions to selected restaurants, and attractions in Atlanta. This information is also accessible on the Internet and at information kiosks installed in transit stations, hotels, visitor centers, hospitals, airports, public and private office buildings and shopping centers in Atlanta.

In this project, various actors such as Georgia DOT (providing project supervision), private consultants, high-tech companies (providing map databases and interactive computer systems), local public transportation agencies (MARTA, Cobb Community Transit), hotels, Georgia Public Television, and other public and private agencies formed partnerships to successfully deploy the devices for information gathering and dissemination to travelers.

#### *Minnesota Travlink and Genesis*

Minnesota Guidestar is the Minnesota statewide ITS program that leads research and development and conducts operational tests of state-of-the-art ITS technologies. This program has evolved through partnerships involving Minnesota DOT, U.S. DOT, the University of Minnesota Center for Transportation Studies, the Regional Transit Board and Metropolitan Transit Commission (MTC) and private sector companies (e.g. consultants). Travlink and Genesis are both part of the Guidestar program.

*Travlink* is an operational test of advanced public transportation systems that involves the implementation of integrated AVL and ATIS technologies along the I-394 freeway corridor. Using various devices and systems such as a computer-aided dispatching (CAD)/AVL system, commercial videotex<sup>5</sup>, smart kiosks<sup>6</sup> and display monitors, real-time and static multimodal information are distributed to travelers. The operational test integrates all these technologies into

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<sup>5</sup> Videotex is an interactive online information subscription service that helps users plan bus trips (routes and schedules), find out if their bus is on time, be informed of traffic conditions (delays), and provide a variety of other urban travel information. The ATIS will offer travel time and cost comparisons of bus and auto travel to encourage transit use

<sup>6</sup> Smart kiosks uses touch screens and multimedia to provide the on-time status of scheduled buses and other special messages for travelers at a major regional shopping mall, at the downtown MTC Transit Store, and at the Commuter Connection (a transportation information storefront operated by the downtown business council). Display monitors are mounted inside waiting areas at two transit transfer stations along I394.



a single functional system. Travlink is designed to encourage commuters to consider alternatives to single occupant travel, especially public transit by making increasing the reliability and security of transit services (16).

The ATIS collects real-time and static data from the CAD/AVL system and other MTC databases. Traffic data is obtained through the companion operational test project, Genesis.

*Genesis* is an advanced traveler information system that uses Personal Communications Devices (PCDs) to transmit real-time transit and traffic information. Since the Genesis PCD is small and portable, the user can access traveler information on any trip mode and route.

In providing transit information to customers who travel across different service boundaries, transit agencies need to coordinate services and provide individual service inputs to the region-wide traveler information system.

[Since] each agency's facility is just a part of the total regional transportation network covering all modes [bus, rail, ferry, etc.] and all areas (adjacent cities and counties)[,] [o]perational decisions made by one agency impact facilities operated by other agencies. It is important to collect and coordinate the information and response of different management and control systems by different agencies. ( 15)

Usually, a regional organization such as the MPO or the state DOT assumes the responsibility to coordinate partnerships that involve a host of public and private agencies in the joint effort of providing traveler information systems. ATIS technologies have been widely accepted and deployed in many areas in the United States and are relatively more mature in terms of widespread deployment than smart card technology for integrated fare collection systems.

## **5.2 Fare Collection: Smart Card Technology**

The Smart Card, containing a microchip or an embedded integrated circuit, can be used on different modes of public transit and also within the same mode, such as on buses operated by different agencies in a region for fare collection. The correct fare is automatically deducted from pre-stored values on the card when the traveler positions a contactless card near a card reader or

inserts a contact card into the reader. Applicable discounts for the elderly, students or the disabled are automatically incorporated into the fare. Also, transfer slips are eliminated with the use of the Smart Card.

The latent potential of smart card technology is very encouraging in its ability to cut administrative costs (in handling the money collection processes), to provide data portability and security (by restricting access of personal and business data available to appropriate administrators or users) and to increase convenience to customers (by eliminating the need to carry cash). Recent examples of reported benefits from this technology include:

- Ventura County, California: the smart card system will save approximately \$9.5 million per year in fare evasion, \$5 million in reduced data collection costs, and \$990,000 in elimination of transfer slips.
- New York City: Metro Card system will save approximately \$70 million per year in fare evasion, leading to \$34 million increased revenue from merchant fees and revenue float, \$140 million from unused value on the cards, and \$49 million from increased ridership (17).

The *Transit ITS Impacts Matrix* web site<sup>7</sup> also cites other operational benefits of the smart card (18):

- Expandability to other applications (commercial purchases, health and insurance info, etc)
- Increased reliability relative to a magnetic stripe card
- Capital cost savings could be shared with private sector (e.g. banks)
- Improved safety and security relative to a magnetic stripe card
- Enhanced service quality (time, delay and reliability) relative to cash fare boxes, leading to high customer satisfaction
- Increased efficiency (person throughput, resources and scheduling)

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<sup>7</sup> The benefits are cited from the Transit ITS Impacts Matrix website, which integrates inputs from the transit industry, Advanced Public Transportation Systems (APTS) Stakeholders Forum, Federal Transit Administration (FTA), and Intelligent Transportation Systems (ITS) America on the perceived impacts of all transit ITS technologies/services.

