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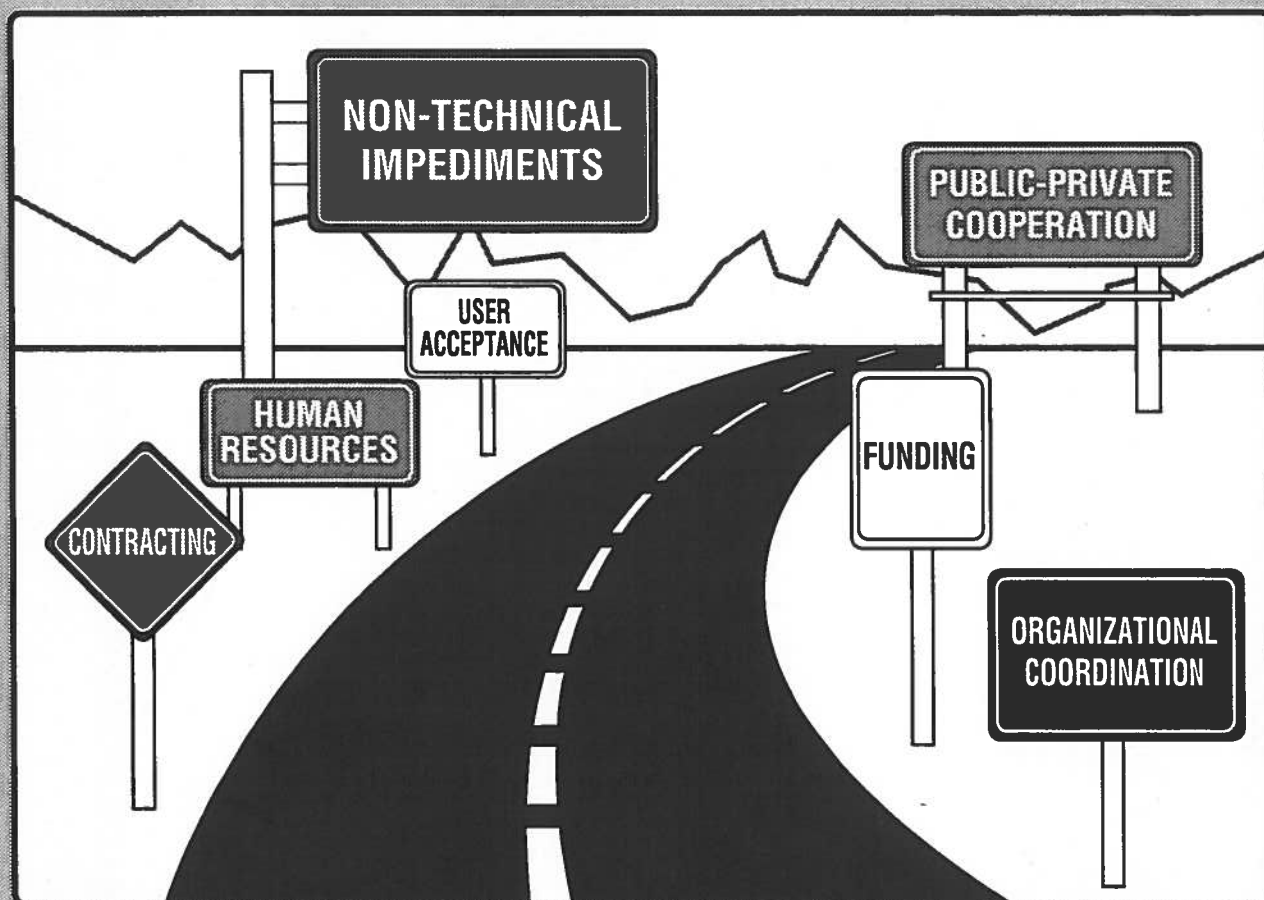
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Final Report
June 1994

REVIEW OF THE TRAVLINK & GENESIS OPERATIONAL TESTS



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Final Report

**IVHS INSTITUTIONAL AND
LEGAL ISSUES PROGRAM**

**REVIEW OF THE TRAVLINK AND
GENESIS OPERATIONAL TESTS**

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June 1994

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PREFACE

In response to the Intermodal Surface Transportation Efficiency Act of 1991, the United States Department of Transportation (U.S. DOT) developed the *Intelligent Vehicle-Highway Systems Institutional and Legal Issues Program*. This program was designed to identify (1) issues that may constrain the full deployment of IVHS products or services, (2) the means to overcome non-technical barriers to IVHS deployment, and (3) the lessons that were learned which might expedite the full deployment of IVHS technologies.

This report was prepared by the U.S. DOT's John A. Volpe National Transportation Systems Center (Volpe Center) under the guidance of the Federal Highway Administration's (FHWA) Office of Policy Development and Office of Traffic Management and Intelligent Vehicle - Highway Systems (IVHS). The Volpe Center is providing analytical support to the U.S. DOT in the Operational Test Case Studies subject area of the *Institutional and Legal Issues Program*. This subject area calls for a national, independent, and cross-cutting evaluation of several operational tests. This evaluation will identify the problems and issues that participants in operational tests encountered when deploying IVHS technologies and services and the important lessons that have been learned and may be applied in future deployments of IVHS products and services. The operational tests represented three IVHS functional areas: (1) Advanced Traffic Management Systems (ATMS), (2) Advanced Traveler Information Systems (ATIS), and (3) Commercial Vehicle Operations (CVO).

The Volpe Center has assessed eight federally sponsored operational tests with the **primary purpose** of answering four questions:

1. *What non-technical impediments were encountered establishing partnerships and deploying IVHS services and products during the operational test?*
2. *Where in the life cycle of the operational test did these impediments occur?*
3. *What were the causes of these impediments and how were they overcome?*
4. *What lessons were learned in dealing with these impediments that can be applied to future deployments of IVHS products and services?*

In order to place the non-technical issues in the life cycle of the development and the deployment of the IVHS product or service, the **secondary purpose** of the assessments is to describe the operational test and document its history. These assessments are intended to be illustrative and descriptive in nature. They are not intended to be evaluative (i.e., comparing an observed outcome of the operational test to an expected level of performance) or show cause-and-effect (i.e., identifying whether the operational test has contributed to changes to a base condition or event).

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1. SUMMARY

This section presents an overview of the Minnesota Guidestar Program and two federally-funded operational tests--Travlink and Genesis. It provides a summary of the issues and lessons learned that project participants discussed.

1.1 PROJECT OVERVIEW

The Minnesota Guidestar Program is the Minnesota Department of Transportation's (MnDOT) intelligent vehicle highway system (IVHS) program. The mission of the Guidestar Program is to provide leadership and coordination for an IVHS which provides the greatest benefits to travelers in Minnesota. Major components of the Guidestar initiative are research and development, and operational tests. The program is an umbrella for a variety of IVHS projects within Minnesota, such as Genesis, Travlink, Acts, Roadstar I, Trilogy, Advanced Rural Transportation Information and Coordination (ARTIC), AUTOSCOPE™, highway advisory radio, and a cable TV traffic channel.

The MnDOT has been active in traffic management initiatives since the development of its Traffic Management Center (TMC) in 1975. It became active in IVHS with its involvement in the HELP program in 1985 to 1988. In 1986 the Center for Transportation Studies (CTS) was started at the University of Minnesota. In 1988 the Freeway Operations Program was started by the Director of Freeway Management. Since 1989 the MnDOT freeway operations staff has been involved in IVHS-type activities and TMC/Freeway Operations have expanded. In the fall of 1989 a formal IVHS Program, started in the central office of the MnDOT, was assigned to the district level.

A ten-point plan was completed in 1989 to address the congestion problem. This plan provided for several demonstrations of new technologies and a management plan for Minnesota's expanding freeway operations program. A strategic action plan was also developed to address the expansion of existing traffic management technology and motorist information services. This plan sparked a series of discussions between representatives of the MnDOT and the CTS from which the Guidestar Program evolved. An IVHS management study undertaken during 1990-1991 synthesized the results of these discussions and laid the foundations for the program as it is today. The program has continued to develop as a true partnership between the MnDOT and the University of Minnesota.

In Fiscal Year (FY) 1991, Guidestar received its first earmarked IVHS funding, a catalyst for the program. In FY 1992, the Guidestar Program received \$10 million in earmarked IVHS funding and in FY 1993, \$8.75 million. The CTS was named as a Center for IVHS Excellence in 1992 and will receive \$1 million per year for 6 years from the Federal Highway Administration (FHWA). In April 1992, the Office of Research and Strategic Initiatives was formed. Also the Guidestar program was elevated to Office level within the MnDOT, making it more visible within the MnDOT organization.

