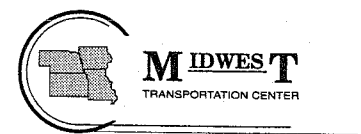


**INTELLIGENT TRANSPORTATION
SYSTEMS (ITS) AND
COMMERCIAL VEHICLE
OPERATIONS (CVO)**

**INTERSTATE COOPERATION FOR
IMPLEMENTATION OF ITS-CVO
FUNCTIONS: INSTITUTIONAL
OPPORTUNITIES AND BARRIERS**



**Phase 1 Report
June 1995**

Midwest Transportation Center

Director

Tom Maze
Director, Iowa Transportation Center
Professor of Civil and Construction Engineering
Iowa State University

Associate Director

David Forkenbrock
Director, Public Policy Center
Professor of Urban and Regional Planning
University of Iowa

Advisory Committee

V. Kenneth Jensen, Regional Administrator, Region VII, Federal Highway Administration
David G. Lammers, Vice President, Land Transportation Electronics, Collins Commercial Avionics, Rockwell International Corporation
Richard Mikes, Senior Vice President, Ruan Transportation Management Systems
Robert H. Neal, General Manager, AGRI Grain Marketing
Darrel Rensink, Director, Iowa Department of Transportation
Richard J. Schiefelbein, Assistant Vice President, Labor Relations, Burlington Northern Railroad Co.
K. Stephen Spade, Manager, Des Moines Metropolitan Transit Authority
Paul Thornbloom, Manager, Complete Goods Distribution Services, Deere and Company
Lee O. Waddleton, Area Director, Federal Transit Administration

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information provided herein. This document is disseminated under the sponsorship of the U.S. Department of Transportation's University Transportation Centers Program and the Iowa Department of Transportation in the interest of information exchange. The U.S. Government and the State of Iowa assume no liability for the contents or use thereof.

Midwest Transportation Center
Iowa State University
2521 Elwood Drive, Suite 125
Ames, Iowa 50010-8263
Telephone: 515-294-8103
Fax: 515-294-0467

**INTELLIGENT TRANSPORTATION SYSTEMS (ITS)
AND
COMMERCIAL VEHICLE OPERATIONS (CVO)
INTERSTATE COOPERATION FOR IMPLEMENTATION OF ITS-CVO
FUNCTIONS: INSTITUTIONAL OPPORTUNITIES AND BARRIERS**

Phase 1 Report
June 1995

T. H. Maze, Principle Investigator
Michael L. Hancock, Principle Author

Midwest Transportation Center
Iowa State University
2521 Elwood Drive, Suite 125
Ames Iowa, 50010

Telephone: 515-294-8103
Fax: 515-294-0467

Table of Contents

List of Tables	v
EXECUTIVE SUMMARY	vii
Project Scope	vii
Key Findings	viii
Institutional Barriers and Opportunities	xi
Conclusions	xii
CHAPTER 1: Introduction	1
Project Development Issues	2
Institutional Issue Studies	6
CHAPTER 2: Research Background and Methodology	11
Introduction	11
Research Questions	11
Research Methodology	12
CHAPTER 3: Identification of Agencies Involved in CVO Administration, Lead Agencies for ITS-CVO Initiatives, and Related Issues	19
Introduction	19
Determination of Agencies Involved in CVO Activities	20
Determination of Lead Agency for ITS-CVO Initiatives	27
CHAPTER 4: Identification of Likely ITS-CVO Functions and Relative Timing of Implementation in the Region	33
Introduction	33
Likely ITS Functions and Relative Timing of Implementation in the Region	34
Implications of Likely ITS-CVO Functions and Relative Timing of Implementation	36
CHAPTER 5: Identification of Unique Characteristics of ITS-CVO Development and Operation and the Need for Multi-Jurisdictional Cooperation	41
Introduction	41
Unique Characteristics of ITS-CVO Development and Operation	42
Conclusion	57
CHAPTER 6: Identification of Opportunities and Barriers for Multi-State Cooperation in the Development, Deployment, and Operation of ITS-CVO Functions	61
Introduction	61
Methodology	62
Findings: Institutional Opportunities and Barriers for Multi-State Cooperation in ITS-CVO	66
Conclusion	79

CHAPTER 7: Possible Strategies for Mitigating the Institutional Barriers to Multi-State Cooperation in ITS-CVO	85
Introduction	85
Methods for Mitigating Institutional Barriers to Multi-State Cooperation for ITS-CVO	85
Conclusion	92
APPENDIX 1: CVO Agencies by State and Responsibility	A-1
APPENDIX 2: Scenario Prioritization Matrix.....	B-1
APPENDIX 3: Background Materials and Scenarios for Interviews with Lead Agencies for ITS-CVO	C-1
APPENDIX 4: Procurement Methods for Promoting Private Sector Innovation and Improving Public Sector Investment Decision Making	D-1
APPENDIX 5: Example of a Public Corporate Instrumentality: Port Authority of New York and New Jersey	E-1

List of Tables

Table 3.1	Illinois Agencies Involved in CVO Administrative and Safety Regulation	21
Table 3.2	Iowa Agencies Involved in CVO Administrative and Safety Regulation	22
Table 3.3	Minnesota Agencies Involved in CVO Administrative and Safety Regulation	23
Table 3.4	Missouri Agencies Involved in CVO Administrative and Safety Regulation	24
Table 3.5	Nebraska Agencies Involved in CVO Administrative and Safety Regulation	24
Table 3.6	South Dakota Agencies Involved in CVO Administrative and Safety Regulation	26
Table 3.7	Wisconsin Agencies Involved in CVO Administrative and Safety Regulation	27
Table 3.8	Lead Agency and Contact for ITS-CVO by State	28
Table 6.1	Lead Agencies, Relevant Codes and Rules, and Sources for Codes and Rules	62
Table 6.2	Summary of Institutional Opportunities and Barriers to Multi-State Efforts in ITS-CVO By State	80
Table A1-1	CVO Agencies by State	A-3

EXECUTIVE SUMMARY

Departments of transportation and the motor carrier industry are looking toward Intelligent Transportation Systems for Commercial Vehicle Operations (ITS-CVO) to increase highway transportation safety and efficiency through streamlining and automation of current processes and improved regulatory enforcement and infrastructure and fleet management enabled by more detailed, accurate, and timely information. Many of these possible benefits can only be realized through large-scale, regional or even national implementations of ITS-CVO.

These large-scale deployments will, at a minimum, require some cooperation among states. Current state business practices and the legacy systems developed to support them may, however, stand as significant impediments to such cooperation for ITS-CVO development and implementation. Prior research and experience has shown that institutional barriers to ITS-CVO can be significant. The FHWA-funded state studies of intrastate institutional barriers to ITS-CVO have shown there are a number of significant issues that can impede ITS-CVO implementation. These issues range from a lack of communication and cooperation among state agencies with commercial vehicle regulatory or taxation duties to business practices and legal codes that do not accommodate the new practices and technologies of ITS-CVO. Similarly, research and demonstration projects have been stymied by problematic barriers resulting from such institutional issues.

This report documents the results of the first phase of a two-phase research project that identifies long-range institutional issues that could impede multi-state cooperation for development and deployment of ITS-CVO among seven midwestern states and offers possible approaches for mitigating such issues. The study was funded by the Iowa Department of Transportation and the Midwest Transportation Center at Iowa State University.

Project Scope

The research utilized a case study of issues involving the state of Iowa and the six states adjacent to Iowa (Illinois, Minnesota, Missouri, Nebraska, South Dakota, and Wisconsin). Because of the number of states and agencies involved in the study and the differences between development and operation of ITS-CVO and the development and operation of traditional highway infrastructure, a number of approaches were used to identify potential barriers to interstate cooperation in ITS-CVO and possible methods for mitigating these barriers. The research was split into two phases—Phase 1 encompassed those tasks necessary to identify issues and barriers in interstate cooperation for ITS-CVO, and Phase 2 focused on identifying and prioritizing possible efforts to mitigate the barriers revealed in Phase 1.

Phase 1 efforts to identify opportunities and barriers in multi-state cooperation for ITS-CVO included:

- Contact with state trucking associations, motor carriers, and state agencies to determine the agencies involved in CVO activities in each state;
- Discussions with transportation agencies in each state to ascertain the lead agency and contact person for ITS-CVO efforts in each state;
- Review of FHWA ITS program plans, minutes of meetings with motor carriers and state agencies, and discussions with identified ITS-CVO lead agencies to identify likely ITS-CVO functions and relative timing of implementation; and
- Identification and analysis of barriers to multi-state cooperation in ITS-CVO including a review of each state's laws and rules governing procurement by lead agencies for ITS-CVO and interviews with these lead agencies regarding their procurement and management philosophies.

The combination of these efforts resulted in a comprehensive examination of practices and requirements that could present barriers to interstate cooperation in ITS-CVO. Once opportunities and barriers to multi-state efforts in ITS-CVO were identified, possible options for mitigating these barriers were also developed.

Key Findings

The research was guided by three assumptions: (1) Deployment of ITS-CVO will be administered through routine highway development, operation, and maintenance channels; (2) Significant differences exist between the development of ITS-CVO systems and the development of traditional highway infrastructure; and (3) These differences may impact the ability of current practices and processes for highway development to accommodate the development and deployment of ITS-CVO. Thus, the characteristics differentiating the development and operation of ITS-CVO systems and standard highway projects were the crux of the research. The primary research question was whether the institutions established to support routine highway development can support the deployment and operation of ITS systems.