Other benefits of the smart card technology may include the flexibility in implementing changes in fare policy such as multiple fare structures that include loyalty discounts based on usage. Transaction data can also be used to produce ridership statistics and profiles, thus enabling the operators to modify routes and peak service rates accordingly. Greater efficiency and effectiveness of the network can therefore be achieved with the collaborative effort of transit agencies in sharing and using the data collected.

Deployment of smart card technology have been tested in various pilot projects (19):

- Greater Cleveland, Ohio: Smart Card Demonstration Project
- Washington, DC: SmartTrip Demonstration Project — contactless card used in rail, WMATA-operated parking facilities, bus trips and paratransit
- Seattle, Washington: Regional Fare Coordination Project

Processes of card production, distribution and marketing need to be supported by coordinated efforts of all participating agencies. Also, institutional aspects of the revenue collection process among transit agencies need to be considered since each agency must determine which portion of a customer's trip uses its services. When institutional and operational issues of the smart card are addressed, significant cost savings are accrued for the agencies and increased convenience are provided for the customers.

While ITS helps to eliminate some institutional barriers to coordination among transit operators, new barriers may emerge and new communication channels need to be built among these agencies, leading to new alliances among public agencies and between public agencies and the private sector. ITS planning and deployment required coordination among jurisdictions, data sharing, unique technical knowledge and involvement of nontraditional players. ( 20). Coalitions between these players need to form.

Although there are new institutional barriers associated with the deployment of ITS technologies, its development, planning and implementation have required greater cooperation and communication among transit agencies. As a result, stronger relationships are built among

agencies and a more regional perspective can be instilled. It has been found from case studies such as San Francisco's TransLink® Pilot Project and the New York-New Jersey-Connecticut TRANSCOM coalition<sup>8</sup> that a regional organization can be quite successful at maintaining and fostering close relationships among agencies for the effective implementation of ITS technologies.

## **6.0 FORMAL COORDINATION**

Different approaches and levels of formality have been used in various parts of the world to enhance interagency coordination. This report classifies the format of coordination generally into two categories: *formal* and *informal* coordination. What approaches of coordination would be considered as formal? Formal coordination generally involves the creation of a regional organization that is specifically designed to facilitate cooperation among many transportation agencies, regardless of whether the coalition is developed for a specific project or for long-term, regional management of the transportation system. Another characteristic of formal coordination is the existence of either formal agreement(s) reached by all the member agencies or legislation that dictates roles and responsibilities of each agency within the coalition. The decision-making process of formal coordination, however, can range from centralized control by a single organization to a collaborative, consensus-based format.

### **6.1 Factors Contributing to Successful Formal Coordination**

Contributing factors essential to successful formal coordination may include but are not limited to the following list. Note that Section 6.2 includes successful case studies that illustrate how each (or a combination of the) factor(s) contributed to effective formal interagency coordination.

- Established tradition of cooperation among agencies (Hamburg, Germany — Section 6.2.1; Transport *for* London — Section 6.2.2)

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<sup>8</sup> See Section 6.2.6 and 6.2.7, respectively.

- Single source of responsibility for strategic planning and general policy guidance: a regional organization with strong leadership (Hamburg, Germany — Section 6.2.1; Transport *for* London — Section 6.2.2; Dutch National Railways — Section 6.2.3; GVTA — Section 6.2.4; San Francisco Bay Area Metropolitan Transportation Commission — Section 6.2.5)
- Clear division of roles and responsibilities among agencies (all case studies)
- Strong policy or legal framework requiring coordination (Transport *for* London — Section 6.2.2; GVTA — Section 6.2.4)
- Long history of centralized control (Transport *for* London — Section 6.2.2)
- Established common goal and vision: customer-oriented approach and regional perspective to providing an effective transportation system (all case studies)
- Availability of suitable technologies to spur institutional and operational changes (Dutch National Railways — Section 6.2.3; San Francisco Bay Area Metropolitan Transportation Commission — Section 6.2.5; SMART Corridors Program — Section 6.2.6; TRANSCOM — Section 6.2.7)
- Consensus- and compromise-driven decision making process (San Francisco Bay Area Metropolitan Transportation Commission — Section 6.2.5, SMART Corridors Program — Section 6.2.6; TRANSCOM — Section 6.2.7)

## **6.2 Success Stories**

As previously mentioned, there are a number of successful case studies of formal coordination throughout the world. These case studies are discussed in detail in Sections 6.2.1 to 6.2.7. The key factors contributing to the success of interagency coordination in each case are also further elaborated.

### **6.2.1 Hamburg, Germany: Hamburg Transport Alliance**

In Hamburg, Germany, there is a long tradition of cooperation among public transport agencies. In 1965, nine transport companies and politicians entered into cooperative agreements and established the Hamburg Transport Alliance. According to the Chief Executive Officer of this

organization, Peter Kellerman, One schedule, one tariff and one ticket, was its motto. The Alliance is responsible for planning, organizing and optimizing public transport in the region, while the nine companies are responsible for daily transport operations. This is an example of establishing coordination via a formal agreement among the parties involved.