The **Travlink** operational test is an automated vehicle location (AVL) and advanced traveler information system (ATIS) which provides real-time data on transit connection times and service performance to travelers. It was approved as an operational test in 1992. Travlink will evaluate the influence of transit information on commuter mode choice and single occupancy automobile travel. Data will be provided to transit operators and to the public via videotext and audiotext systems, cable TV, and "smart" information kiosks and terminals located in homes, work places, transit stations, and other convenient public locations. Transit operators will use this real-time transit vehicle location data for improved on-time performance and fleet management and as inputs to the traveler information systems. Travelers will be able to access real-time transit schedule and traffic information, including travel time savings estimates for high occupancy vehicle (HOV) use. The pilot test is scheduled to begin in the fall of 1994.

The **Genesis** operational test will examine the market and technical potential of an ATIS that provides comprehensive real-time travel data via personal communications devices (PCDs). It was started in 1991 and was accepted as an operational test in 1992. The Genesis system will collect, process, and manage real-time traffic data. Genesis is directly linked to the Travlink APTS network. Traffic data will come from transit and other "probe" vehicles, as well as conventional traffic data sources. The test will use a distributed processing system and will fuse data from many different sources. Data will be made available for multiple applications. Data collection systems will include existing loop detectors, new overhead detectors, and vehicles equipped with automated vehicle identification (AVI).

Initially, two types of devices will be evaluated: an alphanumeric pager and a personal digital assistant (PDA). Travelers will use their hand-held Genesis PCD to access a variety of services including real-time, route specific vehicle and transit travel times, as well as other personal use information. These portable devices allow users to know conditions on the highway and receive travel advisories before they leave the home or workplace, as well as in their vehicle. The PCDs will be evaluated in a multi-phase test throughout the Twin Cities Metropolitan Area. The initial phase, a pilot test, will provide reports on incidents only. Subsequent phases will examine the provision of additional information via the PCDs.

The Genesis project is currently in the detailed design phase. A preliminary system design was completed in March 1993; the detailed design study is scheduled to be completed in September 1994. The pilot test is scheduled to start in March 1995 and full implementation in September 1995.

The management structure for the Travlink and Genesis projects has been specified by the Guidestar Management Study because they are part of the Guidestar Program. The Guidestar Program structure has four levels of authority and responsibility. The roles of the Guidestar Executive and Steering Committees are common to the both projects. In addition each project has a Working Committee and a Project Team.

The **Guidestar Transit Innovations Committee** is responsible for planning and coordinating research, operational tests and deployment of APTS, and oversees the Travlink project. The Travlink project manager is responsible for the management of the technical consultant and the

understand IVHS concepts or see the benefits of IVHS, they are unwilling to spend their *limited resources* participating in IVHS activities. Interviewees suggested that project participants meet with representatives from these agencies and *educate* them on the benefits of IVHS. They also suggested that project participants work closely with these officials and *develop projects* which would encourage their participation.

Public sector participants also stated that finding private sector participants who would be committed to the IVHS program was difficult. Some private sector firms wanted to follow the *traditional customer-vendor process*; they wanted to be paid for providing products, not share in the costs. Some firms only wanted to market their own products. The interviewees stressed that all parties in a partnership must identify their concerns early in the project and respect the concerns of the others.

Some public sector interviewees felt that a process to select participants from the private sector should be clarified. The selection of partners outside of a formal procurement process raises *ethical* and *legal* concerns. The use of formal requests for proposals (RFPs), however, has drawbacks as well. In the formal RFP process, potential partners are responding only to the tasks listed in the RFP. The private sector does not participate in project planning or make full use of its resources.

The principal **lesson** cited was that a *new paradigm* is required. Some interviewees proposed the use of RFPs structured to solicit partners rather than to solicit work tasks. Interviewees also stressed that to alleviate ethical and legal concerns, attorneys and contracting personnel should be appointed to the problem-solving team.

Another major area of concern was the definition of partner roles and responsibilities. Several public and private sector participants offered an important **lesson: Clearly define roles and responsibilities at the beginning of the project**. Interviewees stated that partners had to adjust to the *changing role* of the private sector from contractors to partners. The public sector had to include the private sector in the planning process, and the private sector had to be aware of the political environment in which the public sector worked.

Interviewees also discussed the role of traditional operating agencies. Public sector participants suggested that managers of operating agencies develop *new business practices* and look to the private sector to help them incorporate IVHS activities into day-to-day operations. The interviewees also stated that the role of the public sector, in general, must be redefined in a similar manner. The public sector must move away from its perception that it is the *only provider* of public services and allow for more participation from the private sector.

A third area of major concern was the administration of projects involving many participants. Developing memoranda of understanding (MOUs) among the private and public sector partners was difficult and requires a *new paradigm* for public-private relationships. This model must allow the State to help the private sector achieve goals and profit without the appearance of fraud and unethical behavior.

stressed that the federal and state contracting processes need to be streamlined. The structure of the state's standard contract should be changed to incorporate some of the ways private firms contract for work.

They also recommended that *legal counsel* be involved early in the contracting process because of the new and difficult contract issues created by IVHS. The interviewees also felt that more *training*, such as a workshop on public-private partnership contracting procedures, is required.

The second **lesson** private and public sector participants learned was that *government auditing* procedures must be clarified for the private partners. Some private sector participants were reluctant to provide certain financial information, such as overhead rates, to government auditors because they feared that this information would be made public. Private sector companies felt that this information was *proprietary* and, if released, could be used by competitors. The state clarified the auditing procedures to the private partners and indicated that the state does not usually insist on performing the audit. If necessary, a third party could be hired to perform the audit. In addition, the state made it clear that audit data does not become public just because state auditors looked at it. Some interviewees feared that this auditing issue could *discourage* potential private partners from participating in IVHS activities.

Anticipating the short time frames that would be required to get consulting staff onboard, MnDOT officials elected early in the project to work from a pre-qualified list of vendors under a task order contract, rather than issue a RFP for each required task. Unfortunately, the *upper limit* of the task order contract was set *too low*. The tasks orders may have to be re-bid in order to increase the amount of funding. The use of the task order granted MnDOT more *flexibility* in selecting project consultants. MnDOT officials felt that the task order approach worked well and saved time. Some other public sector participants, however, felt that the task order process slowed down the project.

The public sector participants learned a **lesson** in contract negotiations: **Involve administrative personnel who have contract negotiations experience early in the negotiation process.** Prior to the IVHS program, MnDOT project personnel handled only professional and technical contracts. Usually, these contracts did not require contract negotiations. The MnDOT staff failed to understand that the new partnership agreements would require contract negotiations.

MnDOT officials requested assistance from state administrative personnel; a senior contract administrator has been assigned to handle contracts. Also the Department of Administration suggested *corrective action*, and these steps have been implemented by MnDOT.

Public sector representatives also learned that several private sector partners were not familiar with government contracting. Some private companies had experience in federal *defense* contracting requirements but were not familiar with FHWA and state government regulations. Also state contracting and reporting requirements differ from federal requirements in areas such as allowable costs. Moreover, both the public and private sector have their own standard contracts.

A few public sector officials stated that some personnel involved in the day-to-day operations of the transportation system are *reluctant*, and sometimes resistant, to change. Some view work in the IVHS area as an add-on function rather than a change in daily business. They do not see the benefits of IVHS in their work area. Also, they traditionally have dealt with freeways and signalized streets *separately* and do not have a systems perspective.

These officials suggested that the operational staff must be *encouraged* to see the vision and be shown that IVHS is the future. Management should set priorities with the staff and develop a long range plan that would *integrate* the operations of freeways and signalized street systems.

One participant succinctly expressed a lesson, "**Project participation is not assured unless the support of upper management is secured.**" Although the lack of upper management support has not significantly affected an operational test, one public agency considered withdrawing its support because its policy-making board did not see the benefits of the project and was *skeptical* of the project's value. Without upper management support, the likelihood for an agency to withdraw from a project increases.

One intra-agency issue was discussed by both private and public sector representatives. They stated that the FHWA was uncertain how it would manage the IVHS program. The IVHS program was *new* to the FHWA staff. The chain of command involving the Washington Headquarters (HQ), the Region 5 Office, and the Minnesota Division Office was not clearly defined. Initially, the HQ staff wanted to *manage* the IVHS program from HQ. The division office staff referred all actions to the HQ through the regional office, which was *contrary* to normal federal-aid procedures. Usually, the division office staff works directly with the MnDOT staff. Eventually, FHWA personnel in the different offices became more comfortable dealing with each other and generated a level of *trust*. The Division Office is now responsible for day-to-day management and oversight, but MnDOT officials communicate directly with Washington when necessary.

Only representatives from the public sector discussed issues involving *inter-agency* coordination. These interviewees suggested that some issues in this area may never be resolved fully because the involved organizations may continue to have conflicting philosophies and priorities.

The participants learned the importance of involving *legal counsel and contract personnel* from outside of one's agency early in partnership negotiations. At first, the MnDOT technical staff did not involve legal and contract personnel. At the time it did not seem necessary. There was concern that involving agencies from outside of the department might slow the progress. MnDOT officials recognized, however, that support from outside of MnDOT would be helpful because the IVHS program required *new innovative methods* to develop public-private relationships. As a result, the MnDOT IVHS staff solicited support from the Department of Administration and the Attorney General's Office. These agencies are now involved *early* in the negotiations process rather than at the end.