To answer this question, the research identified and analyzed the attributes of ITS-CVO development that differentiate it from traditional highway development and which will present difficulties for public agencies implementing ITS-CVO infrastructure. Once these attributes and their corresponding challenges were identified, the resulting institutional issues were identified for each state and the region in general. The following two sections summarize these differences

between traditional highway development and development of ITS-CVO and the resulting institutional issues that will be encountered by the study states or any public agencies implementing ITS-CVO infrastructure.

Fundamental Differences Between Development of ITS-CVO and Development of Traditional Highway Infrastructure

Differences between the development of ITS-CVO systems and the development of traditional highway infrastructure can be placed into four broad categories:

- 1. The High-technology Nature and Cost Structure of ITS-CVO.** The ability to build a vast network of highways is possible because highways can be built using inexpensive materials and standard construction technology, and minimal technical and capital investments are required for entry into the highway construction industry. Costs of highway construction are largely a function of the variable units produced (e.g., miles paved and cubic yards of earth moved) and fixed costs are a small portion of the costs of highway construction. ITS-CVO systems, on the other hand, are highly technical, require high fixed cost investments, and follow fast upwardly-migrating technology paths. Because of these differences, efficient development of each type of infrastructure (i.e., traditional highway infrastructure and ITS-CVO infrastructure) may require different relationships with the infrastructure developer. Highways have traditionally been developed through arms-length relationships with contractors where procurements are made through competitive sealed bids based on technical specification. This system of development may be contradictory to efficient development of ITS-CVO systems.
- 2. Lack of Standards for System Design, Communications, Operation, and Maintenance.** Without standards for ITS, investors will be making investments without the guidance on technology and functionality provided by standards, and thus they face the risk of investing in systems which may be incompatible with systems operated by other organizations, and the possible high cost of developing custom systems.

In addition, the lack of standards in ITS-CVO creates a different set of investment parameters than those for standard highway infrastructure investments. Highway construction and highway geometry have long-standing, established design standards. When two states each plan segments of a highway that meets at their borders, standards have already been established to provide consistent, functioning facilities from one jurisdiction to the next. There are no standards to ensure interoperability of ITS-CVO systems across state borders. In fact, a hallmark of commercial vehicle administrative and safety

regulatory systems has been their lack of uniformity from state to state.

3. **Private - Public Development and Funding Approaches.** Unlike traditional highway infrastructure development, which relies on state and federal tax dollars for its development and operation, the development and operation of ITS-CVO is expected to combine both public and private investment. Since its inception, ITS has been planned as an initiative in which private industry is expected to be a major investor in both the development and deployment of ITS functions.^{1,2} This private sector role as active investor in bringing about ITS development and deployment is quite different from the private sector's role in traditional highway development as a supplier of products and services.

4. **The Interstate Nature of ITS-CVO Functions.** Commercial vehicle traffic is predominantly interstate and is highly regional. For example, for the state of Iowa, intrastate truck traffic accounts for only 20 percent of the truck traffic freight tonnage, while interstate and bridge traffic account for approximately 80 percent of total truck traffic freight tonnage in and through Iowa.³ Clearly, the majority of truck traffic in the Midwest travels through two or more states. In addition, truck traffic is likely to be regional. For the state of Iowa, roughly 60 percent of interstate truck traffic originating in Iowa is destined for one of the states adjacent to Iowa (Illinois, Minnesota, Missouri, Nebraska, South Dakota, and Wisconsin).⁴ Similarly, approximately 56 percent of interstate truck traffic destined for Iowa originates in one of the study states. Bridge traffic through Iowa is also highly regional, with nearly 57 percent of bridge traffic through Iowa originating in one of the study states.

This interstate nature of commercial vehicle operations and, therefore, ITS-CVO creates the most significant difference between the development and operation of ITS-CVO functions and the development and operation of traditional highway infrastructure. The development and operation of highways, bridges, and other highway infrastructure is governed by common standards, and these standards ensure compatibility across states and regions. Similar standards do not currently exist for ITS. In addition, the development and operation of traditional highway infrastructure requires very little interaction between states. Conversely, the interaction between states needed for the development and operation of ITS-CVO will require aggressive interstate cooperation due to the need for interoperability and coordination of functions, operation, and maintenance among a number of states or, in some instances such as safety, across the entire nation.

Institutional Barriers and Opportunities

To provide a common point of reference for identification and analysis of institutional barriers in each state, Iowa and the six adjacent states were asked to identify a lead agency in the state for the deployment of ITS-CVO functions. The administrative rules and laws governing these agencies were studied, and representatives of each lead agency and related motor carrier service organizations were interviewed in each state. From the research conducted for each state, barriers and opportunities were identified that relate to regional, multi-state deployment of ITS-CVO functions. Potential barriers and opportunities related to intrastate issues were ignored. Although many issues were identified, they can be divided into two general categories: 1) procurement laws, rules, and practices and 2) lead agency management issues.

- 1. Procurement Laws, Rules, and Practices.** Transportation agencies have established rules for procurement which are intended to foster competition. Most state level procurement focuses on the purchase of transportation infrastructure based on technical specifications and through competitive sealed bids. Selection is often based on low bid, and bid documents of the selected contractor often become public information. These procurement practices are intended to support the purchase of standard highway facilities while ensuring competition among several satisfactory producers. This may not be the case with ITS-CVO facilities and services where the number of providers is extremely limited, high fixed costs cause barriers to market entry, and procurements may be more complex because of a lack of standards.

In addition, although each state has the same fundamental objective for developing procurement practices (e.g., promoting free and open competition), not all states have developed similar procedures. For example, some states may encourage the use of life-cycle costing as a basis for selecting an equipment supplier, while other states may require selection based on low purchase price. Some states may allow the purchase of equipment and services through competitive negotiation, while others may require competitive sealed bids. Some states may allow multi-year contracts without annual rebidding, while others may require annual competitive procurements. Further, almost all states have preferences for vendors located in their own jurisdiction. These conflicts in procedures and rules create significant barriers to multi-state deployments.

- 2. Lead Agency Management Issues.** Although there are a myriad of issues involving the lead agency in each state, ranging from a lack of lead agency commitment to ITS-CVO to the inability to commit staff to develop and promote ITS-CVO, the primary barriers to multi-state cooperation for ITS-CVO relate to management philosophies. Most

state agencies indicated an unwillingness to allow other states or a multi-state organization to perform or control its own commercial motor vehicle safety and administrative regulatory services. In other words, each state wants to continue to control all its own motor carrier services, although some states indicated a willingness to assume the responsibilities of other states. The issue of each state wanting to maintain absolute control over its own motor carrier services is antithetical to multi-state cooperation and diametric to the predominant trend of interstate and even global commerce and truck transportation.

Conclusions

As ITS-CVO applications move from research and operational test phases to deployment and become subject to traditional highway infrastructure funding processes, significant barriers will be encountered. Traditional highway infrastructure has been developed at the local or state level using standard methods and constructed by a large pool of qualified highway contractors. This environment is very different from the environment facing ITS-CVO in four general aspects: 1) the high-technology nature and cost structure of ITS-CVO; 2) the lack of standards for system design, communication, operation, and maintenance; 3) the need for private-public development and funding approaches; and 4) the interstate nature of ITS-CVO functions. Because of these differences, and without significant incentives and funding from the federal level, deployment of ITS-CVO functions is likely to face significant barriers.

Research into the traditional highway infrastructure development process in seven midwestern states revealed that established procurement and development processes are incompatible with efficient processes for deploying ITS-CVO functions. Further, the processes designed by each state are inconsistent and incompatible with other states, making multi-state cooperation difficult. Also, several states expressed the need to control regulatory processes at the state level. Interstate cooperation for the operation of ITS-CVO administrative and safety regulatory systems will be much more difficult to develop when each participating state must control operating processes. State level control of processes is antithetical to current trends towards commerce operating in an interstate and international environment.

A prioritized action plan for addressing near-term issues affecting interstate cooperation for ITS-CVO among the study states was developed in Phase 2 of this study. This Phase 1 research was reported to an audience of state agency administrators from the study states, private ITS service and equipment providers, and motor carriers at a working meeting, and near-term issues and proposed efforts for multi-state cooperation in ITS-CVO were identified and prioritized. See the Phase 2 report for details on the identified issues and action plan for the study states.

¹ M. Hallenbeck, J. Koehne, and D. Rosen, "Identifying and Surmounting Barriers to Implementing IVHS Commercial Vehicle Operations Systems." *Proceedings of the IVHS America 1994 Annual Meeting*, Vol. 1, pp. 55-61, 1994.

² "The Crescent Project: An Evaluation of an Element of the HELP Program." Prepared by WHM Transportation Engineering Consultants, Inc., Castle Rock Consultants, and the Western Highway Institute/ATA Foundation, 1994.

³ T. H. Maze, C. Walter, and A. G. Smadi, "Policy Issues of an Iowa Longer Combination Vehicle Network." Prepared for the Midwest Transportation Center, Iowa State University. 1994, pp. 86 - 101.

⁴ T. H. Maze, C. Walter, and A.G. Smadi, "Policy Issues of an Iowa Longer Combination Vehicle Network." Prepared for the Midwest Transportation Center, Iowa State University. 1994, pp. 86 - 101.