### **6.2.2 Transport *for* London: London Transport Bus and London Underground**

Transport *for* London (TfL) is an executive arm of the Greater London Authority (GLA), a centralized organization that plans, controls and integrates all transit services in the Greater London region. TfL was established in July 2000 and reports directly to the mayor of London. The organization assumes all of the responsibilities of the former regional entity, London Transport, for services including: London Buses, Dial-a-Ride, Victoria Coach Station, London River Service, Croydon Tramlink, the Travel Information Call Centre, London Transport Museum and Lost Property. In addition, TfL is now responsible for the Docklands Light Railway, the Public Carriage Office (responsible for taxi and private hire vehicle licensing) and the Woolwich ferry. It will also be responsible for London Underground (rail lines) upon completion of the Public Private Partnership.<sup>9</sup> TfL is solely responsible for the delivery of the Mayor's integrated transport strategy in the region.

Some background of the former organization, London Transport, is worth mentioning here to understand the policy framework under which London's public transportation systems have been operated. London Transport (LT) was institutionalized during the 1980s by a national policy to centrally control and manage transit services in the region. Under the London Regional Transport Act of 1984, London Transport was directly controlled by the national government. Therefore, the creation of TfL effectively shifted that power from the national government to the regional government of the Greater London region. Within LT, service providers act as contractors and are responsible for operations and the procurement of assets (buses). LT provides coordinated transit service to the customer with an integrated ticketing system, and passenger information services across different modes of transportation. For instance, one Travelcard can be used for

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<sup>9</sup> The London Underground Public Private Partnership aims to secure long-term sustained levels of transit investment (for renewing and upgrading infrastructure) through long-term contracts between LU and private companies.

travel across buses, light rail, tubes and trams. Transit tickets and monthly or annual passes can be purchased over the Internet or using the toll free number of the Ticketline . Also, an interactive map and journey planning tool is available online for travelers to access information about particular station locations, transit connection points, schedules and any service disruptions across all modes of the public transportation network.

Two modes of transit services, namely London Transport Buses (LTB) and London Underground (LU), previously under the authority of LT (and soon under the authority of TfL, in the case of LU) are further discussed here. LTB is a logistics center whose primary responsibilities are designing, tracking and evaluating service from the customer s perspective using information technologies to monitor all of its services. Since actual bus operations are contracted out to private companies through a competitive tendering process, LTB does not own any buses. LTB, however, retains centralized control over the private service providers in that [it] plans routes, specifies levels, monitors the quality of the services and works with other organizations to develop bus priority schemes. ( 21). Unlike LTB, London Underground provides all of its rail services with publicly own and operated rail systems. LU is also responsible for planning, maintaining, upgrading and extending the underground lines.

Under this new organization, TfL, all modes of transportation, including bus, tram, subway, light rail, river and express coach lines, would be effectively coordinated and integrated. TfL tracks performance of its two divisions (LTB and LU) in terms of efficiency of services provided and quality of users experiences. Specifically, at LTB, two performance measures have been developed to award or deny incentives to private bus operators, depending on their individual performance:

- Countdown data measures the efficiency of each bus operator using fleet wide automated vehicle location systems to track actual bus arrival times and amount of service provided.
- Mystery Shopper Survey records the performance of the operator with reference to the quality of service experienced by the user (7).

LU has also incorporated new performance measures to evaluate quality of service for the user's whole trip, including waiting time to get a ticket, waiting time to access the elevator/escalator, ability of platform to process volume of persons with one train, train travel time, time to exit the station (7). Similar to LTB, the London Underground conducts a quality-control program, Mystery Travel Survey, with a Mystery Shopper that consists of a team of trained market research specialists who evaluate transportation services and facilities from the customer's perspective. Quarterly evaluations have been prepared by the Market Planning department of London Transport in a spreadsheet with rolling 12-month averages, trend calculations and traffic light status of red, yellow or green (7). A red light indicates a poor quality of service and the need for immediate improvement; a yellow light signals the emergence of a problem; a green light gives an acceptable level of quality.

London's public transportation system is very well integrated although there are many different modes and operators in the region, mainly because London has a long history of centralized control over transit services by a regional organization such as Transport *for* London or London Transport. Division of responsibilities between organizations for operating various modes of transportation is clearly defined. All of these individual agencies must collaborate with TfL and with each other under statutory mandates. TfL holds the responsibility to coordinate and integrate all services in the region while individual agencies strive to improve their services through customer-oriented performance measures and innovative approaches to service evaluations. In this successful case study of interagency coordination, the formality and centrality of the institutional structure play instrumental roles.

### **6.2.3 Netherlands/Dutch National Railways: National Multimodal Customer Information**

In Netherlands, a mid-level manager envisioned using integrated application of new technologies to improve the dissemination of multimodal traveler information nationally. This example illustrates that leadership is key in facilitating and sustaining interagency coordination. This person's vision and persistence has been the driving force to bring about the full integration of customer information across 24 separate service providers. Prior to this vision, there were 50 phone numbers for obtaining separate transit information. Also, a customer could call 380



railroad station numbers. The trip planning process has since been consolidated under the responsibility of one separate agency. Organizations such as the Dutch National Railways, the Municipal Transit Operations and national bus companies collaborated on the institutional restructuring of customer information systems.