Public sector participants saw a need to improve the coordination and communication between the Federal Transit Administration (FTA) and other partners. Several participants felt that the

projects to the FHWA and at national conferences to gain acceptance. Although funds were *earmarked* for Guidestar by Congress, the FHWA had to approve individual projects before a project could be implemented. FHWA reviewers expressed concern over the objectives of the operational tests and MnDOT's process for selecting consultants and partners.

The MnDOT and FHWA staffs were involved in *lengthy discussions* to identify mutually acceptable projects and project implementation *delays* occurred. In some instances, the MnDOT funded projects entirely with *state funds*. The MnDOT resolved this issue by developing *work and program plans* and a *new process* to review proposals.

Second, public and private sector interviewees stressed that additional guidance from the FHWA was needed on eligible match requirements. Discussions on what constitutes the *local match* must be held and an agreement must be reached early in the project. Project participants stated that the activities that would be supported by federal funds, the contributions that could be applied to the local match, and the value of partner contributions were *not defined clearly*. *Establishing the value* of contributions was a significant issue, because the process of determining the value of partner contributions was *new* to most partners. *Requirements* have been drafted by the FHWA and included in the Federal Register solicitations. In addition, *meetings* were held at which the FHWA explained the funding situation to private partners and MnDOT staff.

Third, public and private sector participants stressed that the *project scope* should define clearly goals and objectives. They also recommended that *financial commitments* be obtained at an early stage in order to prevent a change in project scope at a later date. Interviewees stated that a change in funding for the Travlink project negatively impacted the scope and level of functionality of the operational test. The desire by participants to maximize the functionality of the project had to be balanced with existing funding limitations. The change in scope resulted in *budget overruns*, *fewer busses* equipped with Travlink equipment, and a *smaller test area*.

In the Genesis operational test, the FHWA did not fully support *data collection* efforts requested by the participants. Private and public project participants felt that the \$3 million allotted for data collection was not sufficient. One private sector partner, in particular, was very concerned about the implications of the FHWA decision: if the user of the device perceived that the data was inaccurate or unreliable, the user would develop *negative perceptions* of the private sector manufacturer. The Genesis project became *harder to sell* to corporate decision makers and to public agencies. One way participants dealt with this issue was to *review costs and benefits* of different levels of functionality and *cut areas* that only provided incremental benefits.

Fourth, the public sector interviewees cited the need to get *local governments* involved. Because city and county governments have *limited budgets and staff*, officials may choose not to spend their limited resources on IVHS activities. They cannot match federal funds and lack funds for training and travel. To encourage local government involvement, interviewees suggested *simplifying the channels* for providing IVHS funds to local governments and establishing a *local IVHS council* which would offer local information forums and training sessions.

partner contributions. One participant from a transit agency thought that there was a lack of understanding of IVHS technologies within the public sector. Also, the IVHS field *changes quickly* and staff must keep up to date on these changes.

Interviewees also expressed concern about public sector staff members applying IVHS knowledge gained from work in the public sector to part-time employment in the private sector. In one instance, a MnDOT staff person who had gained valuable experience working on IVHS test projects was *offered a job* in the private sector. Officials questioned the *ethics* of taking knowledge gained within an agency and applying it to work outside of the agency. Questions emerged regarding the staff member's *commitment* to his MnDOT job and *jealousy* and tension among other MnDOT employees developed.

The public sector participants also stated that *resource limitations* hamper learning. The Guidestar project staff answers inquiries and meet with others from the general IVHS community as well as perform their required work tasks. This is very *time consuming* and burdensome. Often staff members are unable to take training, read relevant literature, or participate in conferences. Project personnel feel this issue causes them sometimes to make decisions with *limited information*.

1.2.6 Intellectual Property and Royalty Rights

Public sector participants discussed two **lessons** that they learned addressing issues in this area. First, interviewees cited the need to identify what material private partners consider *proprietary* and the need to *specify ownership* rights in the contract. This must be accomplished to alleviate the conflict between the desires of private partners to make some work *proprietary* and the traditional thinking that publicly-funded products should remain in the *public domain*. The *conflict* over intellectual property rights threatened agreements and made MOUs difficult to write. This issue was particularly acute for the Genesis project in which disputes over the PCD software rights threatened to paralyze the project.

The FHWA proposed wording that specified the ownership of property rights. This wording was acceptable to all parties. In the case of the Genesis project, the contract stated that the private sector owned the rights and could sell them. It also stated that the FHWA and the MnDOT are fully licensed to use the material.

Second, the interviewees learned that *information sharing* is critical to successful partnerships. Private partners must be willing to share proprietary information. Partners must develop a complete understanding of each other's expectations. This will build trust among the partners and encourage them to reconcile differing goals.

The interviewees also stated that state agencies have difficulty handling royalty rights. The MnDOT *lacks legislative authority* to accept money from royalties. No guidelines existed, and there was *no system* to track royalties, value enhancements beyond the original patent, or allow for diminished royalty rights based on changes to the system. In addition to the legal and

1.2.10 Standards and Regulations

The lack of standards concerned both private and public sector representatives. They feared that a technology being developed for an operational tests could be tied to obsolete standards. Selecting a standard for the test might limit the technology in the long run.

One interviewee noted that many states or regions, who are engaged in operational tests, have plans for implementing and perhaps expanding the systems developed in these operational tests. Because federal money may not be available for deployment, it is likely that what exists at the end of the test will be what that state or region will use for implementation. A determination will have to be made whether or not creating or establishing a standard should be a goal of the operational test.

Interviewees stated that operational test personnel find working with radio spectrum regulations and standards difficult and offered one lesson: **Coordination and collaboration on radio spectrum standards and capacity is needed.** Staff members felt that adequate radio frequencies were not available and that regulations governing the use of radio frequencies were restrictive.

Project personnel *redesigned* the trunk radio system for Minneapolis-St. Paul area and had to reconcile this system with local authorities and the Federal Communications Commission. Because the MnDOT staff does not yet know what their long-term IVHS requirements will be, questions have been raised concerning matching this trunk system with those developed later and in other areas. The current solution is for the MTC and MnDOT to share a backbone for future voice and data transmissions.

The interviewees offered another lesson: **Communications between the MnDOT and the Minnesota Public Utilities Commission (PUC) were essential.** The MnDOT avoided regulatory issues by fostering good relations with the Minnesota PUC. This lesson was learned as project participants struggled to adhere to regulations covering telephone company operating privileges.

1.3 ISSUES THAT MAY BE ENCOUNTERED BY PROJECT PARTICIPANTS

This subsection presents the more important issues that project participants said they may encounter as the Genesis and Travlink operational tests continue into later phases or if they move into full deployment:

- Contracts that lack explicit dispute resolution terms could be troublesome if a partner is non-compliant.
- State labor policy could affect contracting arrangements used by IVHS projects.

2. PROJECT OVERVIEW

This section describes the scope, history, management structure, and participants of the Minnesota Guidestar Program and the Genesis and Travlink operational tests. It also discusses the stated project goals and objectives, the goals and objectives of the project participants, the benefits the interviewees foresee from participating in the project, the risks that they or their organization may be taking, and what they see as the critical success factors of the project.

2.1 PROJECT DESCRIPTION

The Minnesota Guidestar Program is the Minnesota Department of Transportation's (MnDOT) intelligent vehicle highway system (IVHS) program. The mission of the Guidestar Program is to provide leadership and coordination for an IVHS which provides the greatest benefits to travelers in Minnesota. Major components of the Guidestar initiative are research and development, and operational tests. The program is an umbrella for a variety of IVHS projects within Minnesota, such as Genesis, Travlink, Acts, Roadstar I, Trilogy, Advanced Rural Transportation Information and Coordination (ARTIC), AUTOSCOPE™, highway advisory radio, and a cable TV traffic channel. The operational test component of Guidestar currently consists of four principal initiatives: Genesis, Travlink, Integrated Traffic Management Systems (ITMS), and Rural IVHS. This review focused on two federally-funded operational tests: **Genesis and Travlink**.

The **Travlink** operational test is an automated vehicle location (AVL) and advanced traveler information system (ATIS) which provides real-time data on transit connection times and service performance to travelers. Travlink will evaluate the effectiveness of transit information in influencing commuter mode choice and decreasing single occupancy automobile travel. One hundred and fourteen Metropolitan Transit Commission (MTC) buses will be equipped with AVL devices. The data from these units will be provided to transit operators and to the public via videotext systems, such as U.S. West's Community Link service, audiotext systems, cable TV, and "smart" information kiosks and terminals located in homes, work places, transit stations, and other convenient public locations.