CHAPTER 1 INTRODUCTION

This report documents Phase 1 of a research project funded by the Midwest Transportation Center and the Iowa Department of Transportation. The purpose of the project is to investigate institutional issues between Iowa and states adjacent to Iowa that may act as a barrier to the deployment of Commercial Vehicle applications of Intelligent Transportation Systems (ITS) which cross state borders. This research found that interstate institutional issues present significant barriers to the deployment of ITS Commercial Vehicle systems under standard federal and state highway development programs.

Systems developed under the U.S. Department of Transportation's ITS Program for Commercial Vehicles (as well as other transportation segments) pass through three phases as ITS concepts move from research projects to operational systems. The first phase involves research and development activities and is intended to provide the basic systems and knowledge required to achieve deployment. The second is the operational test phase where systems and institutional arrangements are tested and evaluated. The operational test phase is necessary to provide actual working tests of systems and is seen as a bridge to the last phase—deployment of full-scale functioning systems. As of yet, no ITS applications in Commercial Vehicle Operations (CVO) have moved to fully operational deployment.

The few ITS-CVO research projects and operational tests initiated to this point in time have been funded largely with federal funds which were appropriated by Congress for ITS projects, federal research funds which are allocated to ITS projects at the discretion of states, and state in-kind support through the sharing of personnel and/or facilities. By their very nature, research projects and operational tests funded with federal moneys require different institutional administration than that used for routine highway infrastructure development, construction, and operation involving both federal aid and state and/or local funding. Unless Congress provides a special federal appropriation to financially support deployment and development of full-scale, operational ITS-CVO systems on or associated with major highways, routine federal aid, state, and local funds will be required to support the deployment of ITS-CVO. Therefore, the deployment of ITS-CVO will be administered through routine highway development, operation, and maintenance channels as opposed to being funded through federal research channels as has been done with operational tests.

A comparison of the development of ITS projects and routine highway projects bares some extreme differences. Highway construction and maintenance employs standard techniques and involves common technology, and the costs for highway infrastructure developers (highway contractors) are dominated by variable costs (e.g., labor and materials) as opposed to fixed costs. In addition, highway devel-

opment projects are usually limited to one jurisdiction, and connections between jurisdictions are governed by existing standards for highway design.

ITS projects, especially the early ITS projects, have very different characteristics than those of standard highway development projects. ITS projects involve advanced technology and new methods for transportation operations, and the costs of technology providers are dominated by fixed costs as opposed to variable costs. In most cases, ITS projects will involve multiple jurisdictions and most CVO projects will involve multiple states in a region or along a major interstate corridor. In addition, ITS-CVO systems are in their infancy and, unlike highways, few standards for ITS-CVO system design, communications, or services exist.

The characteristics differentiating the development and operation of ITS-CVO systems and standard highway projects are at the crux of the research presented in this report. The predominant question asked in the research is whether the institutions established to support routine highway development can support the deployment and operation of ITS systems. Given the characteristics of ITS projects, the hypothesis of this research is that existing highway infrastructure development systems will have difficulty supporting ITS-CVO project development and deployment.

ITS research and demonstration projects and operational tests have met resistance through problematic institutional issues.¹ Even in this specialized research and testing administrative environment, ITS projects have been stymied by institutional issues. At the same time, technical barriers to project development have been minor. Further, of all the ITS functional areas, institutional issues have been the most invasive in CVO applications.² This report seeks to support the original hypothesis and, unfortunately, concludes that outside of the research and testing administrative environment and using standard highway development administrative channels, institutional issues are likely even more vexing.

Project Development Issues

There are three fundamental types of issues that act as barriers to the development of new systems. They are Technical Issues, Financial and Resource Issues, and Institutional Issues.

Technical Issues

Technical Issues relate to having knowledge of the methods necessary to conduct the ITS service, the technology capable of conducting the ITS service, and the necessary databases required to conduct the ITS service. For many ITS-CVO services, the technology is currently available. Generally ITS-CVO functions require off-the-shelf technology and involve the integration of computers, ancillary devices, sensors (e.g. a global positioning receiver (GPS) or a brake sensor), communication equipment, and vehicle, driver, and carrier databases. Technical

issues have not created significant challenges for several CVO user services, although significant technical challenges remain in the area of safety services.

Financial and Resource Issues

Several state transportation agencies lack the resources to adequately maintain current highway infrastructure and, therefore, state transportation agencies may find it extremely difficult to justify an investment in new services and in advanced technology.³ On the other hand, ITS-CVO services are likely to provide significant benefits to state agencies and motor carriers. Although evaluations of existing systems to determine the benefits of ITS-CVO services are still being conducted,¹ initial calculations show the benefits greatly outweigh the costs of ITS-CVO user services.² Thus even though system developments may provide benefits which exceed costs, other traditional categories of expense may provide a great and politically defensible demand on scarce resources. To further compound the situation, carriers have already indicated a willingness to pay for some ITS-CVO user services, although many states lack the appropriate institutions to allow the collection of fees from users to support CVO services.³

Although the very justifiable argument has been made that public transportation funds should be used to support the operational and maintenance needs of the existing infrastructure before investing in new ITS technology, this argument ignores the return on investment of new systems. The issue may not be the lack of resources, but an institutional issue that precludes directing resources to deserving ITS-CVO projects. To illustrate, the annual expenditures on motor carrier transportation services in the United States was \$292 billion in 1992,⁴ which is roughly three and one-half times annual federal, state, and local governmental expenditures on all highways in the United States (capital improvements, maintenance, and operations). Even a very small improvement in truck transportation productivity would off-set a very large relative increase in highway infrastructure expenditures. For example, a three percent increase in motor carrier productivity is roughly equal to one-half the entire federal expenditures in 1992 for highways and highway related purposes. In addition, the dollars invested in truck transportation services grew by 6.5 percent to a total United States expenditure of \$311 billion in 1993 and is expected to continue to grow at a rate of more than five percent per year.⁵ As truck transportation expenditures grow, benefits from only modest productivity gains will continue to offset even greater infrastructure expenditures. Clearly, the problem of developing ITS-CVO services is not a resource issue—ample resources exist in the truck transportation industry to support productivity enhancing ITS-CVO services.

Although they are less easily identified, significant governmental benefits are also likely to be accrued through the automation of administrative regulatory services. Reduction of paperwork and the resulting savings in person hours would allow agencies to focus their resources on other important areas of responsibility. For example, a department of transportation may be able to reduce the resources needed to issue overdimensional credentials through ITS-CVO. These resource

savings could then be used to develop systems and processes that allow the agency to eliminate unnecessary delays for the majority of motor carriers who operate within weight limits and to focus enforcement efforts on the small minority of vehicles that might be overloaded (either intentionally or accidentally). As a result of these increased enforcement efforts, pavement damage due to overloaded commercial vehicles and the resulting highway maintenance costs could be reduced. Thus the costs of ITS-CVO may in fact be to a significant extent a simple shifting of costs from administrative staff and highway maintenance to other areas, such as enforcement, allowed by ITS-CVO.

Therefore, the issue for both the motor carrier industry and public agencies is not one of financial resources but one of more efficient resource allocation to finance ITS-CVO functions. This is not meant to assume that financing of ITS-CVO services through industry and governmental sources will not be a difficult issue. One commonly identified barrier to funding ITS functions is the traditional attitude that highway services should be free of user fees.¹⁰ Such an attitude makes it difficult to tap the resources of the motor carrier industry to provide resources for ITS-CVO. Similarly, shifting costs from one area in a state's or agency's budget may be difficult as well. For example, agencies running with a bare minimum of staff may not want their staff further reduced even though ITS-CVO may make it possible. The inability to allocate resources or support improvements that would make such allocations possible, however, is not an issue of financial means but is instead an institutional issue.

Institutional Issues

Institutional issues arise when ITS systems come into conflict with pre-existing systems which were developed to support traditional technology. An example of a fairly simplistic institutional issue would be a legal requirement that drivers retain an original copy of a document in their truck cab. A more efficient and secure system may be to electronically retain proof of the information contained on the document. Hence, the traditional system of checking the original paper copy is an institutional issue that acts as barrier to the application of ITS-CVO systems.

Trucking applications of ITS have been found to have the most intransigent institutional issues. Their intransigence is related to the diversity of the public agencies that regulate, inspect, and tax motor carriers and the diversity of the motor carrier industry itself.

Public Agency Diversity. In the 1920s and 1930s, as the fledgling motor carrier industry was beginning to form, truck transportation was generally limited to short hauls, mostly within a single state. Long-haul freight was carried by rail and water carriers. The development of administrative regulation (size and weight limits, registration, and permitting), economic regulation, taxation, and safety regulation during this period often took different forms as states evolved their own unique regulatory systems. The state organizations with motor carrier related responsibilities varied from state to state and they had varying organizational

missions. This widespread non-uniformity between states was not a significant issue when most trucking took place within a single state.

Although the motor carrier industry and shipping patterns have changed dramatically over the twentieth century to include a great deal of regional and long-haul freight in addition to intrastate freight, the agency responsibilities to regulate motor carriers in many cases have not changed. States commonly have five or six different agencies involved in one or more types of motor carrier regulation and taxation. Each agency is likely to have different agency objectives and the trucking industry is likely to be only a minor consideration in the agency's overall mission. For example, a state's department of revenue may have responsibility for the collection of motor carrier fuel tax as well as all other taxes such as income and excise taxes which make up the bulk of their revenue and workload. As a result, uniformity with other agencies dealing with motor carriers (e.g., the motor vehicle department) or working with other states to streamline taxation of motor carriers may only be a minor consideration. More important considerations may be issues of uniform and consistent tax assessment and tax collection procedures within the department or efforts to maintain consistency with federal tax collection procedures.