Not only was the visionary's persistence an important factor in driving coordination, the availability of suitable technologies to facilitate such collaboration were essential. The OVR system (Openbaar Vervoer Reisinformatie) is a leading railway information service provider that advises users on railway connections and timetable information (comparable to the Automatic Terminal Information Service system<sup>10</sup> for flight information). The OVR-system is a dialogue system that contains basically speech recognition, dialogue management and speech output. The system has a default order of questions, however, the user can shortcut some of the questions because the OVR system can spot multiple data items in one sentence. Also, the user can enter a data item, which was not explicitly asked for, to influence the order of questions and obtain appropriate traveler information (22).

The deployment of OVR technology, along with the commitment of various transportation agencies to improve customer service and efficiency, has facilitated and provided incentives, respectively, for interagency coordination to a greater extent than previously possible.

#### **6.2.4 Greater Vancouver Transportation Authority (GVTA)**

The Greater Vancouver Transportation Authority, also known as TransLink, was created by the British Columbia (BC) Greater Vancouver Transportation Authority Act in 1998. TransLink, independent and separate from the BC provincial government and the Greater Vancouver Regional District (GVRD), is responsible for regional transportation planning (preparation and implementation of strategic, service and capital plans), demand management, vehicle emission inspections, transit service levels, regional highways, arterials, bridges, transportation budgets and financial agreements. TransLink plans, manages, finances and operates the regional

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<sup>10</sup> Automatic Terminal Information Service is the continuous broadcast of recorded non-control information in high activity terminal areas.° Its purpose is to improve pilot and controller effectiveness and to relieve frequency congestion by automating the repetitive transmission of essential but routine information.°

transportation system with services including: buses, Skytrain (light rail), SeaBus (ferry), West Coast Express (express bus), HandyDART (privately-operated paratransit) and the Albion Ferry. All revenues collected by TransLink are then allocated to its transportation programs and service providers.

One of TransLink's many responsibilities is to prepare an Area Transit Plan for each of the seven local districts in the region to identify 1-5 year priorities for improving local transit service at the community level.

The Plans will focus on local service improvements and enhanced connections to adjacent parts of the region. The planning process will focus on developing innovative, integrated and cost effective solutions in close consultation with municipalities, residents, transit users and other key stakeholders in each area. TransLink is committed to a strong community and municipal focus. Our region has a great diversity of land uses and travel patterns. Cookie cutter approaches to providing transit services across the region will not provide the best, or most cost-effective, transit service for meeting each area's unique needs. (23).

TransLink recognizes that active community and municipal involvement are essential to identifying and meeting the region's transit needs. In the development of the Area Transit Plans, a Public Advisory Committee in each area is responsible for organizing public consultation events such as open houses, forums and workshops to obtain community input. Each committee consists of six to ten community representatives and transit users selected by the city council. Furthermore, TransLink conducts telephone surveys of residents in each area to identify key concerns of customers and to help examine innovative solutions to improve the regional transportation network as a whole.

The TransLink organization is the result of a complete institutional realignment that consolidated the responsibilities (transit planning and financing) of separate transit providers in each area under one regional agency and one name. Under this unilateral management of the regional transportation system, the organization is more accountable to the customer and more responsive to the different transit needs of each area through a unified public transportation network.

### **6.2.5 San Francisco Metropolitan Transportation Commission (MTC): TransLink® and TravInfo®**

Historically, MTC has limited supervisory powers even though it assumes the responsibilities to distribute regional, state and federal subsidies to transit providers and to promote interagency coordination. The Transportation Development Act (TDA), enacted in 1972, actually has specific provisions for coordination of services and transfers between operators: funds apportioned need to be expended for physical improvement to improve the movement of transit vehicles, the comfort of patrons, and the exchange of patrons from one transportation mode to another. ( 24). The effectiveness of MTC as a regional planning organization to ensure interoperability of distinct transit systems in the Bay Area has been constrained because many funds are restricted to specific counties, rather than at the sole discretion of MTC to allocate funds to efficient and cooperating agencies. However, MTC, as a third party, is playing an instrumental role in coordinating efforts of several transit operators. For example, helping to launch bus service across the Richmond-San Rafael Bridge and from the Colma BART station to the San Francisco International Airport.

In 1996, legislation was passed in California, SB 1474, and enacted into law that dealt with the implementation of transit coordination policies and procedures in the San Francisco Bay Area through the Metropolitan Transportation Commission. In summary, SB 1474 authorizes MTC, in coordination with a regional transit coordinating council, to improve service coordination and effectiveness in specified transit corridors by adopting specific improvements (25). MTC is also authorized, in consultation with the council, to identify those functions performed by individual transit agencies that could be consolidated to improve service.

In the study of Transit System Reorganization in the San Francisco Bay Area (26), it was suggested that the nine county-San Francisco Bay Region is a prime candidate for a transit federation in which transit service can be fully integrated. This recommendation is reasonable because there are 28 autonomous transit-operating agencies in the Bay Area with separate visions, goals and priorities. Possibilities for integrated planning, operations, marketing,

assembling and scheduling for transit services at the regional level are numerous in the Bay Area. In fact, MTC has broadened its mission and role beyond that of a traditional Metropolitan Planning Organization by taking a proactive role in managing and sponsoring a smart card technology initiative (TransLink<sup>®</sup>), regional traveler information systems and the Regional Rideshare Program.