Transit operators will use this real-time transit vehicle location data for improved on-time performance and fleet management and as inputs to the traveler information systems. Travelers will be able to access real-time transit schedule and traffic information, including travel time savings estimates for high occupancy vehicle (HOV) use. Genesis users will be able to access the same data through their personal communications device (PCD). A companion advanced public transportation system (APTS) "smart card" project will test the use of automated card reader systems to improve service levels and management procedures.

The recently completed Interstate I-394 connects the western suburbs of the Minneapolis-St. Paul region. This highway was designed to serve as the region's live transportation laboratory for

for multiple applications. Data collection systems will include existing loop detectors, new overhead detectors, and vehicles equipped with automated vehicle identification (AVI).

The operational test area will evolve in phases. For the initial phase of the test, the test area encompasses a large portion of the western area of the Twin Cities metropolitan area. The full extent of the operational test area will necessarily be constrained by data collection availability, costs of additional data collection capability, and the duration of the test itself.

2.2 MANAGEMENT STRUCTURE

Organizationally, the Minnesota Guidestar Program is set up for four purposes:

- Build multi-modal solutions.
- Create consensus throughout public agencies in the state.
- Meet urban and rural needs.
- Foster real partnerships.

A hierarchical committee structure provides the framework within which management and coordination of all Minnesota Guidestar activities occurs. Each committee level consists of members with approximately equal seniority and decision-making capabilities, and each is assigned tasks commensurate with that authority. This structure serves to ensure both continued interest in the initiative by committee members and appropriate support for the Guidestar Program at the various management and staff levels within the participating agencies and organizations. This hierarchy also provides a clear chain of command and accountability.

The **Executive Committee** represents the highest level of the program management structure. The committee is comprised of chief administrative officers and senior managers. Its overall mission is to insure that Minnesota Guidestar remains focused on its goals and objectives, to support the program's overall success, and to make strategic policy decisions.

The **Steering Committee** directs Guidestar's day-to-day management activities. Committee membership includes representatives from academia and federal, state and local government agencies. The Steering Committee is responsible for developing and maintaining the program's strategic plan and associated funding requirements. Committee members are directly involved with management and coordination of specific projects.

Working Committees are responsible for the coordination, implementation and management of technical studies and other activities. Their members are experts in particular fields of IVHS and provide quality control on the work performed at project level. Responsibilities of the working committees include preparing project work plans, coordinating and managing project implementation activities, preparing documents for Steering Committee review, and preparing appropriate recommendations for Steering Committee approval. Committees include Rural

Travlink was developed by the Transit Innovations Committee of Guidestar and is sponsored by a public-private partnership. Sponsors include the MnDOT, the FHWA, the Federal Transit Administration (FTA), the MTC, the Metropolitan Council, the RTB, US West, 3M, the Westinghouse Electric Corporation (Westinghouse), and the CTS. Each partner has their own primary responsibilities within the operational test.

The **MnDOT** is the Travlink project leader and is responsible for day-to-day administrative matters through the systems design phase of the test and for budgeting and scheduling. The **FHWA** will provide financial support and overall strategic direction to the project and ensure that Travlink remains consistent with the various federal policies, procedures and goals. The **CTS** will provide information regarding the human factors aspects of the Travlink system and will participate in evaluation.

The **FTA** will provide financial support through grants and overall direction to the project and ensure that Travlink remains consistent with the various federal policies, procedures and goals. FTA funds will be used exclusively to fund non-operational project costs including research, design, evaluation, project management, and consultant support. The **MTC** will supply and operate the AVL-equipped buses that will be used in the I-394 corridor. The MTC also will be responsible for day-to-day project management upon initiation of the operational test phase of the test. The **RTB** serves as a member of the technical team and provides financial support.

The **Metropolitan Council** serves as a member of the technical team which is responsible for overall project management. **US West** will supply the 800 videotext systems which will deliver Travlink information to homes in the area, and provide technical support. **3M** will provide technical support and the Opticom AVL system for monitoring transit vehicle locations. **Westinghouse** will provide technical support and donate radios and hardware for the operational test. Other participants include Strgar Roscoe Fausch, the project managers, and Colle and McVoy, the market researchers.

The public sector participants and **US West** are members of Transit Innovations Committee and were involved with the project from its inception. Once the operational test concept was developed other private sector partners were asked to join Travlink. In January 1993, **3M** and **Westinghouse** joined the Travlink project team.

The **Genesis** project was also set up under the Guidestar Program and is sponsored by a public-private partnership. Partners include the MnDOT; the FHWA; Motorola; Loral, formerly IBM; and the CTS. Each partner has their own primary responsibilities within the operational test.

The **MnDOT** is the Genesis project leader responsible for budgeting and scheduling. Also it will be responsible for engineering services and the capital procurement process, operate the traffic information database, and control the dissemination of all traffic information. The **FHWA** will provide financial support and overall strategic direction to the project and ensure that Genesis remains consistent with the various federal policies, procedures and goals.

expanding freeway operations program. A strategic action plan was also developed to address the expansion of existing traffic management technology and motorist information services. This plan sparked a series of discussions between representatives of the MnDOT and the CTS from which the Guidestar Program evolved. An IVHS management study undertaken during 1990-1991 synthesized the results of these discussions and laid the foundations for the program as it is today. The program has continued to develop as a true partnership between the MnDOT and the academic community at the University of Minnesota.

In Fiscal Year (FY) 1991, Guidestar received its first earmarked IVHS funding, an accelerating point for the program. The Minneapolis-St. Paul region was one of 25 cities that received start-up grants. In 1992 the CTS was named as a Center for IVHS Excellence and will receive \$1 million per year for 6 years from the FHWA. In FY 1992, the Guidestar Program received \$10 million in earmarked IVHS funding and in FY 1993, \$8.75 million. In April 1992, the Office of Research and Strategic Initiatives was formed. The Research and Strategic Initiatives Division elevated Guidestar to Office level within the MnDOT, making it more visible within the MnDOT organization.

By the summer of 1993, Guidestar was underway and had produced an early version of its Strategic Plan. A version of Minnesota Guidestar Guidelines Manual has also been distributed for review. The Guidestar Strategic Plan outlines a migration path for the Guidestar Program. This plan covers short-term activities for the period from the present to 1995 and medium-term plans up to the year 2000; it also considers some possible long-term ventures into the next century. The Guidestar Strategic Plan presents four general activities:

- IVHS Management Study (of which the Strategic Plan is part)
- Program management and coordinating
- Participation in standardization
- Development of research facilities.

Early in 1993 the first program work plan was prepared. The first PPM Committee meeting was held in March of 1993.

The Guidestar partners have recognized the importance of developing effective multi-modal transportation solutions. Under the umbrella of the Guidestar program, a Transit Innovations Committee was established to develop **Travlink**, the APTS for the region. The committee is seeking to define, operationally test, and deploy APTS technologies that can be used to improve the cost effectiveness and attractiveness of transit and ride sharing services. The Transit and Innovation Committee conceived the idea for the Travlink project.

In September of 1992 a grant application was submitted to the FTA. Strgar Roscoe Fausch commenced their role as project manager. US West Community Link Videotext service was demonstrated at the 1992 Minnesota State Fair supporting travel information service. The Travlink operational test was accepted by the FHWA and was incorporated as part of the national

Customer-oriented objectives:

- To increase the number of transit users as a result of improvements to the transit system:
 - To increase access of potential riders to information regarding transit services and facilities by providing information at home, in the work place, and at park-and-ride lots, and other public locations.
 - To provide real-time transit and traffic information that emphasizes the time and dollar savings that can be achieved through the use of alternatives to the single-occupant vehicle.
 - To improve the quality of customer information by emphasizing timeliness, flexibility, and content that is based upon measured customer needs.
 - To improve bus on-time performance, minimize wait-time and increase the reliability and safety of bus operations.
- To determine customer response to the technologies tested including use and acceptance, changes in travel behavior, and transit ridership.

Operations-oriented objectives:

- To evaluate the impact of AVL on service efficiency and quality including on-time performance, timed-transfers, incident management, and scheduling.
- To evaluate the functionality and integration of ATIS/AVL into the MTC's bus operations including service planning, dispatching, transit control and security, communications, and information systems.
- To test the effectiveness of the traveler information systems in terms of the physical location, content, and availability to communicate the required information.

Technology-oriented objectives:

- To determine the performance of the selected APTS technologies in a real-world environment including accuracy, timeliness, and reliability by evaluating three technologies:
 - Videotext and audiotext systems
 - Communications networks for the AVL, audiotext, and videotext components
 - AVL systems.
- To evaluate the APTS technologies in relation to the existing transit strategies and facilities in the I-394 corridor.

investment within a reasonable time, and a rationale for additional sales. They also had the objective to be part of the operational test in order to showcase their product.

- To evaluate the effects, impacts, and effectiveness of the operational test. (11-7)

This objective was mentioned only by public sector participants. These interviewees wanted to prove the benefits of IVHS and evaluate the costs, impacts on the transportation system, service improvements, user acceptance, new concepts, the technical feasibility, and the performance of the technology being tested.