The diversity of public agencies involved in the regulation of motor carriers and the varying missions of agencies have proven to make cooperation between agencies difficult. When multiple agencies become involved in projects which cross state lines, the incompatibility, inconsistency, and conflicting missions make cooperation even more problematic. The variety of state agencies, for example, has been one of the most troublesome issues for the Advantage I-75 operational test, which includes several states and one Canadian province.

Motor Carrier Industry Diversity. Within the motor carrier industry, there is also a great diversity of interest in ITS user services. For example, less-than-truck-load (LTL) intrastate carriers operating on regular routes are likely to benefit little from most ITS user services.¹¹ An evaluation of an Iowa-based LTL trucking firm found almost no benefits were likely from ITS user services. The trucks of this carrier, like other similar carriers, do not often leave the state and do not often travel along roads with weigh and inspection facilities; therefore user services that provide electronic clearance at weigh stations and ports of entry and multi-state credentialing are of no benefit. On the other hand, truckload (TL) carriers operating throughout all contiguous states and Canadian provinces with team drivers are likely to find ITS-CVO services highly beneficial. As a result of the differences in the operations of individual motor carriers, there is no uniform demand for ITS-CVO user services across the entire industry.

The diversity of interests both for public agencies charged with regulating the trucking industry and for the motor carrier industry itself results in difficulties in identifying common needs (even a willingness to agree that there is a need), agreeing to common functions, adopting compatible procedures and equipment, and agreeing to system management and funding. The inability to converge on a

common system or even common compatible systems is a result of institutional issues and not technical or financial issues.

Institutional Issue Studies

Recognizing the importance of overcoming institutional issues before ITS-CVO programs could progress, in 1991 the Midwest Transportation Center funded the first intrastate ITS-CVO institutional issues study for the state of Iowa. Following its completion, the Iowa study served as a model which was quickly adopted by the Federal Highway Administration (FHWA), and the FHWA quickly provided funds to all other states to allow them to conduct studies similar to the Iowa study. Forty-six states have either completed or are conducting intrastate institutional issues studies individually or in consortia. These studies present a mosaic of issues from various state perspectives but were not intended to address institutional issues that arise in a multi-state framework. Many of the state level studies have found it problematic for organizations within a single state to agree on functions, compatible systems, operating procedures, and other technical issues for potential ITS-CVO systems. Systems which cross state boundaries will require multiple states to agree and will compound the complexity of developing a commitment to and the design of a compatible system.

ITS-CVO systems are unique among all ITS applications in their requirement that multiple jurisdictions and agencies cooperate to form a single system or a series of compatible systems. Although there have been several studies of institutional issues, none has been found which deals with multi-state institutional issues. Therefore, this study seeks to fill this void by investigating multi-state institutional issues for Iowa and adjoining states.

Coincidentally, approximately nine months following the initiation of this Midwest Transportation Center study (in July, 1994), the Federal Highway Administration has offered to sponsor multi-state institutional issue studies. The Midwest Transportation Center research is also intended to serve as a model for the following Federal Highway Administration sponsored studies.

The research documented in this report examines institutional issues which act as barriers to cooperation and ITS-CVO system deployment between Iowa and the states sharing borders with Iowa: Illinois, Minnesota, Missouri, Nebraska, South Dakota, and Wisconsin. The goals of the research are to:

- Identify and analyze the interstate institutional issues which present barriers to multi-state development, procurement, and operation of ITS-CVO systems in the region.
- Develop a national model for evaluating and identifying strategies to overcome interstate barriers to ITS-CVO.

- Identify strategies for overcoming barriers to interstate cooperation for ITS-CVO in the region.
- Develop a prioritized action plan for resolving the identified barriers to interstate cooperation for ITS-CVO in the region.

Overview of Research Methodology

To meet the project goals, the study was conducted in two phases. Phase 1 of the study is designed to identify and analyze the interstate institutional issues associated with ITS-CVO systems and services development, procurement, and operation. In Phase 2, the issues identified in Phase 1 will be prioritized and strategies will be developed for resolving these issues in the region.

The Phase 1 study includes a review of literature to identify existing innovative procurement and public/private partnershiping techniques and to develop supporting information to enable identification and analysis of significant barriers to interstate cooperation. Government procurement practices have been identified as a barrier to ITS application and particularly to those systems which depend on private/public partnerships for development. For example, a Federal Highway Administration sponsored conference on Public - Private issues in ITS deployment reported "... public sector low bid procurement is generally seen as a barrier to private sector involvement. Procurement techniques used for highway construction and maintenance activities are thought to be fundamentally incompatible with IVHS acquisition needs."¹²

Prior to conducting the research, it was hypothesized that procurement systems that were incompatible between states and incompatible with ITS acquisition would be one of the most contentious issues affecting the deployment of systems across state borders. Procurement laws and practices vary dramatically from one state to the next. For example, some states very strictly observe free and open competition requirements on every purchase and encourage selection of suppliers based on low bid. Other states, however, have more liberal laws and rules which allow non-competitive negotiation with suppliers when doing so is in the best interest of the state involved. Differences in procurement requirements and even the agency's procurement philosophy may create an institutional barrier to multi-state cooperation. Hence, the need to review the literature for innovative procurement techniques that may offer means to minimize the impacts of these issues.

Phase 1 also involved the collection of information from each state regarding actual practices that could become a barrier to deployment and management philosophies which could relate to ITS-CVO deployments. As a first step towards understanding each state's relationship to the motor carrier industry, agencies involved in motor carrier regulation or taxation were identified. This included identifying agencies with responsibilities for economic regulation, vehicle registration, permitting, highway use taxation, safety regulation, and size

and weight regulation. Also identified in each of the seven states was one lead agency which would most likely have responsibility for promotion and deployment of future ITS-CVO initiatives. In later portions of the study, these contacts helped to facilitate research on agency philosophy, administrative procedures, and state-level legal requirements.

An important step in the research was to interview staff members within the lead agency in each state and, in some cases, staff members from related agencies. To provide the interviewed staff members with information and background for their responses, a list was prepared of ITS-CVO functions which are likely to be deployed in the region along with the likely sequencing in time of deployment of ITS-CVO functions (i.e., which function should be deployed first, which should be deployed second, etc.). This background material helped interviewees to ground their responses in tangible proposed systems.

During Phase 1, the laws and agency administrative rules governing procurement in each state were also examined to determine commonalities and differences among the seven states participating in the study. To identify potential conflicts in these laws and rules, a matrix was developed to provide a simple comparison of all seven states' laws and administrative rules on procurement practices. This was an important step, and it clearly identified conflicts between the laws and rules of the seven states. The results of these two efforts resulted in a table which provides a simple comparison of the barriers identified in the legal codes and rules, practices, and philosophies of the lead agencies for ITS-CVO in all seven states.

The issues identified and conclusions drawn by the research and presented in this Phase 1 report provide the background information for Phase 2 activities. Phase 2 findings are contained in a companion document.

Just as the original Iowa study of ITS-CVO institutional issues was a "first step" in clearing the way for ITS-CVO development across the country, the results of this study will likely be the "next step" that clears the way for efficient and cost-effective multi-state cooperation for ITS-CVO development, procurement, and operation. Regardless of the CVO function, multi-state cooperation in ITS implementation will result in interoperable ITS-CVO systems and services that fulfill the needs of states and motor carriers while providing seamless truck travel throughout the United States and, eventually, North America.

- 1 . Science Applications International Corporation. *IVHS Institutional Issues and Case Studies: Analysis and Lessons Learned*. Prepared by Science Applications International Corporation for the Federal Highway Administration, Washington, D.C., 1994. Report No. DOT-VNTC-FHWA-94-15.
- 2 . Science Applications International Corporation. *IVHS Institutional Issues and Case Studies: Analysis and Lessons Learned*. Prepared by Science Applications International Corporation for the Federal Highway Administration, Washington, D.C., 1994. Report No. DOT-VNTC-FHWA-94-15. p. 4-1.
- 3 . Hallenbeck, Mark, Koehne, Jodi, and Rose, David. "Identifying and Surmounting Barriers to Implementing IVHS Commercial Vehicle Operations Systems." *Proceedings of the IVHS America 1994 Annual Meeting*, Atlanta, Georgia, 1994.
- 4 . The ATA Foundation, Inc. "A Framework to Measure the Benefits and Costs of IVHS/CVO User Services." *Work in progress*. Technical Memorandum 1, Tasks 2A and 2B: Integrating IVHS Research with Truck Regulations, DTFH61-93-C-0099 Task F. ATA Foundation, Inc., Rumford, RI, 1994.
- 5 . Maze, T.H. and Maggio, M.E. *Intelligent Vehicle Highway Systems, Institutional Barriers and Opportunities For I.V.H.S. In Commercial Vehicle Operations: An Iowa Case Study*. Midwest Transportation Center, Iowa State University, 1992.
- 6 . *The Crescent Project: An Evaluation of an Element of the Help Program: Executive Summary*. Prepared by WHM Transportation Engineering Consultants, Inc, Castle Rock Consultants, and the Western Highway Institute/ATA Foundation, 1994.
- 7 . Wilson, Rosalyn A. *Transportation in America: 12th Edition*. Eno Transportation Foundation, Inc., Lansdown, Virginia, 1994. p. 40.
- 8 . Wilson, Rosalyn A. *Transportation in America: 12th Edition*. Eno Transportation Foundation, Inc., Lansdown, Virginia, 1994. p. 73.
- 9 . Foster, Thomas, A. "It's About Time and Inventory." *Distribution*, July, 1994. p.10.
- 10 . *A Report to Congress: Nontechnical Constraints and Barriers to Implementation of Intelligent Vehicle-Highway Systems*. U.S. Department of Transportation, Washington, D.C.: 1994. p. 1-3.
- 11 . Maze, T.H. and Maggio, M.E. *Intelligent Vehicle Highway Systems, Institutional Barriers and Opportunities For I.V.H.S. In Commercial Vehicle Operations: An Iowa Case Study*. Midwest Transportation Center, Iowa State University, 1992. pp. 29-30.