### *TransLink<sup>®</sup>*

On a macroscopic and region-wide scale, MTC is the primary organizer of the TransLink<sup>®</sup> demonstration project that brings together the region's transit operators to develop a regional, electronic fare payment system that uses a single transit smart card for the Bay Area's six largest public transit service providers. A six-month Public Volunteer Pilot Program, consisting of approximately 4000 transit riders, began in February 2002 to test the system. After evaluating the program results in late 2002, MTC may expand the project to include all the transit operators in the Bay Area. Specifics of the smart card technology are mentioned in Section 5.2 of this report. For more information on the TransLink<sup>®</sup> project, the reader can go to [www.transitinfo.org](http://www.transitinfo.org) directly or use the link from MTC's Website, [www.mtc.ca.gov](http://www.mtc.ca.gov).

### *TravInfo<sup>®</sup>*

Another example of MTC's success in encouraging interagency coordination is the TravInfo<sup>®</sup> program that launched in September 1996 as a Field Operational Test (FOT) and continued afterwards when the FOT ended in 1998 as a part of the Bay Area's regional traveler information system. By calling the TravInfo<sup>®</sup> telephone number, 817-1717 or by logging onto the [www.travinfo.org](http://www.travinfo.org) Website, a caller can access current transit routes and schedules, ridesharing, park-and-ride lots and bikeways. In-vehicle navigation systems, pagers and cellular phones can also be customized to access such traveler's information. A branch of the TravInfo<sup>®</sup> program is the website, [www.transitinfo.org](http://www.transitinfo.org), that features the 'Take Transit' automated transit trip planner. The online trip planner provides door-to-door transit itineraries with walking maps to the stations and between transfer points, expected bus arrival times and in-vehicle travel times. The Website also includes system maps and individual route maps for most transit operators, links to transit providers, up-to-date service changes, and other regional transit information.

In both of the TransLink® and TravInfo® programs, MTC has capitalized on the opportunity provided by information technologies and intelligent transportation systems technologies to encourage interagency coordination and enhance interoperability of agencies in the Bay Area.

#### **6.2.6 San Francisco Bay Area: SMART Corridors Program**

Launched in the Bay Area, [t]he SMART Corridors program is a cooperative effort by Alameda County Congestion Management Agency (CMA), Contra Costa County Transportation Authority (CCTA) and twenty-four other agencies to plan and implement a multi-modal advanced transportation management system along the San Pablo Avenue and the I-880 (consisting of International Boulevard, East 14th Street, San Leandro Boulevard, San Leandro Street, Hesperian Boulevard, and Union City Boulevard) corridors. (27). In particular, three transit agencies (AC Transit, West CAT and Union City Transit) collaborated with municipal, regional and federal authorities in this project. The availability of ITS technologies has allowed the agencies to reconsider and restructure their traditional service delivery systems in order to improve efficiency and quality of service for customers. Implementation of these technologies in turn has spurred institutional changes among these agencies. The program is known as the SMART Corridors Program because it employs ITS technologies along the San Pablo Avenue and Interstate 880 corridors. The following list includes some of the technologies deployed in the project:

Automated Vehicle Location (AVL) technology tracks buses location along the corridors so that real-time service adjustments can be displayed on the kiosks and dynamic message signs to be installed at particular stations:

- Transit signal priority allows buses to go through signalized intersections with less delay when specialized receivers detect the signal from an approaching bus. The controller may grant an extension of the green phase until the bus passes or until the advancement of the next green phase. No signal preemption that immediately changes the signal to green upon the arrival of a bus has been considered. With transit signal priority, stricter schedule adherence will result in increased customer satisfaction and ridership;

- Global Positioning Systems (GPS) along with AVL technologies have allowed for incident detection and emergency vehicles management by identifying the location where an incident or emergency has occurred.

The goal of the project is to provide timely and multi-modal transportation information to the public and to agencies that are responsible for managing congestion and incidents. Traffic and transit data is obtained from detectors, intersection surveillance cameras, GPS and other information technologies. The challenge is to share this information among different agencies efficiently and effectively so that individual agencies can use it to better plan and manage services.

Whenever a project as large as the SMART Corridors Program (with a budget of \$3.48 million for the whole process of design, plan and build) involves many autonomous agencies, significant institutional issues surrounding regional deployment of the project are always ubiquitous. A lead agency (in this case, the Alameda County CMA) needs to be the facilitator of cooperation and communication among all the agencies involved. Specific attention also needs to be paid to the division of power and responsibility for financing, managing and maintaining the system's equipment once they have been installed across various municipalities. In this case study, the Alameda County CMA has been given the authority to construct the system through an MOU (Memorandum of Understanding) contracting process while the local agencies will be responsible for the ongoing management and maintenance of the equipment according to the Operation On Management Manual (OOMM) agreement. Both the MOU and the OOMM are detailed legal documents signed and agreed to by all agencies so that the legal liability issues associated with the project are clearly set out at the project's inception.

The main lesson learned in this case is that ITS technologies can be effectively used as a means to help facilitate and an incentive for many agencies to collaborate on a single, regional project when it provides benefits to each agency one way or another. In trying to breakdown the institutional barriers that hinder the prompt implementation of technologies, agencies are encouraged to coordinate creatively such as by setting up new arrangements and agreements to divide responsibility and control among the stakeholders.