- To promote new institutional relationships and public-private partnerships. (10-8)

State and federal public sector participants wanted to develop and test new partnership agreements and institutional arrangements for IVHS that are valid for federal and state governments. They also mentioned expediting completion of difficult contract negotiations and building coalitions for IVHS in areas such as commercial vehicle operations (CVO).

- To realize operational improvements. (11-5)

This objective was cited only by state-level public sector participants. They wanted to establish a system-wide motorist information program, rapidly deploy improvements, and integrate operational test technologies into operations.

- To enhance mobility and reduce congestion. (9-8)

Only public sector officials stated this goal. They wanted to use the tested products and services to improve transportation, reduce congestion, minimize passenger travel times, and improve mobility of transit users with ambulatory disabilities. They also wanted to find new solutions to old problems without increasing the infrastructure, that is, to move away from building new transportation facilities and towards managing the existing infrastructure more efficiently.

- To facilitate and encourage mass transit. (9-7)

This is another goal supported by the public sector. These participants wanted to encourage transit usage and innovations, increase transit ridership, determine how ridership is impacted by better data, and improve transit service quality. They also wanted to develop an HOV-systems plan for the region and discussed reducing single occupancy vehicle use by increasing the use of transit and HOVs.

- To find new ways of doing business, expand roles, and create new business opportunities. (9-5)

- The existing infrastructure will be used to its optimal potential. (3-3)

Representatives from the public and private sectors placed a heavy emphasis on *learning new ways of doing business, forming new partnerships, and creating new business areas*. The public sector representatives also were concerned with *improving safety, reducing congestion, improving customer service, and increasing mass transit ridership*. The private sector participants emphasized *developing new products and markets*.

2.7 RISKS

This section presents the risks that the interviewees or their organizations have or may face because of their participation in the Guidestar Program or the Genesis or Travlink operational tests. Fourteen risks were mentioned three or more times or by three or more interviewees:

- The operational test may fail; it may not to provide a solution to the transportation problem or the technology being tested may fail to perform as expected. (16-10)
- The public does not accept IVHS products and services. (10-7)
- Adequate and ongoing funding is not guaranteed. (8-7)
- The reputation of a participating organization may be injured. (8-6)
- Legal and ethical concerns may be raised concerning new and untested partnering agreements. (7-6)
- The program or project concept may be skewed. This would lead to addressing the wrong areas or improper investment of resources. (10-4)
- Participants may increase their exposure to liability. (6-5)
- Participation in IVHS activities may result in lost opportunities in other areas. (5-5)
- Participants may fail to maintain project schedules. (5-4)
- Participants have to enter new marketplaces and new business areas. (4-4)
- Participants may withdraw from the project. (4-3)
- A market for products and services may not develop. (3-3)
- Other operational tests may be performing duplicate work. (3-3)
- The evaluation may not prove the benefits of IVHS. (4-2)

Representatives from the public and private sector discussed all of the risks except for two. Only public officials mentioned that *the concept may be skewed* and *the evaluation may not prove the benefits*. The former was mentioned only by public sector participants involved in making policy, while the latter was mentioned by both policy makers and project administrators.

3. ISSUES AND LESSONS LEARNED

This section presents the institutional issues or non-technical constraints that the interviewees discussed. It also includes the lessons that they learned addressing these issues. The issues and lessons are divided into ten categories:

- New Business Relationships
- Contracting and Auditing
- Organizational Coordination
- Funding
- Human Resources
- Intellectual Property and Royalty Rights
- User Perception and Acceptance
- Project Evaluation
- Implementation and Deployment
- Standards and Regulations

3.1 NEW BUSINESS RELATIONSHIPS

This section is divided into two areas: (1) issues that project participants encountered and the lessons learned addressing these issues and (2) issues that may encountered in future operational tests or deployments.

3.1.1 Issues That Were Encountered by Project Participants

In this subsection, each issue area is placed into one of three major groupings: (1) issues related to partner recruitment and selection, (2) issues related to partner roles and responsibilities, and (3) issues related to project administration. The issues discussed in this subsection are closely related and have similar causes and effects. Consequently, there may be some overlap in the discussions of the issues listed in the three groupings.

3.1.1.1 Partner Recruitment and Selection

Public sector participants at the state level disclosed that they encountered three issues in recruiting and selecting partners. This issues occurred early in the program and have not been resolved totally:

The participants offered several **lessons** on involving other government agencies:

- Encourage the involvement of local government and transit officials by working closely with them and developing a joint program.
- Encourage local governments to participate in IVHS by educating them about IVHS benefits.
- Give local government and transit representatives a meaningful role IVHS projects.
- Include enforcement agencies in IVHS planning.

ISSUE 2: THE PUBLIC SECTOR HAD DIFFICULTY RECRUITING PRIVATE SECTOR PARTNERS WHO WERE BOTH COMMITTED TO IVHS AND WILLING TO BECOME FULL PARTNERS

Private sector companies traditionally do not work with governments in a partnership. The public sector needs private sector partners who exhibit a strong commitment to IVHS, are already involved in IVHS, or are internally motivated.

Many companies prefer the *traditional customer-vendor* relationship. Others are not committed to IVHS, are looking for work, or are trying to sell a product. Successful partnering stems from a company's perspective of the program. In the past, companies were paid for this type of work. Now, however, they are being asked to participate as a partner and *share project costs*. In addition, the public sector has not clearly defined what it expects from private sector partners. Consequently, some companies are reluctant to enter the IVHS arena.

One of the effects of this issue was *wasted time and project delays*. For example, MnDOT representatives had discussions with several firms that eventually did not participate. Also negotiations between representatives of Guidestar and the private sector moved slowly.

The principal **lesson** learned was that **new public-private partnerships are difficult** because both sectors have unique concerns. In order to develop a partnership, both sides need to present their concerns early in the process. The participants stated other lessons:

- Assess the readiness of a prospective partner and its willingness to move negotiations out of marketing into engineering.
- Review the history of a prospective partner relative to innovation and the partner's willingness to invest capital towards the future.
- Investigate the quality of the talent base offered by the prospective partner.
- Solicit partnerships where the partner will take the lead.

3.1.1.2 Partner Roles and Responsibilities

Participants discussed four issues in the area of partner roles and responsibilities. The first was discussed by representatives of the public and private sectors while the last three were only mentioned by public sector representatives. All occurred early in the program and are still being resolved:

ISSUE 1: THE PARTNERS HAD TO ADJUST AS THE ROLE OF THE PRIVATE SECTOR CHANGED FROM CONTRACTOR TO PARTNER

This issue was a challenge for both the public and private sectors. From the MnDOT point of view, working within public-private partnerships was valuable because, though partnerships, resources were added and risks shared. Public-private relationships, however were *new* to the MnDOT. MnDOT staff had to modify the way they treated contractors. MnDOT staff had to recognize that private partners were entitled to *provide input* in the decision-making process and that, in some instances, the private sector moves more quickly than the public sector. Some public sector representatives also noted that private partners are not totally aware of *political realities* public agencies must consider and that some private partners focus only on business issues. From the private partner point of view, most private sector firms had *few previous experiences* with the public sector. When they did, they worked with the Department of Defense, which operates differently from the FHWA and the MnDOT.

The effect of this issue was both sectors experienced a *long learning curve*. Each sector had to take time to learn about the other sector. It also forced the participants to define the roles of the partners more clearly.

Although this issue is still not fully resolved, one important **lesson** was learned: **Clearly define the partnership relationship at the beginning of the project**. Holding regular meetings was stressed as a method to facilitate a better understanding among the partners.

ISSUE 2: THE ROLES OF THE PARTNERS WERE NOT WELL DEFINED WITHIN AND ACROSS PROJECTS

Project personnel found the roles of the private partners difficult to define because the private partners were extremely *sensitive* about their roles. Private partners had *differing opinions* about who should have leadership vs. supporting roles. At times, private partners working on the same project wanted the lead role and did not want to be subordinate to another partner.

Also the responsibilities of the project participants working on related projects has not been clearly defined. Some *turf battles* and possible *duplication* of work have resulted.

The **lesson** learned was **the roles of the partners should be defined early**, support for these definitions must be obtained from the leadership of each partner, and the work of the partners working on different projects must be coordinated.

ISSUE 1: DEVELOPING MEMORANDA OF UNDERSTANDING WITH PARTNERS HAS BEEN DIFFICULT

There are two main causes for this issue. First, trying to blend the requirements of multiple parties who come from *different cultures* and have no common ground is difficult. Each party has different objectives and expectations. MnDOT officials were looking for partners to share investment, risks, and benefits. One MnDOT representative stated that initially MnDOT officials were naive in asking the private sector to contribute money. Also, private sector participants, who are profit driven, had *philosophies* which differed from the public sector's. Some private sector firms wanted Guidestar to pay for their services. The expectations of partners were not completely understood or appreciated by the other partners.