12 . Ritter, Gary. "Public - Private Issues in IVHS Deployment: Report on the April 1992 FHWA Conference." *Proceedings of the IVHS America 1992 Annual Meeting*, Newport Beach, California, May, 1992. p. 302.

CHAPTER 2 RESEARCH BACKGROUND AND METHODOLOGY

Introduction

As the ITS-CVO state institutional issues studies have shown, there are a number of significant intrastate issues that can impede ITS-CVO implementation. The reality of these intrastate issues combined with the interstate nature of the motor carrier industry suggested that perhaps more significant problems would be encountered when states wanted or needed to cooperate with each other in ITS-CVO implementation. Obviously, if state agencies encounter barriers to working with other agencies within the same state, a logical hypothesis is that they will also encounter barriers to working with agencies in other states. These barriers can only multiply and/or intensify as the number of agencies involved increases as more states undertake implementation of ITS-CVO. With some states having five or more agencies involved in motor carrier administrative and safety regulation, the number of agencies involved in interstate cooperation for ITS-CVO could become large, thus increasing the likelihood and significance of any barriers to ITS-CVO development.

Research Questions

A number of questions must be answered positively to successfully and efficiently develop, implement, and operate ITS-CVO systems and services. These questions arise from the differences between development, deployment, and operation of ITS-CVO and development and operation of traditional highway infrastructure detailed in Chapter 5. These questions include:

- **Are states equipped philosophically and legally to cooperate with other states in ITS-CVO development?** The interstate nature of motor carrier operations calls for ITS-CVO systems and services that can fulfill the needs of states and motor carriers as transparently as possible. This will require cooperative development of standards for ITS-CVO functions, systems, operation, and maintenance to ensure that ITS-CVO is interoperable both technically and functionally across states. The new levels of cooperation needed for ITS-CVO may not fit within the current agency cultures or be allowed under state laws and rules.
- **Will states be able to generate the necessary resources, both financial and staff, to develop, implement, and operate ITS-CVO systems and services?** Funding of ITS-CVO functions will require new levels of trust and cooperation as well. The U.S. DOT has emphasized that ITS is expected to be a public/private partnership

with states and private industry sharing in development and implementation costs. This approach will be quite a change for most state agencies, whose programs are traditionally sponsored entirely through state, federal, or some combination of state and federal funds. Likewise, many state agencies may find it difficult or impossible to add staff to handle ITS-CVO duties or absorb these duties under current staffing or budgeting requirements, thereby necessitating privatization or contracting to fulfill these duties. Agencies may not be allowed under current laws, rules, or practices to transfer these duties to private industry or may be unwilling to do so.

- **Can states accommodate innovative and cooperative procurement and management approaches under current laws, rules, and practices?** High development and implementation costs call for innovative cooperation in partnerships for the development, procurement, financing, and management of ITS-CVO systems and services. With the increasing pressures to trim the federal deficit and tight state budgets as well, states will need to pursue every means possible to obtain and provide ITS-CVO systems and services that meet public and private user needs and maximize the return on investment. In many cases, these new and efficient approaches may not be allowed under current laws, rules, and practices of agencies involved in CVO administration.

Positive answers to these questions will necessitate a high level of cooperation between states and between states and private industry.

Research Methodology

There are a number of differences between development, deployment, and operation of ITS-CVO and the development and operation of traditional highway infrastructure (see Chapter 5). These differences and the number of states and agencies involved in CVO regulation suggest a number of approaches would be needed to identify potential barriers to interstate cooperation in ITS-CVO and possible methods for mitigating these barriers. The research was split into two phases—Phase 1 encompassed those tasks necessary to identify issues and barriers in interstate cooperation for ITS-CVO while Phase 2 focuses on identifying and prioritizing of possible options for mitigating the barriers uncovered in Phase 1. Phase 1 will be completed and Phase 2 will begin upon acceptance of this document by the Project Advisory Committee.

Phase 1 efforts to identify issues and barriers in multi-state cooperation for ITS-CVO included:

- Contact with state trucking associations, motor carriers, and state agencies to determine the agencies involved in CVO activities in each state;

- Discussions with transportation agencies in each state to ascertain the lead agency and contact person for ITS-CVO efforts in each state;
- Review of FHWA ITS program plans, minutes of meetings with motor carriers and state agencies, and discussions with identified ITS-CVO lead agencies to identify likely ITS-CVO functions and relative timing of implementation; and
- Identification and analysis of barriers to multi-state cooperation in ITS-CVO including a review of state laws and rules governing procurement by lead ITS-CVO agency and interviews with lead ITS-CVO agencies regarding procurement and management philosophies.

The marriage of these efforts resulted in a comprehensive examination of practices and requirements that could present barriers to interstate cooperation in ITS-CVO. The remainder of this chapter describes each of these Phase 1 efforts in detail.

Determination of Agencies Involved in CVO Activities

To begin the investigation into possible barriers to multi-state cooperation in ITS-CVO among the seven study states, the agencies involved in interstate CVO activities in these states must be identified. As experienced by trucking companies and made clear by the FHWA-funded state institutional issues studies, states vary greatly in their approach to motor carrier regulation and administration. Some states have a single agency, such as the DOT, administering all motor carrier functions while others may have three, four, or even five agencies handling the routine regulatory and administrative functions that every interstate motor carrier must fulfill. Add to these routine functions such specialized functions as hazardous materials permitting, agricultural or excise tax commodities permitting, or others and the agencies involved in administering motor carrier regulations become a multifarious array with differing purposes and philosophies regarding motor carrier services.

The number of agencies and differences in agency functions and philosophies can present significant intrastate barriers to development and implementation of ITS-CVO functions. Knowledge of the number of agencies involved and their primary functions (revenue collection, motor vehicle enforcement, infrastructure construction and maintenance, etc.) is essential to investigating the possible issues that may arise due to not only the high-technology, high-cost nature of ITS-CVO but also the differences in philosophies, practices, and rules/laws under which states and agencies conduct business.

To determine which agencies were involved in CVO administration, a number of resources were used. First, *Transport Topics'* annual list of motor carrier regulatory agencies was reviewed.¹ To verify the information provided by *Transport*

Topics and get names of specific individuals as agency contacts, state trucking associations in each state were contacted. Lastly, the information was verified by each state's representative serving on the study's project advisory committee. Appendix 1 lists the state agencies involved in CVO by state and responsibility.

Determination of Lead Agency for ITS-CVO Initiatives

As reported in Chapter 3, the identification of a lead agency for ITS-CVO initiatives in each state was necessary to help focus the study. Clearly, the agency charged with lead ITS-CVO responsibility in a state will be the agency whose practices, applicable laws and administrative rules, and philosophies will most directly affect development, implementation, and operation of ITS-CVO services and systems. In addition, identification of the lead agency for ITS-CVO in each state would create a single point of contact with each state, thus allowing the research team to build a working relationship with each state and minimizing the amount of effort used to identify information sources and gather information in each state.

While the effects of intrastate issues on interstate cooperation for ITS-CVO cannot be ignored, it is beyond the scope of this study and would be redundant to previous efforts. The FHWA has previously sponsored intrastate institutional issues studies to examine all involved agencies in a state and the interaction among them to identify intrastate institutional barriers to ITS-CVO. Instead, the study focuses on the barriers presented by the overall philosophy of each state toward CVO regulatory administration (one agency or many involved in motor carrier regulatory functions) and the practices, applicable rules and laws, and philosophies of the identified lead agency for ITS-CVO in each state.

To identify the lead agency for ITS-CVO initiatives in each of the seven study states, administrators of the department of transportation in each state were asked to identify the agency that would be the lead for ITS-CVO initiatives in their state and who would be the contact person at that lead agency. Once these agencies and contacts were identified, the study team began building a rapport with these contacts and gathering information on each state. Chapter 3 includes a list of the lead agency for ITS-CVO in each state and the identified contact person.

Identification of Likely ITS-CVO Functions and Relative Timing of Implementation

To set a background for interviews with staff from each state's lead agency for ITS-CVO, the likely ITS-CVO functions and their relative timing of implementation in the region were identified. In addition, during the planning phase of the study it became apparent that ITS functions for CVO had widely varying technology needs and applications. These wide variances in technology needs and applications create varying investment needs and varying degrees of institutional and business practice changes that may be necessary for or come about as a result

of implementation of ITS-CVO functions. Because of the differences in needs and changes required by each function and the institutional differences between states and agencies, identification of the functions likely to be implemented and the relative timing of their implementation is important to anticipating the types of difficulties that might affect multi-state cooperation in ITS-CVO.

Detailed in Chapter 4, a two-faceted approach was used to identify those ITS-CVO functions most likely to be implemented and their relative timing of implementation. To ascertain the initiatives being supported by the federal government through the FHWA, the research team reviewed the draft *National Program Plan for IVHS*.² In a parallel review, the research team examined the findings from state ITS-CVO institutional issues studies (both completed and in-progress) and reports from various ITS forums to ascertain the wants and needs of the involved states and the trucking industry in general and specific to the region.