## 6.2.7 NY-NJ-CT TRANSCOM

The creation of TRANSCOM (the Transportation Operations Coordinating Committee) in the New York-New Jersey-Connecticut (NY-NJ-CT) Tri-State metropolitan area has sparked and stimulated interagency cooperation. This case study illustrates the importance of establishing adequate communication channels and committing agency roles and responsibilities to successfully implement a project that involves many jurisdictions and agencies.

In 1986, 15 traffic, transit and police agencies jointly created TRANSCOM in the tri-state area. The committee's mission is to set up a medium for regional cooperation in managing transportation and improving interagency response to incidents. In the tri-state area, member agencies together are responsible for the operation of 38 highways, commuter rail track, trains and buses, tunnels and bridges, major airports, port facilities and major bus terminals.

Dennis Keck, ITS Coordinator for the New Jersey Department of Transportation said, The extensive number of jurisdictions, operators, and transportation agencies within the NY-NJ-CT Metropolitan Area created obstacles that had to be overcome. Representatives of the area's public agencies recognized that we had to communicate and cooperate with one another if we were to surmount these barriers and provide travelers with the seamless transportation information that both commuters and tourists want. (4). Since the agencies carried the common goal to address customer need and satisfaction, their joint efforts to improve interagency coordination are customer-oriented and market driven.

The organizational structure of TRANSCOM is composed of the following committees (4):

- Executive Committee is responsible for overall program and policy direction and consists of 15 chief executive officers from member agencies; an action is authorized only with all members voting unanimously for passage.
- Technology and Operations Committee makes recommendations to the Executive Committee on budgeting, operating and technology issues.

- A General Manager directs day-to-day operations and management of the association.
- TRANSMIT (TRANSCOM System for Managing Incidents and Traffic) Steering Committee develops alternative contracting approaches to handle projects that involve multiple jurisdictions and agencies. This committee serves as a tool for promoting interagency communication and cooperation on a project-specific basis.
- Staff is provided by member agencies.

The coalition's member agencies in this coalition have developed an understanding of their common problems, which prompted them to collaborate and solve them together. As stated by Michael Ascher, President of the Triborough Bridge and Tunnel Authority and Chairman of TRANSCOM, member agencies recognized and accepted that they could no longer build their way out of congestion; we recognized that technology offered the opportunity to address our transportation and mobility problems, but this technology had to be implemented at a regional level. To do so, however, each agency had to cooperate with one another and even give up some of its autonomy. This has led to our success. (4).

The formation of the TRANSCOM interagency group requires time, communication, and a common understanding of the region's transportation problems. In the particular TRANSMIT Operational Test project, the common desired product, E-ZPass, was the motivating factor for agencies to coordinate. The E-ZPass is an electronic toll collection system for 11 toll agencies in the area, and therefore, it requires a regional framework for management and operation. Through this project, the agencies learned that compromise and consensus are necessary for the implementation of efficient and effective intelligent transportation systems. (4). Since the agencies have already developed a regional perspective to managing incidents through continued interaction within the TRANSCOM group, arriving at unanimous decisions for operations and planning was much easier than without such a common vision.

In evaluating the success of this project, Matt Edelman, General Manager of TRANSCOM said, "You need to be open to new organizational approaches, but it should be done in a way that



integrates and respects existing institutions. As the TRANSMIT project has shown, no one agency has to be in charge for an area's transportation agencies to work cooperatively for the good of the entire region. (4). This case study has demonstrated that interagency coordination can be achieved in the context of a coalition of agencies with a common goal and a regional perspective even without a top-down, centralized framework. Clear division of roles and responsibilities among agencies are nevertheless formally stated at the outset. The formality of creating such an interagency group remains crucial in setting the scene for increased interaction, communication, and coordination.

## **7.0 INFORMAL COORDINATION**

Instead of achieving interagency coordination via a well-structured coalition or a regional organization, informal coordination provides an alternative approach to encouraging cooperation among agencies on an ad hoc basis. Recent studies suggest that existing linkages between organizations, while largely informal and unplanned, may better serve the interests of those demanding transit than a large central authority. One recent organizational study (28) focusing on transit in the Bay Area contends that the most important barriers to coordination would not be solved by structural reform since these barriers are political or technical in nature.<sup>11</sup>

The reader will notice that the number of success stories for informal coordination listed here are not as abundant as those for formal coordination. This is largely because informal cases are not as explicitly documented and studied as formal cases.

### **7.1 Success Stories**

Since most of the research on informal coordination mechanisms has been done in the San Francisco Bay Area, the following discussion focuses on successful arrangements between Bay Area transit operators. Because there are 28 autonomous transit-operating agencies in nine-

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<sup>11</sup> Quote cited is originally from *Organization and Transit Performance in the Bay Area: A Theoretical and Empirical Review* by Daniel Stone (See Reference 24).

county Bay Area, this region is also an excellent testbed for innovative approaches to interagency coordination.