Second, there is a *lack of understanding* as to why partnerships are formed. Some managers do not understand why they should be partnering and cannot distinguish the difference between a partner and a participating vendor. In one extreme circumstance, an arrogant negotiating posture on the part of one private partner led state personnel to believe that the firm had no understanding of the partnership philosophy, and was solely motivated by profit and greed.

One effect of this issue is the amount of *staff resources* used to resolve disagreements such as the value of partner matches. Another effect was that the MnDOT considered *business planning* and started using RFPs for partners. This issue also resulted in *delay* in project schedules.

The interviewees proposed resolutions for this issue. The first suggestion was *training* in the role and purpose of partnerships. The second suggestion was that partnerships should be formed only with contractors who can produce and accelerate *public services*. The third suggestion was to form partnerships around *mutual needs*, such as the private partner need for information and the MnDOT need for communication devices.

The lesson participants learned was a **new paradigm for public-private relationships is needed**; one in which the State can help the private sector achieve goals and profit without the appearance of fraud and ethical problems. In developing memoranda of understanding (MOUs), progress was made by showing partners that there is a benefit to their participation on IVHS. Also the MnDOT was able to leverage engineering skills. Private sector funds were leveraged by a factor of three.

ISSUE 2: PUBLIC-PRIVATE PARTNERSHIPS REQUIRE MANAGEMENT STYLES AND ORGANIZATIONAL STRUCTURES NOT FOUND IN TRADITIONAL GOVERNMENT-CONTRACTOR RELATIONSHIPS

Participants of the IVHS operational tests are forced to work within new organizational structures that are foreign to the way business previously had been conducted. To make these new structures work, participants must forge *new relationships*. A proactive management style and flexibility are required. Operational test managers must be able to deal with partners on an *equal basis*--not as if they were contractors.

3.2 CONTRACTING AND AUDITING

This section is divided into two areas: (1) issues that project participants encountered and the lessons learned addressing these issues and (2) issues that project participants may encounter.

3.2.1 Issues That Were Encountered by Project Participants

In this area, five issues were discussed. Representatives from the private and public sectors discussed the first three and only public sector participants at the state level mentioned the last two. All issues are in various stages of resolution:

ISSUE 1: CURRENT CONTRACTING PROCEDURES ARE NOT SUITED TO THE REQUIREMENTS OF IVHS PROJECTS

The process for recruiting a contributing partner is difficult. The contracting process is too *cumbersome* and *untimely*. Also the state's process does not address the needs of projects with software design tasks and does not cover certain areas, including intellectual property rights, liability, and proprietary data, adequately. Several interviewees stated that the contracting process needs to be reinvented to accelerate public-private partnerships.

Government *regulations* are the major cause of this issue. The current contracting process was developed to hire firms to design and build bridges and roadways and is *not suitable for IVHS* projects. IVHS technology turns over much more quickly than the roadway infrastructure for which the contracts were designed. The contract process is not capable of keeping up with IVHS technology. The standard state contract does not fit the prototype situation; performance requirements are not appropriate for contractors hired to determine the feasibility of IVHS technologies and evaluate them. It is also difficult for a *bureaucratic structure* to adopt a new process without knowing what the consequences will be.

In addition, both state and federal contracting regulations must be met. Interviewees said that *combination* of the Federal Acquisition Regulation (FAR), a state requirement that firms be registered in Minnesota prior to being put on pre-qualified list, and affirmative action requirements to meet quotas for targeted business groups and minority businesses, make it difficult to select the most qualified partners.

The major effect of this issue is that it takes significant *time* to get contracts signed. Participants spend a considerable amount of time dealing with specific terms and conditions. In one instance, a partner started work without a contract in order to honor project timetables. This action increased the partner's level of risk. Activities are forced by the process to be done *sequentially* when, at times, they need to be done concurrently. Creating new procedures slowed the review and response time by the FHWA. Another potential effect is that partnership formation may be discouraged. Better communications and *improved working relationships*, however, were also outcomes.

costs are not included. The state clarified the auditing procedures to the private partners and indicated that the state does not usually insist on performing the audit. In addition the state made it clear that audit data does not become public just because the state looked at it. The Minnesota Data Privacy Act treats data as confidential if the data meet certain criteria, such as being proprietary or having a value.

The **lessons** learned for this issue were **clearly define the auditing procedures** for the private partners and to hire a **third party** to perform the audit, if necessary.

ISSUE 3: THE TASK ORDER CONTRACT UNDER WHICH CONSULTANTS AND CONTRACTORS HAVE BEEN SELECTED MAY NEED TO BE RE-BID

Anticipating the short time frames that would be required to get consulting staff onboard, MnDOT officials elected early in the project to work from a pre-qualified list of vendors under a task order contract, rather than issuing a RFP for each required task. One pitfall in this approach was that the *upper limit* of the task order contract was set *too low*. This may require that task orders be re-bid in order to increase the amount of funding, although consultants already have been selected and have started work on the task.

The use of the task order granted MnDOT more *flexibility* in selecting project consultants. MnDOT officials felt that the task order approach worked well and saved time; some other public sector participants, however, felt that the task order process slowed down the project.

ISSUE 4: THE MINNESOTA DEPARTMENT OF TRANSPORTATION PROJECT PERSONNEL LACKED CONTRACT NEGOTIATION EXPERIENCE

Prior to the IVHS program, MnDOT project personnel handled only professional and technical contracts. Usually, these contracts did not require contract negotiations. There was an initial failure to understand that the new partnership agreements would require contract negotiations.

One effect of this issue was *stalled negotiations*. MnDOT officials requested assistance from state administrative personnel. Another effect was *slippage* in project schedules.

This issue is partially resolved. A senior contract administrator has been assigned to handle contracts. Also the Department of Administration suggested *corrective action*, and these steps have been implemented by MnDOT. Some interviewees stated that the program is now back on track with a high degree of potential for success.

The project participants offered one **lesson: Involve administrative personnel who have contract negotiations experience early in the negotiation process.**

- Private partners may not accept the current indemnification provision in contract.

Public and private sector interviewees listed several reasons for their concern. First, indemnity is not spread proportionally among all partners. Second, the State has sovereign immunity, but the private partners do not. Third, liability indemnification is not clearly stated in the contract. Fourth, the hold harmless clause is a threat to private partners, especially to smaller firms.

Some interviewees thought that if a liability claim against a private firm goes to court to be resolved by a jury, private firms may have to pay extremely high awards. One potential resolution would be to use an indemnity policy purchased by state.

3.3 ORGANIZATIONAL COORDINATION

This section discusses the issues and lessons learned in the area of organizational coordination. It is divided into two areas: (1) issues that project participants encountered and the lessons learned addressing these issues and (2) issues that project participants may encounter.

3.3.1 Issues That Were Encountered by Project Participants

In this subsection, each issue area is placed into one of two groupings. (1) issues related to **intra**-agency coordination and (2) issues related to **inter**-agency coordination.

3.3.1.1 Intra-agency Coordination

There were five issues that project participants encountered in the area of intra-agency coordination. The first two issues in this area were rated as significant and mentioned by many interviewees. All five issues were discussed by public sector representatives; private sector representatives only discussed the issue involving the FHWA. The first three issues developed early in the program and the last two developed over time. The first and fourth issues will be ongoing ones, but the others have been resolved:

ISSUE 1: TWO DIVISIONS WITHIN THE MINNESOTA DEPARTMENT OF TRANSPORTATION WERE PURSUING IVHS ACTIVITIES SIMULTANEOUSLY

Several interviewees stated that this issue was the most problematic. The involved parties are committed to keeping this ongoing issue in check. The principal cause of this issue is tied to the *history* and organizational development of the Guidestar Office. The MnDOT Metro Division had been operating the TMC for 20 years and developing expertise in IVHS through hands-on experience. This group felt that the foundation for IVHS activities within MnDOT was started

Division to resolve this issue. The two groups increased their level of coordination and cooperation. For example, key personnel from the Guidestar Office and the Metro Division met to address and set priorities for a list of 35 issues. Also, a quality improvement facilitator was used to help the two agencies set priorities and improve communications.

There were several lessons learned from this issue:

- Coordination and cooperation between the Metro Division and the Guidestar Office are necessary for the success of the IVHS program.
- To resolve intra-agency tensions, top management must communicate regularly and technical personnel must be involved.
- The use of team-building techniques was helpful.
- When an issue may be ongoing, regular meetings and discussions are necessary to prevent additional tension from developing.

ISSUE 2: TRANSIT OPERATIONS PERSONNEL WERE NOT INVOLVED IN THE EARLY PLANNING OF THE OPERATIONAL TEST

This issue was one of the most frequently cited issues. In the Travlink operational test, the MTC operational personnel were *not involved* in the early stages of the project. Several decisions were made by the planning staff that directly affected the operations of the fleet. The operational requirements of the MTC were not considered in the concept design. The operations personnel did not approve the project scope and were consulted only after plans were developed. Some participants stated that the MTC planners were not asking the right questions of the operational personnel.