From these sources, a matrix of general CVO functions was assembled in respect to likely and unlikely general implementing technologies and relative timing of function implementation in the ITS-CVO development cycle. The matrix was developed to serve as a quick reference to background information on likely functions, technologies, and timings for identifying and analyzing possible barriers. Once developed, the matrix was validated by distribution to the lead agency contact in each of the seven states for comments and corrections. See Appendix 2 for a copy of the ITS-CVO Likely Function and Relative Timing Matrix.

Identification and Analysis of Barriers to Multi-State Cooperation in ITS-CVO

To uncover barriers to and opportunities for multi-state efforts in ITS-CVO, the research team focused on two core efforts:

1. a review and analysis of state laws and rules governing procurement by the agency identified as the lead for ITS-CVO initiatives in each state;
2. meetings with identified ITS-CVO lead agency contacts and other staff to gain insights into procurement and management philosophies and practices that might present barriers or opportunities for cooperation in ITS-CVO.

The results of these efforts are reported in Chapter 6.

The review and analysis of state laws and rules governing lead agency procurement was conducted by a research team member with legal training. To obtain copies of the relevant documents, lead agency contacts were asked to provide relevant state code and administrative rules or coordinate with the proper division of their organization or state to have copies of these sent to the research team. The review of these documents focused on the areas thought to be most likely to present barriers to or opportunities for cooperation in ITS-CVO: 1) In-State

Bidder Preferences; 2) Limitations on Contract Term; 3) Competitive Bidding Process; 4) Intellectual Property Practices; 5) Source Selection; 6) Experience with Life-Cycle Costing; 7) Bid Evaluation Process; and 8) Bid Specifications.

In addition to this review of documents, members of the research team traveled to each study state and met with personnel from the lead agency responsible for ITS-CVO development in each state. In all cases, these meetings included both ITS-CVO program personnel and agency staff responsible for procurement or staff from the administrative organization responsible for procurement. The major focus of these meetings was to get a real-world interpretation of procurement and management requirements and practices within each state's lead agency for ITS-CVO and indications of cooperative attitudes, commitment to ITS-CVO, and availability of resources (staff, expertise, and funding). Attendees were provided background materials in advance of the meetings and asked to be prepared to discuss the issues raised by these materials. Included in the background information was a list of sample questions from various procurement topics and a set of procurement and management scenarios that ranged from conservative to very progressive. These background materials are included in Appendix 3.

Topics covered during the course of the meetings included procurement requirements and practices, availability of resources (expertise, personnel, funding), philosophy toward CVO and ITS, management philosophy and practices, and ability to and likelihood of participating in cooperative ITS-CVO ventures.

Options for Mitigating Barriers to Multi-State Cooperation for ITS-CVO in the Region

Options for mitigating barriers to multi-state cooperation in ITS-CVO and taking advantage of opportunities for multi-state cooperation are made in Chapter 7 of this report. These options were suggested by the findings of the study and by discussions with the project advisory committee.

The suggested recommendations will then be validated and prioritized by lead state agency, ITS industry, and motor carrier representatives in Phase 2. This validation and prioritization will result in an action plan for the State of Iowa to use as a basis for bringing about cooperation with its neighbor states for development and deployment of ITS-CVO functions.

1. U.S. Department of Transportation and IVHS America. *National Program Plan for Intelligent Vehicle-Highway Systems*. Volumes 1-2. Draft May 1994.
2. Strah, T. "Trucking Through the States." *Transport Topics*. pp. 18-65. American Trucking Associations: November 1, 1993.

CHAPTER 3

IDENTIFICATION OF AGENCIES INVOLVED IN CVO ADMINISTRATION, LEAD AGENCIES FOR ITS-CVO INITIATIVES, AND RELATED ISSUES

Introduction

Approaches to motor carrier administrative and safety regulation vary greatly from state to state. Some states have a single agency, such as the department of transportation, administering all motor carrier functions while others may have five agencies handling the routine administrative and safety regulatory functions that every interstate motor carrier must fulfill. Add specialized functions such as hazardous materials permitting, agricultural or excise tax commodities permitting, or others to this mix and the agencies involved in administering motor carrier regulations become a diverse array with differing purposes and philosophies regarding administration of motor carrier regulation.

The state institutional issues studies completed in the region and across the country have clearly shown that the number and types of agencies involved in CVO services within a state can greatly affect the extent and nature of the issues associated with developing, implementing, and operating systems and services to provide ITS-CVO functions.^{1,2,3,4,5} For example, the institutional issues identified for Iowa, a state with just one agency—the Iowa Department of Transportation—overseeing all routine CVO administrative and safety regulation, are somewhat different from those identified for Nebraska, a state with a number of agencies involved in routine CVO administrative and safety regulation. Because Iowa has only one agency involved in routine CVO regulatory functions, the significant barriers identified for Iowa included such issues as the traditional adversarial relationship between the motor carrier industry and state and federal transportation agencies and instances of legal code that may need to be modified or enacted to enable ITS-CVO functions.⁶ Nebraska, on the other hand, has several agencies involved in routine motor carrier regulatory functions, and the Nebraska institutional issues study identified a number of barriers related to agency and administrative conflicts.⁷ These and other studies identified the inability of states to cooperate in inter- and multi-jurisdictional motor carrier regulation as a barrier as well.^{7,8,9,10,11}

Obviously, the potential issues associated with interstate cooperation in ITS-CVO will be largely dependent on the number and types of agencies currently involved in CVO and likely to be involved in any ITS-CVO efforts in each state. Therefore, any examination of the issues associated with interstate cooperation in ITS-CVO requires identification of these agencies.

To avoid redundancy, this study does not directly investigate the issues between agencies in each state as the FWHA-sponsored institutional issues studies have done, but instead focuses on identifying a lead agency for ITS-CVO initiatives in each state and examining the issues associated with that agency. The identification of agencies involved in CVO combined with the findings of the state institutional issues studies gives sufficient indication of the type and severity of issues related to multiple intra-jurisdictional agency involvement in ITS-CVO. This study provides a close examination of the issues faced by the lead agency for ITS-CVO in each study state and, thus, exposes the issues in interstate cooperation for ITS-CVO between lead agencies and states in the region.

Determination of Agencies Involved in CVO Activities

Identifying the agencies involved in interstate CVO activities in the study states served two primary purposes:

1. To gain an understanding of the approach to motor carrier regulation used in each state. For example, is motor carrier regulation seen as one group of functions administered under a single agency (i.e. DOT) or are a number of agencies involved based on the regulatory functions, such as taxation or safety enforcement, being performed.
2. To gain knowledge of the number and types of agencies involved in motor carrier functions in each state so barriers related to the differences in agency philosophies and the complexities of multi-state and multi-organization involvement can be identified and analyzed.

To determine which agencies were involved in CVO administration, a number of resources were used. First, the research team consulted back issues of *Transport Topics*, a weekly motor carrier industry publication. *Transport Topics* annually compiles and publishes a list of motor carrier regulatory agencies by state.¹² This list served to validate our own knowledge of the agencies involved and as a starting point for further investigation. To verify the information provided in *Transport Topics* and obtain names of specific individuals as agency contacts, state trucking associations in each state were contacted. These associations are well-versed in the requirements their respective states impose on motor carriers and serve as resources and advisors to trucking companies on the requirements of their state. Finally, the list was verified by the project advisory committee member from each state. The agencies involved in CVO administration in each state are discussed by state below and summarized in Table A1-1 in Appendix 1.

Illinois

The Illinois agencies involved in CVO services are listed in Table 3.1 and include the Secretary of State, the Commerce Commission, the Department of Revenue, the Department of Transportation, and the Illinois State Police.^{13,14,15}

The number of agencies involved in CVO administrative and safety regulation in Illinois suggests that ITS-CVO efforts in Illinois will require efforts to promote intrastate cooperation and coordination. The effects multiple CVO regulatory agencies will have on interstate cooperation are unpredictable, but there is significant potential for such intrastate issues to impact the process. If a decision involving an ITS-CVO function involves more than one agency, getting a consensus from the involved agencies may be difficult, depending on how well the needs and perspectives of the involved agencies overlap and other intrastate issues in operation at the time. With such diverse agencies involved in CVO administrative and safety regulation, forming a general consensus on ITS-CVO functions and issues will be an important hurdle that Illinois may want to address before pursuing interstate relationships. However, Illinois has recently completed a study of intrastate institutional issues related to ITS-CVO done in cooperation with the State of Indiana. With the results of this study now available, Illinois may be well on its way to reducing the intrastate barriers to ITS-CVO as cooperation with other states becomes a significant consideration. The Illinois DOT is participating in the *Midwest States One-Stop Electronic Purchase of Motor Carrier Credentials* project, which may also aid in resolving some of Illinois' intrastate institutional issues.