### **7.1.1 AC Transit — BART Busbridge Emergency Agreement**

In the San Francisco Bay Area, two operators, AC Transit and BART are found to be highly interdependent since they have a common clientele for some service areas. Strong and informal connections between the two agencies were observed by Chisholm (28). In fact, his study shows that BART exhibits the most extensive set of informal interorganizational ties and channels with other agencies among the 28 transit operators in the Bay Area. This is reasonable because rail is highly dependent on bus feeder services for passengers to reach the rail stations.

A busbridge emergency agreement was formulated from an informal agreement, somewhat like a mutual-assistance pact between AC Transit and BART. In case of a BART failure on any portion of its system that is within AC's jurisdiction, AC would provide emergency bus service for BART's customers. The agreement was intentionally kept oral and flexible by not involving lawyers to complicate the process since needs arising from emergency situations are often unpredictable. BART's scheduling director was able to directly contact AC's operations manager to work out this agreement expeditiously because pre-existing informal ties existed between the two officials. The two agencies therefore work together on the basis of mutual trust and a strong informal relationship. As a result, greater flexibility and adaptability were achievable in this agreement.

The benefits of this busbridge agreement were realized when the BART Transbay tube fire and closure occurred on 17 January 1979. The original agreement provided a set of immediate procedures to deal with the emergency situation. AC Transit dispatched buses to carry BART passengers across the Bay Bridge from the original BART rail stations. Also, since the closure of the bridge lasted much longer than originally predicted, AC Transit's assistant general manager for operations decided to charter private coaches on BART's behalf since AC Transit has the expertise for bus procurement and operation. AC Transit was able to obtain chartered buses at much lower prices than BART previously did and larger load factors were achieved on each

chartered bus. Transferring the responsibility of bus chartering to AC Transit resulted in large cost savings for BART.

In this case study, informal coordination was achieved by using informal relationships and mutual trust between personnel of the two agencies to speed up negotiations of an agreement. This type of interagency coordination has led to additional flexible and adaptive arrangements that are essential in an emergency.

### **7.1.2 BART — AC Transit, San Francisco MUNI and SamTrans: Routing Arrangements**

When BART first began operations, AC Transit rerouted more than 90 of its bus lines to facilitate easier bus-train transfers at more than one location. San Francisco Municipal Railway (Muni) also rerouted many bus lines so that they would connect with BART stations. When SamTrans (San Mateo County Transit) began operations after BART opened for service, it also designed some of its buses to stop at the BART Daly City Station. Because rail has a strong interdependence with bus feeder services to carry its passengers to the rail stations, most informal arrangements were set up to facilitate better transfers and coordination among rail and bus operators (24).

### **7.1.3 AC Transit — Alameda Ferry: Scheduling Arrangements**

Some of AC Transit's bus routes, especially in the evening, are scheduled to depart the ferry terminal ten minutes after the Alameda ferry has arrived to minimize the wait time of patrons transferring from ferry to bus. In the early morning, AC Transit buses are scheduled to drop off passengers near the ferry's departure time. These scheduling arrangements are typically informal, i.e. organized at the operational level by scheduling or operations managers from the two agencies. Coordinating schedules between bus and ferry service has been quite challenging because the Alameda ferries run on irregular headways seven days a week. Personnel managing operations at both agencies have had to coordinate schedules on a route-by-route basis. Therefore, continued communication between the two operators is essential to solve interoperability issues across these two different transportation modes.

## 7.2 Factors Contributing to Success of Informal Coordination

According to Chisholm (28), a range of factors, from personal attributes to organizational structures, contribute to the success of informal coordination. A list of factors is provided here:

- Interorganizational interdependence;
- Mutual trust and similar corporate values among agencies;
- Culture of reciprocity (people should help those who have helped them) allows informal mechanisms to persist and establish firmly in our society;
- Personal contacts and networks serve as informal channels; therefore, personal attributes of operations managers affect their capability for informal interaction;
- Chance or serendipity: often informal relationships develop outside of individuals work and in turn, provide further opportunities for informal coordination at work ;
- Willingness to permit informal channels as facilitated by management style of each agency, i.e. the executives of an agency allowing subordinates to make operational decisions and to coordinate service with personnel from other agencies;
- Motivation to coordinate: organizations will coordinate if there are extrinsic benefits for all parties involved such as expedited services as well as intrinsic benefits such as increased customer satisfaction and ridership;
- Lower turnover of personnel allows organization to retain institutional memory - knowledge of previously established informal ties

Informal coordination is the cumulative result of many individual decisions that work with conditions favoring development of informal ties. Informal channels provide the means through which coordination can occur, sometimes without any direct or formal coordination procedures. Informal mechanisms can address transit needs that arise from the inherent interdependencies among particular operators.

In the Bay Area transit system, the extent of interdependence among most operators requires only unilateral or bilateral action involving two to a maximum of three service providers. For instance, the interdependence of AC Transit and BART led to the busbridge emergency agreement between the two agencies. Informal mechanisms were seen to be particularly suited

to coordinating bilateral [rather than multilateral] interdependence which existing informalities handle effectively. ( 28). One critique of informal coordination is in its limitation to involve many jurisdictions and operators effectively in a project and to unanimously define the roles and responsibilities of each participant. In such projects, components of formal coordination, such as written, legal agreements, and a collaborative organization, might be desirable to fill in the shortfalls of informal mechanisms.