Dispatch, scheduling, and fleet management considerations were *overlooked* by planners. What was planned was not operationally practical. The concept definition called for 84 buses to be equipped with Travlink components, and project funding was geared to this level. Operational considerations, however, make it difficult for the MTC operational staff to isolate a fleet of fewer than 114 busses.

The effect was that the project *cost and scope increased* because more in-vehicle units were needed. Project requirements had to be reworked, which *delayed* the project.

The **lesson** learned was that when operational tests have components which affect or could affect operations, the **operations personnel must be involved early**.

ISSUE 3: THE FEDERAL HIGHWAY ADMINISTRATION WAS UNCERTAIN HOW IT WOULD MANAGE THE IVHS PROGRAM

The main cause of this issue was that the IVHS program was *new* to the FHWA staff. The chain of command involving the Washington Headquarters (HQ), the Region 5 Office, and the

ISSUE 5: LACK OF UPPER MANAGEMENT SUPPORT WILL AFFECT PROJECT PARTICIPATION

As one participant expressed, "Project participation is not assured unless the support of upper management is secured." Although this issue has not significantly affected an operational test, one public agency considered withdrawing its support because its policy-making board did not see the benefits of the project and was *skeptical* of the project's value. Some upper managers were *not comfortable* entering a new and unfamiliar area.

In another instance, the executive board of a public agency was not fully committed to the project at its start. As the *cost* of the project increased, the board members became increasingly uneasy. They perceived additional *risks* would be involved and that the project was not under control. The issue did not affect the project significantly, but a potential effect is the increased likelihood for an agency to drop out of the project. This action would delay the project.

3.3.1.2 Inter-agency Coordination

Five issues were discussed in the area of inter-agency coordination. All were mentioned by public sector representatives. The first, third, and fourth issues developed early in the program; the second and fifth developed over time. Inter-agency issues may never be resolved fully because the involved organizations may continue to have conflicting philosophies and priorities:

ISSUE 1: INITIALLY, LEGAL AND CONTRACT PERSONNEL WERE NOT INVOLVED FULLY IN PARTNERSHIP NEGOTIATIONS

Early in the program, the MnDOT technical staff did not involve legal and contract personnel in the early stages of partnership *negotiations*. At the time it did not seem necessary; there was concern that involving agencies outside of the department might slow the progress. Because the IVHS program required *new innovative methods* to develop public-private relationships, MnDOT officials recognized that support from outside of MnDOT would be helpful. The MnDOT IVHS staff solicited support from the Department of Administration and the Attorney General's Office. These agencies are now involved *early* in the negotiations process rather than at the end.

The resolution to this problem was to establish a *multi-disciplinary team* involving staff members from the MnDOT, the Department of Administration, and the Attorney General's Office. Although neither the Attorney General's Office nor the Department of Administration is staffed to allow full-time involvement, both agencies are actively involved in resolving issues in the IVHS program. This has led to unprecedented *cooperation* among these agencies.

The lesson learned was that it is important to **involve legal counsel and contract personnel early** in partnership negotiations.

ISSUE 4: THE ACADEMIC SECTOR IS NOT BEING USED EFFECTIVELY

The project participants stated that the cause of this issue was the *differing goals* and priorities between the academic sector and project implementors. Public sector participants perceived that university faculty and staff traditionally have been measured by the number of grants they receive, the number of students they supervised, and the number of papers they write. According to public sector interviewees, these are not proper measures of effectiveness for a task within an operational test.

Also project participants stated that universities focus more on pure research than on the application of the research findings. The interviewees felt that university researchers learn from a project and then move to a new project. Researchers tend to develop technology only to the point where it works technically. This point is usually short of the point where the technology is ready for implementation. Project implementors, on the other hand, want to deploy the technology and do not want to sacrifice deployment for more research. They stressed that only one University of Minnesota product, the AUTOSCOPE camera, has ever been applied.

The primary effect from this issue is a perceived *lack of cooperation* between the academic sector and project implementors. Researchers may view operational personnel as not being cooperative, while operations personnel may view research work as not relevant. Some participants questioned if resources were being spent effectively.

The **lessons learned and resolutions are to get researchers more involved in operations, get operations personnel on steering groups for research projects, and relate research to problems** defined by operations personnel. Also, project managers and principal investigators plan to meet monthly.

ISSUE 5: BARRIERS EXIST BETWEEN THE MINNESOTA DEPARTMENT OF TRANSPORTATION AND STATE POLICE

Minnesota State Police have not been committed to the state's IVHS efforts. This is due to *differing priorities* of the state agencies. For example, rapid response is a state patrol responsibility, but incident management is not a high state police priority. MnDOT officials are trying to resolve this issue by initiating discussions to work out the needs of each party.

3.3.2 Issues That May Be Encountered by Project Participants

Public and private sector representative stated that a *change in MnDOT executives* could affect the IVHS program. Although there has been a turn over of officials due to elections and retirements, no major effects were cited. The interviewees feared, however, that a future upheaval could reduce investment in IVHS because a new MnDOT management may adopt different priorities or private partners may see the situation as politically unstable.

ISSUE 2: THE CONTRIBUTIONS THAT COULD BE APPLIED TO THE LOCAL MATCH AND THE METHOD TO DETERMINE THE VALUE OF THESE CONTRIBUTIONS WERE NOT DEFINED CLEARLY

The activities that would be supported by federal funds, the contributions that could be applied to the local match, and the value of partner contributions were *not defined clearly*. *Establishing the value* of the contributions was a significant issue, because the process of determining the value of partner contributions was *new* to most partners. Product scarcity and the market-bearing price must be considered when assigning a value to a service or product. The assignment of a value becomes more difficult when the product or service is new and has no market base.

Lengthy discussions were held to determine acceptable contributions and their value. This placed an additional burden on the MnDOT staff and the partners. Uncertainties regarding local match also made it difficult to define the project and *slowed* the project down.

Steps were taken to resolve this issue. *Requirements* have been drafted by the FHWA and included in the Federal Register solicitations. In addition, *meetings* were set up at which the FHWA explained the funding situation to private partners and MnDOT staff.

The interviewees stated the principal **lesson** learned was that **additional guidance from the FHWA was needed** on the issue of eligible match requirements. Discussions on what constitutes the local match must be held and **an agreement must be reached early** in the project.

ISSUE 3: FUNDING LIMITATIONS CAN NEGATIVELY IMPACT THE SCOPE AND LEVEL OF FUNCTIONALITY OF AN OPERATIONAL TEST

One cause of this issue was a *reduction* in federal funds expected for the Travlink project. When the funding level decreased, the level of functionality of the test also decreased. The project scope was also impacted because the cost for the new technologies were unknown. The desire by participants to maximize the functionality of the project needed to be balanced with existing funding limitations.

In the Genesis operational test, the FHWA did *not fully support data collection* efforts desired by the participants. The FHWA argued that the operational test was designed to evaluate a hand-held device not to collect data. Private and public project participants felt that the \$3 million allotted for data collection was not sufficient. One private sector partner, in particular, was very concerned about the implications of the FHWA decision: if the user of the device perceived that the data was inaccurate or unreliable, the user would develop *negative perceptions* of the private sector manufacturer.

Effects on the Travlink operational test included *budget overruns*, *fewer busses* equipped with Travlink equipment, and a *smaller test area*. Also, the FHWA decided not to participate in the third phase of the project. The effect on the Genesis project was that it became *harder to sell* the project to private partner corporate decision makers and to public agencies such as the MTC.

operational tests. Project continuity will be affected by future funding commitments by Congress and the FHWA. Since federal funding may not continue, continuation by the private partners on the project is not ensured. This issue may expose all partners to the risk that a partner could withdraw from the project.

- IVHS projects may have to compete for funding under the National Highway System and the State Transportation Program.

MnDOT matching funds are limited because the MnDOT has other funding obligations. Also, IVHS projects in urban areas may have to compete against projects in rural areas. Congress may not fund IVHS projects if benefits do not apply to all constituents, including those in rural areas.

- Funds have not been committed for implementation of products and services after the test is complete.

Interviewees felt that the federal government should be more willing to invest in deployment in order to understand system impacts.

- Aggressive financial commitments of private sector partners may increase the overall cost of the project.

One public sector participant feared overeager private sector participants willing to make substantially large contributions. Because of matching fund rules, this could force an increase in the public sector's contribution. Ultimately, the level of partner contributions could possibly drive up the total project cost.

3.5 HUMAN RESOURCES

This section discusses the issues that the project participants encountered and the lessons learned relating to human resources.