Table 3.1. Illinois Agencies Involved in CVO Administrative and Safety Regulation

Service	Illinois Agency
Prorate (Registration)	Secretary of State, Commercial and Farm Truck Division
Operating Authority	Commerce Commission
Fuel Tax	Department of Revenue, Motor Fuel Tax Division
Oversize/Overweight	DOT, Permit Office
Hazardous Materials	DOT, Commercial Vehicle Safety Section
Size and Weight Enforcement	State Police
Safety Inspections (roadside)	State Police

Iowa

Iowa is one of the few states in the U.S. that not only offers one-stop service for motor carrier credentials (one-stop shopping) but administers CVO administrative and safety regulatory functions through a single agency—the Iowa Department of Transportation.^{16,17,18} In addition, one major arm of the Iowa DOT—the Motor Vehicle Division—is charged with responsibility for all routine CVO regulatory duties (see Table 3.2). This focused administration of routine CVO regulation eliminates much of the potential for intrastate issues in ITS-CVO. If the Iowa DOT decides its direction for ITS-CVO functions, the only hurdles to clear are those posed by ensuring political and industry support for the chosen direction.

While these hurdles may not be inconsequential, in the case of Iowa they are not complicated by the involvement of a number of other agencies who also share CVO responsibilities.

As a result, Iowa's involvement in interstate cooperation in ITS-CVO will not be impeded by intrastate interagency issues. Such single-point responsibility provides an excellent opportunity for involvement in multi-jurisdictional cooperation. In fact, the Iowa DOT is involved in a number of ITS-CVO projects, including the *On-Board Automated Mileage and Stateline Crossing System for Apportioning Commercial Vehicle Fuel Taxes and Mileage and Automatic Submission to IFTA and IRP Base Jurisdiction* and the *Midwest States One-Stop Electronic Purchase of Motor Carrier Credentials* operational tests.

Table 3.2. Iowa Agencies Involved in CVO Administrative and Safety Regulation

Service	Iowa Agency
Prorate (Registration)	DOT, DMV, Office of Motor Carrier Services
Operating Authority	DOT, DMV, Office of Motor Carrier Services
Fuel Tax	DOT, DMV, Office of Motor Carrier Services
Oversize/Overweight	DOT, DMV, Office of Motor Carrier Services
Hazardous Materials	DOT, DMV, Office of Motor Carrier Services
Size and Weight Enforcement	DOT, DMV, Office of Motor Vehicle Enforcement
Safety Inspection (roadside)	DOT, DMV, Office of Motor Vehicle Enforcement

Minnesota

Minnesota is another example of a state with more than one agency involved in CVO administrative and safety regulation. As shown below in Table 3.3, Minnesota has two agencies involved in interstate CVO administration: the Department of Public Safety and the Department of Transportation.^{19,20,21} These agencies have recognized the value of close coordination in administration of their CVO duties and are housed in the same location. Cooperation between these agencies is not limited to shared facilities; both agencies are participating in two FHWA ITS operational tests: the *On-Board Automated Mileage and Stateline Crossing System for Apportioning Commercial Vehicle Fuel Taxes and Mileage and Automatic Submission to IFTA and IRP Base Jurisdiction* and the *Midwest States One-Stop Electronic Purchase of Motor Carrier Credentials*. In addition, Minnesota completed its ITS-CVO institutional issues study in late 1993, and the results of that study may bring about closer coordination among these agencies.

With only two agencies involved in CVO administration and close cooperation being developed between them, intrastate interagency institutional issues should be relatively minor impediments to Minnesota's cooperation in interstate devel-

opment, implementation, and management of ITS-CVO. However, while these agencies have participated in ITS-CVO projects and task forces together, these efforts have not resulted in any significant changes in or coordination of practices and processes related to commercial vehicle regulation. Until such change and coordination comes about, having more than one agency involved in CVO regulation will pose significant institutional issues for Minnesota.

Table 3.3. Minnesota Agencies Involved in CVO Administrative and Safety Regulation

Service	Minnesota Agency
Prorate (Registration)	Department of Public Safety, Prorate and Reciprocity
Operating Authority	DOT, Motor Carrier Services
Fuel Tax	Department of Public Safety, Prorate and Reciprocity
Oversize/Overweight	DOT, Road and Vehicle Information and Services
Hazardous Materials	DOT, Enforcement Section
Size and Weight Enforcement	Department of Public Safety, State Patrol
Safety Inspections (roadside)	Department of Public Safety, State Patrol

Missouri

The State of Missouri has multiple and diverse agencies involved in administration of interstate CVO. With no less than five (or seven if St. Louis and Kansas City Police Departments are included) different agencies or offices with differing missions involved in CVO administrative and safety regulation^{22,23} and no real experience in cooperation among agencies, intrastate interagency issues could present formidable barriers to interstate cooperation in ITS-CVO.²²

The agencies involved in ITS-CVO in Missouri include the Department of Economic Development, two areas of the Department of Revenue—the Highway Reciprocity Commission and the Office of Miscellaneous Taxes, the Highway and Transportation Department, and the Highway Patrol.^{23,24} In addition, the police departments of Kansas City and St. Louis both have jurisdiction over safety inspections in their respective metropolitan areas (see Table 3.4).

Missouri is currently completing its ITS-CVO institutional issues study, which was undertaken in conjunction with the State of Kansas. With this study nearing completion, it is hoped that some of the barriers presented by the involvement of such diverse agencies will be mitigated and some experience in interstate cooperation in ITS-CVO will have been gained through cooperation with Kansas in undertaking the study. Further progress in addressing institutional issues may also be made through involvement of the Missouri Highway and Transportation Department and the Missouri Highway Patrol in the *Midwest States One-Stop Electronic Purchase of Motor Carrier Credentials* operational test.

Table 3.4. Missouri Agencies Involved in CVO Administrative and Safety Regulation

Service	Missouri Agency
Prorate (Registration)	Dept. of Revenue, Highway Reciprocity Commission
Operating Authority	Dept. of Economic Development, Division of Transportation
Fuel Tax	Dept. of Revenue, Office of Miscellaneous Taxes
Oversize/Overweight	Highway and Transportation Department
Hazardous Materials	Highway Patrol
Size and Weight Enforcement	Highway Patrol
Safety Inspections (roadside)	Highway Patrol, Kansas City and St. Louis Police

Nebraska

Nebraska performs routine CVO administrative and safety regulation through six agencies: the Department of Motor Vehicles, the Public Service Commission, the State Tax Commission, the Department of Roads, the Department of Revenue, and the Highway Patrol.^{25,26,27} As Table 3.5 illustrates, all of these agencies are involved in routine regulation of interstate CVO except for the Department of Revenue, which is only involved in administering the transport of tobacco products. The other five agencies perform significant CVO regulatory duties with no strong connections between these widely differing agencies.

Table 3.5. Nebraska Agencies Involved in CVO Administrative and Safety Regulation

Regulatory Function	Nebraska Agency
Prorate (Registration)	DMV, Interstate Registration Section
Operating Authority	Public Service Commission
Fuel Tax	State Tax Commission, Division of Motor Fuels
Oversize/Overweight Section	Dept. of Roads, Carrier Enforcement and Permit
Hazardous Materials	State Patrol and Truck Enforcement
Alcohol/Tobacco	<u>Tobacco</u> : Dept. of Revenue
Size and Weight Enforcement	State Patrol and Truck Enforcement
Safety Inspections (roadside)	State Patrol and Truck Enforcement

The number and differences of agencies administering CVO in Nebraska could present formidable barriers to interstate cooperation in ITS-CVO. Nebraska's

institutional issues study, completed in April 1993, identified several interagency issues that would impede cooperation in ITS-CVO.²⁷ These issues included a lack of cooperation and a failure to exchange information among agencies—two issues which would severely hamper ITS-CVO development and implementation.

Obviously, if these issues exist among agencies in the same state, they may prove more significant when agencies from multiple states are involved. Interstate cooperation for the development, procurement, and implementation could be seriously impeded by this multitude of agencies and the resulting issues. However, with the identification of these issues comes the possibility of resolving them. While Nebraska may present significant barriers to interstate cooperation in ITS-CVO due to the number and diversity of agencies involved, it is possible that these intrastate interagency issues will be significantly reduced before interstate cooperation in ITS-CVO becomes an issue. Nebraska is participating in the *Midwest States One-Stop Electronic Purchase of Motor Carrier Credentials* operational test, which requires both cooperation among four of these five agencies and cooperation with eight states and their corresponding CVO agencies.

South Dakota

For South Dakota, four agencies have jurisdiction over interstate CVO administrative and safety regulation: the Department of Revenue, the Public Utilities Commission, the Highway Patrol, and, by default, the Department of Transportation. In fact, the first three agencies are the only agencies involved in CVO credentialing.^{28,29} The DOT is involved in CVO regulation through its responsibility for the roadways and its practices in administering these responsibilities. While the DOT is not directly involved in CVO administration, it is indirectly involved through its setting of size and weight limits and overdimensional routes. Because of its responsibilities for highway infrastructure development and operation, the DOT will be directly involved in ITS-CVO for any implementation of systems on the roadways and respective rights of way.

At this time, the type and severity of intrastate interagency issues in South Dakota is unknown since South Dakota has not completed an ITS-CVO institutional issues study. The number of agencies involved in CVO would suggest that intrastate interagency issues exist and may be significant. However, South Dakota has just approved undertaking an ITS-CVO intrastate institutional issues study in cooperation with North Dakota. This cooperation between the two states for this study holds some hope for both mitigating the intrastate interagency issues in South Dakota and for fostering interstate cooperation. In addition to this study, South Dakota agencies will be cooperating with each other and with agencies from other states through participation in the *Midwest States One-Stop Electronic Purchase of Motor Carrier Credentials* operational test. A summary of the agencies involved in CVO administration in South Dakota appears in Table 3.6.