Proponents of informal coordination, however, argue that the additional cost of formal coordination may be too great to achieve the optimal level of coordination. We therefore need to adjust our expectation of public organizations so that we won t reorganize frequently without real gain but with much cost, and neglect the powerful tools of informal mechanisms at our disposal. Informal coordination mechanisms are more adaptive to the level of interdependence required on a case-by-case basis while formal channels are more effective in coordinating operations that involve numerous stakeholders.

## **8.0 KEY FACTORS TO ENABLE AND ENCOURAGE COORDINATION**

As evident in the above success stories, there are several key factors that help to create the enabling environment for interagency coordination, namely an established common vision among the agencies, good leadership from individuals within agencies and a lead agency, persistence of the participants to overcome institutional and operational barriers, and the availability of technologies to encourage and enhance the coordination process. Each of these factors is discussed below.

### **8.1 Common Vision**

An established common vision among participating agencies is the most important element of successful coordination, regardless of whether arrangements are formal or informal. This common goal is directly linked to the motivation to coordinate, namely benefits that parties derive from coordination. As discussed in Section 2.0, the need for coordination is clearly urgent when transit s market shares are declining and becoming less relevant to serving the public s

transportation needs. Public transportation for the past thirty years has largely been inattentive to the changing societal needs and operated with sub-optimal efficiency and effectiveness. Fundamental changes in transit operations and institutional frameworks, if implemented, can help avoid descending a path of only incremental improvement or no improvement at all. The new paradigm consisting of customer-oriented and regional perspectives serves as the backbone of the agencies' common goal or vision to providing an effective, regional public transportation system.

The interorganizational interdependence among all the transit agencies creates the compelling force to coordinate. Project-based coordination, along with a consensus-driven decision making process, often is an excellent starting point for regions that lack a long history of centralized control over regional transportation networks. San Francisco MTC's TransLink<sup>®</sup> and TravInfo<sup>®</sup> projects, the SMART Corridors program, and TRANSCOM project are merely a few examples of many available to illustrate the significant progress agencies have made through partnerships in improving interagency coordination. These projects can serve as starting points to establish coordination in a region and build political will and consensus towards greater formal coordination processes.

## **8.2 Leadership and Persistence**

Once a common goal and the need to change old ways of conducting business are established among transit agencies, the next crucial element is adequate leadership. Often, projects supporting regional intermodalism and coordination have overcome many institutional barriers because of the strong leadership of individual personnel within agencies or of a single agency. Another pivotal element once coordination efforts have commenced is the persistence of all parties in resolving conflicts that arise during the coordination process due to differences in operations, policies and priorities.

As shown in the Dutch National Railways case, a midlevel manager spearheading the effort to coordinate was essential to the project's initiation and success. Both formal and informal coordination mechanisms may rely on the continued leadership of individuals within agencies

because coordination efforts occur both at the operations and strategic levels. A single, regional agency such as Transport *for* London, the San Francisco Bay Area's MTC or Vancouver's GVTA hosting and managing regional projects creates a single source of responsibility for strategic planning and general policy guidance. Coupled with the clear division of roles and responsibilities among agencies, whether delegated by the single agency or agreed upon by participating agencies, this coalition of public agencies and the private sector provides the necessary institutional framework for interagency coordination.

### **8.3 New Technologies — ITS**

Section 5.0 and Sections 6.2.3, 6.2.5 — 6.2.7 provide examples (operational tests and fully-deployed regional programs) in which the availability of suitable technologies (ITS) formed the backbone for institutional and operational changes. Benefits such as expedited transit services, decreased operational costs, increased customer satisfaction with increased trip connectivity and, in many cases, increased ridership have motivated agencies to collectively utilize ITS in their operations. ITS technologies then provide the essential incentive for agencies to coordinate because these new technologies are most effective and efficient in improving the transportation network when deployed regionally. A significant number of operational or pilot tests have been carried out in the United States that have led to various partnerships and coalitions involving local, state, public and private actors. Without these technologies, the agencies will have less of a common leverage to start the coordination process. ITS technologies, therefore, have effectively provided the opportunity for many agencies to collaborate, plan, and think on a regional and multimodal perspective.

While ITS helps to eliminate certain institutional barriers to coordination, new institutional barriers may surface with the regional implementation of ITS. For example, data sharing issues, allocation of human resources to the project, and ownership issues need to be resolved among agencies through consensus, agreements and collaboration. Transit agencies now have to work with non-traditional participants such as private sector companies and consultants in ensuring successful ITS deployment. A regional transportation body is needed to oversee transportation projects and manage the multi-organizational relationships resulting from ITS deployment.

Agencies might also need to give up some of their autonomy in establishing coalitions that address the different agendas of all public sector agencies.

## **9.0 NEXT STEPS**

This report has documented a review of the literature on interagency coordination. Often, only project-based examples are available in the United States whereas European countries tend to have a long history of coordinated, regional public transportation services. From the case studies, significant contributing factors along with institutional issues in formal and informal coordination processes have been identified. This has allowed the project team to gain a better understanding of the extent of which interagency coordination has been conducted and institutional issues surrounding that have been examined to date.

The next phase of the project is to extend our investigation of U.S. regional transit coordination practices primarily from Web-based research coupled with administering a survey instrument to perform in-depth analyses relative to the type and level of coordination used among transit agencies within region-specific case study sites.



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