3.5.1 Issues That Were Encountered by Project Participants

Four issues were encountered in this area. All were discussed by representatives of the public sector. These issues have gradually developed and continue to be encountered:

ISSUE 1: PARTICIPATION IN OPERATIONAL TESTS PLACES A STRAIN ON THE STAFFS OF THE PUBLIC SECTOR PARTNERS

Several public sector representatives were concerned with the *increased workload* created by their participation in the IVHS program. This strain on the staff existed at the local, state, and

Interviewees learned that a **need to train practitioners** exists. Current staff must become more familiar with the technology to become less apprehensive about the technology the private partner recommends.

ISSUE 3: PUBLIC SECTOR STAFF MEMBERS APPLIED IVHS KNOWLEDGE GAINED FROM WORK IN THE PUBLIC SECTOR TO PART-TIME EMPLOYMENT IN THE PRIVATE SECTOR

In one instance, a MnDOT staff person who had gained valuable experience working on IVHS test projects was *offered a job* in the private sector. Officials questioned the ethics of taking knowledge gained within an agency and applying that knowledge outside of the agency. Questions emerged regarding the staff member's *commitment* to his MnDOT job. This issue caused *jealousy* and tension among other MnDOT employees.

ISSUE 4: RESOURCE LIMITATIONS HAMPER LEARNING BY THE PROJECT STAFF

The Guidestar project staff answers inquiries and meet with others from the general IVHS community as well as perform their required work tasks. This is very *time consuming* and burdensome. Often staff members are unable to take training, read relevant literature, or participate in conferences. Project personnel feel this issue causes them to sometimes make decisions with *limited information*.

This issue has not been resolved. MnDOT officials recognize the need to *set priorities* and encourage staff members to prepare *summaries* for each other on material they have read recently.

3.6 INTELLECTUAL PROPERTY AND ROYALTY RIGHTS

This section discusses the issues that project participants encountered and the lessons learned in the area of intellectual property and royalty rights.

3.6.1 Issues That Were Encountered by Project Participants

Public sector participants discussed three issues in this area. All three issues emerged early in the program. Only the first issue is resolved:

ISSUE 1: THE OWNERSHIP AND USE OF INTELLECTUAL PROPERTY WAS NOT CLEAR

The principal cause of this issue was the conflict between the desires of private partners to make some work *proprietary* and the traditional thinking that publicly-funded products should remain in the *public domain*. The *conflict* over intellectual property rights threatened agreements and make MOUs difficult to achieve. This issue was particularly acute for the Genesis project in which disputes over the PCD software rights threatened to paralyze the project.

- Potential users may resist IVHS technologies because they are concerned about a loss of privacy.

The potential users may not accept the use of cameras and vehicle tracking because they may feel that these technologies infringe on their privacy. In the case of the Genesis project, there were concerns that drivers of buses equipped with tracking devices would resent having their movements tracked and conversations overheard. The resolution to this issue would be to educate the users and to demonstrate the positive aspects of the system, such as added security for the drivers, quicker emergency assistance, quicker location of stolen cars, etc.

- Potential users may not accept and participate in IVHS activities.

There may be a lack of acceptance of the IVHS products and services by consumers. Some interviewees mentioned that trucking industry representatives do not believe IVHS products and services are capable of delivering predicted benefits. They are resistant, therefore, to invest in IVHS technologies. Other interviewees stated that the motoring public is not convinced that IVHS will benefit them.

Interviewees offered two suggestions to foster trust and understanding within the trucking industry and the general public. First, educate the trucking industry decision makers on the benefits that IVHS has to offer them. Second, use forums, presentations, and demonstrations to educate the motoring public on the benefits of IVHS for them. Show that IVHS technologies have the potential to improve the quality of their lives.

- U.S. West can encourage but cannot enforce standards on the Community Link system.

U.S. West is under a regulatory obligation to allow any service onto the Community Link system. Since U.S. West has no authority over the quality of these services, there is the possibility that an unpopular service could reflect badly on Community Link and affect the acceptance of other services such as Travlink.

- Public perception diminishes the ability of government agencies to take risks.

Fear of failure and fear of impropriety play into this issue. In terms of failure, the public does not accept government agencies taking risks and ridicules government agencies if they fail. This causes government officials to be very conservative. As one interviewee stated, "How much are you willing to spend to see if something doesn't work?"

Regarding impropriety, private industry profit spurred by government dollars is controversial. The participants felt that if government agencies shy away from IVHS, the United States will forfeit potential markets and lose jobs.

3.9 IMPLEMENTATION AND DEPLOYMENT

This section is divided into two areas: (1) issues that project participants encountered and the lessons learned addressing these issues and (2) issues that project participants may encounter.

3.9.1 Issues That Were Encountered by the Project Participants

One issue was encountered in the area of implementation and deployment and was cited by both private and public sector participants. It developed over time and is ongoing:

ISSUE 1: IMPLEMENTATION OF OPERATIONAL TESTS ON A SMALL SCALE COMPLICATES STANDARDIZATION

Because the focus of these operational tests has been on testing technologies, the scope of the tests has been *limited* to a single city, or part of a city and has not encompassed a large region or an entire state. It is not part of the test to determine if these same schemes would work on a larger scale or if a standard approach could be worked out. This is due in part by the *low interest* on the part of other cities to participate in the operational test.

The effect is that the private sector cannot take advantage of cost advantages for standard production and distribution. A private sector participant wishing to distribute products or services they developed for an operational test would have to deal with each city separately, because each city has its own procurement authorities.

A potential resolution would be to develop a *broker-type* situation with a central procurement authority.

3.9.2 Issues That May Be Encountered by Project Participants

Project participants articulated two potential issues:

- IVHS success may be limited because the infrastructure required for deployment of IVHS technologies and services is not in place.

Even if IVHS technology is successful, pre-existing routes and capacity could limit its ultimate success. Also, if there is not a clear commitment from government to develop an IVHS infrastructure, then the private sector may be discouraged from developing IVHS products and services which require such an infrastructure. For example, auto manufacturers would not produce IVHS vehicle-based products in the absence of a suitable infrastructure.

removed frequencies from the microwave spectrum, but has not reassigned them. Third, the project personnel switched to using a *800-MHz* system. Fourth, the frequency required for the operational test requires an *FCC license*. The test, however, does not fall into a standard FCC classification. The MnDOT must prove they will reuse these frequencies 2-3 years in the future in order to gain approval for their use now.

The major effect of this issue is the burden on project personnel to *redesign* the trunk radio system for Minneapolis-St. Paul area. FCC regulations state that if more than five 800-MHz frequencies exist, they must be trunked. This new trunk system would be the backbone for IVHS. They must reconcile this system with local authorities and the FCC.

Also, the redesign of the trunk system as a backbone for future IVHS requirements has been difficult, because the MnDOT staff does not yet know what their long-term IVHS requirements will be. Questions have been raised concerning matching this trunk system with those developed later and in other areas. The resolution is for a shared MTC/MnDOT backbone for future voice and data transmissions.

As a result, interviewees learned that **coordination and collaboration on radio spectrum standards and capacity are needed.**

ISSUE 3: PROJECT PARTICIPANTS MUST ADHERE TO REGULATIONS PERTAINING TO TELEPHONE COMPANY OPERATING PRIVILEGES

Although the geographic area of the Travlink operational test is within the U.S. West local access transport area (LATA), the area is also served by some independent telephone companies. U.S. West wanted to use the U.S. West calling card number as the Community Link identification number. The independent telephone companies did not want their customers carrying a U.S. West card.

Under the first proposed solution, the state would provide the service. This would allow a universal service to be provided across the state and across LATAs and independent operating areas. This solution was rejected. The issue was resolved when independent telephone companies agreed to issue a card which did not resemble a U.S. West calling card. In addition, U.S. West, a project partner, has a *limited ability to expand* their information service outside of their local operating area because of regulations which restrict its market size to the LATA.

The interviewees agreed that **communications between the MnDOT and the Minnesota Public Utilities Commission (PUC) are essential.** The MnDOT avoided regulatory issues by fostering good relations with the Minnesota PUC.

APPENDIX A

ACRONYMS AND ABBREVIATIONS

APTS	advanced public transportation system
ARTIC	Advanced Rural Transportation Information and Coordination
ATIS	advanced traveler information system
AUTOSCOPE	AUTOSCOPE™- 2003 Video Vehicle Detection System
AVI	automatic vehicle identification
AVL	automatic vehicle location
CSF	critical success factor
CTS	University of Minnesota Center for Transportation Studies
CVO	commercial vehicle operations
DOT	Department of Transportation
FAR	Federal Acquisition Regulation
FCC	Federal Communications Commission
FHWA	U.S. Department of Transportation Federal Highway Administration
FTA	U.S. Department of Transportation Federal Transit Administration
FY	fiscal year
Guidestar	The Minnesota Guidestar Program
HOV	high occupancy vehicle
HQ	headquarters
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
IVHS	intelligent vehicle - highway system
LATA	local access transport area
MnDOT	Minnesota Department of Transportation
Motorola	Motorola, Inc.
MOU	memorandum of understanding
MTC	Metropolitan Transit Commission

APPENDIX B

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