Table 3.6. South Dakota Agencies Involved in CVO Administrative and Safety Regulation

Regulatory Function	South Dakota Agency
Prorate (Registration)	Department of Revenue, Division of Motor Vehicles
Operating Authority	Public Utilities Commission
Fuel Tax	Department of Revenue, Division of Motor Vehicles
Oversize/Overweight	Highway Patrol, Motor Carrier Division
Hazardous Materials	Highway Patrol, Motor Carrier Division
Alcohol/Tobacco	<u>Alcohol</u> : Department of Revenue
Size and Weight Enforcement	Highway Patrol, Motor Carrier Division
Safety Inspections (roadside)	Highway Patrol, Motor Carrier Division

Wisconsin

During the course of the study, administration of CVO regulatory functions in Wisconsin has undergone some changes. When the study began, Wisconsin had two agencies involved in administration of CVO regulatory functions.^{30,31} The Wisconsin DOT administered most CVO administrative and safety regulation, while the Office of the Commissioner of Transportation administered operating authority. However, the Office of the Commissioner of Transportation has since been eliminated and the Wisconsin DOT has assumed administration of operating authority, thus making the Wisconsin DOT the single administrator of CVO regulatory functions (see Table 3.7). As in the case of Iowa, this single point of responsibility for CVO regulatory responsibilities eliminates the opportunity for intrastate interagency issues and their potential to impede development, implementation, and operation of ITS-CVO.

Wisconsin is currently conducting its ITS-CVO intrastate institutional issues study and is involved in several multi-state ITS operational tests that require cooperation between Wisconsin agencies and its neighbors, including the *Midwest States One-Stop Electronic Purchase of Motor Carrier Credentials* operational test. With these efforts well underway, the potential for barriers to interstate cooperation in ITS-CVO arising from intrastate issues is significantly reduced. In addition, the cooperation Wisconsin is building with other states and agencies through the operational tests should build a basis for more involved cooperation in ITS-CVO.

Table 3.7. Wisconsin Agencies Involved in CVO Services

Regulatory Function	Wisconsin Agency
Prorate (Registration)	DOT, Motor Carrier Services Section
Operating Authority	DOT, Motor Carrier Services Section
Fuel Tax	DOT, Motor Carrier Services Section, Fuel Tax Unit
Oversize/Overweight	DOT, Motor Carrier Services Section
Hazardous Materials	DOT, Motor Carriers Services Section (regulation) and Division of Highway Patrol (enforcement)
Size and Weight Enforcement	DOT, State Patrol
Safety Inspections (roadside)	DOT, State Patrol

Determination of Lead Agency for ITS-CVO Initiatives

A listing of lead state agencies and a discussion of their significance appears later in this chapter. The identification of a lead agency for ITS-CVO initiatives in each state was necessary to help focus the study and identify any issues related to championing the ITS-CVO effort. Clearly, the agency charged with lead ITS-CVO responsibility in a state will be the agency whose practices, applicable rules and laws, and philosophies will most directly affect development, implementation, and operation of ITS-CVO services and systems. In addition, identification of the lead agency for ITS-CVO in each state would create a single point of contact with each state, thus allowing the research team to build a working relationship with each state and minimizing the amount of effort used to identify information sources and gather information in each state.

To identify the lead agency for ITS-CVO initiatives in each of the seven study states, key CVO administrators in each state were asked to identify the agency that would be the lead for ITS-CVO initiatives in their state and who would be the contact person at that lead agency. Considering that many ITS-CVO applications will require access to the roadway or rights of way, it came as no surprise that the identified lead agencies were all departments of transportation. Once these agencies and contacts were identified, the study team began building a rapport with these contacts and gathering information on each state. Table 3.8 is a list of the lead agency for ITS-CVO in each state and the identified contact person.

The fact that all agencies identified as the lead for ITS-CVO initiatives are state departments of transportation greatly reduces the potential for barriers to interstate cooperation in ITS-CVO due to differing lead agency responsibilities. Although the identified lead agencies may differ in their execution of their duties, they share a great deal of similarity in their mission and core responsibilities.

This commonality should greatly reduce the potential for barriers in interstate cooperation for ITS-CVO development, procurement, and implementation.

Table 3.8. Lead Agency and Contact for ITS-CVO by State

State	Lead Agency	Contact
Illinois	Illinois Department of Transportation 120 West Center Court Schaumburg, IL 60195-3161	Joe Ligas IVHS Program Manager
Iowa	Iowa Department of Transportation Office of Motor Carrier Services Park Fair Mall, 100 Euclid Avenue Des Moines, IA 50306-0382	Ruth Skluzacek Director, Office of Motor Carrier Services
Minnesota	Minnesota Department of Transportation 117 University Avenue Ford Building, Mail Stop 320 St. Paul, MN 55155	Jim Wright, Director Minnesota Guidestar
Missouri	Missouri Highway and Transportation Department P.O. Box 270 Jefferson City, MO 65102	Joe Mickes Chief Engineer
Nebraska	Nebraska Department of Roads P.O. Box 94759 Lincoln, NE 68599-4759	Jim Pearson Special Assistant to the Director
South Dakota	South Dakota Department of Transportation 700 Broadway Avenue East Pierre, SD 57501-2586	Dean Schofield Deputy Secretary
Wisconsin	Wisconsin Department of Transportation 4802 Sheboygan Avenue, Room 633 Madison, WI 53707-7916	Phil DeCabooter IVHS Coordinator

1. Maze, T.H. and M. Maggio. *Institutional Barriers and Opportunities for IVHS in Commercial Vehicle Operations: An Iowa Case Study*. Midwest Transportation Center, February 1992.
2. Truck Services, Inc. *Commercial Vehicle Operations Institutional Issues Study*. Nebraska Department of Roads and U.S. DOT Federal Highway Administration, April 1993.
3. Beier, F. *Institutional Barriers to the Adoption of Electronic Data Collection and Interchange as It Relates to Commercial Vehicles*. Minnesota Department of Transportation, December 1993.
4. Wienrank, C. and R. Benekohal. *Institutional Issues in Application of IVHS Technologies to CVO in Illinois*. Illinois Department of Transportation and U.S. DOT Federal Highway Administration, June 1994.
5. Cambridge Systematics, Inc. and JHK & Associates. *Multi-State IVHS/ CVO Institutional Issues Study*. Cambridge Systematics, Inc., and JHK & Associates, October 1993.
6. Maze, T.H. and M. Maggio. *Institutional Barriers and Opportunities for IVHS in Commercial Vehicle Operations: An Iowa Case Study*. Midwest Transportation Center, February 1992. pp. 93-97.
7. Truck Services, Inc. *Commercial Vehicle Operations Institutional Issues Study*. Nebraska Department of Roads and U.S. DOT Federal Highway Administration, April 1993. pp. 110-111.
8. Maze, T.H. and M. Maggio. *Institutional Barriers and Opportunities for IVHS in Commercial Vehicle Operations: An Iowa Case Study*. Midwest Transportation Center, February 1992. pp. 93-94.
9. Beier, F. *Institutional Barriers to the Adoption of Electronic Data Collection and Interchange as It Relates to Commercial Vehicles*. Minnesota Department of Transportation, December 1993. p. 49.
10. Wienrank, C. and R. Benekohal. *Institutional Issues in Application of IVHS Technologies to CVO in Illinois*. Illinois Department of Transportation and U.S. DOT Federal Highway Administration, June 1994.. pp. 85-86.
11. Cambridge Systematics, Inc. and JHK & Associates. *Multi-State IVHS/ CVO Institutional Issues Study*. Cambridge Systematics, Inc., and JHK & Associates, October 1993. p.4-2.
12. Strah, T. "Trucking Through the States." *Transport Topics*. American Trucking Associations: November 1, 1993. pp. 18-65.
13. Strah, T. "Trucking Through the States." *Transport Topics*. American Trucking Associations: November 1, 1993. p. 32.

14. Interviews with Jay Stevens, Illinois Transportation Association. November/December, 1993.
15. Wienrank, C. and R. Benekohal. *Institutional Issues in Application of IVHS Technologies to CVO in Illinois*. Illinois Department of Transportation and U.S. DOT Federal Highway Administration, June 1994. p. 9.
16. Strah, T. "Trucking Through the States." *Transport Topics*. American Trucking Associations: November 1, 1993. p. 34.
17. Interviews with Craig Finch, Director, Technical Services, Iowa Motor Truck Association. November/December, 1993.
18. Maze, T.H. and M. Maggio. *Institutional Barriers and Opportunities for IVHS in Commercial Vehicle Operations: An Iowa Case Study*. Midwest Transportation Center, February 1992. pp. 38-39.
19. Strah, T. "Trucking Through the States." *Transport Topics*. American Trucking Associations: November 1, 1993. p. 42.
20. Interviews with Andy Piilola, Chief Executive Director, Minnesota Trucking Association. November/December, 1993.
21. Beier, F. *Institutional Barriers to the Adoption of Electronic Data Collection and Interchange as It Relates to Commercial Vehicles*. Minnesota Department of Transportation, December 1993. p. 1.
22. Interview with Bob Lannert, Phil Morgan, Richard Walter, Clay Wester, and Bill Wilson, Missouri Highway and Transportation Department. June 1994.
23. Strah, T. "Trucking Through the States." *Transport Topics*. American Trucking Associations: November 1, 1993. p. 42.
24. Interviews with Ron Breau, Missouri Motor Carriers Association. November/December, 1993.
25. Strah, T. "Trucking Through the States". *Transport Topics*. American Trucking Associations: November 1, 1993. p. 47.
26. Interviews with Bud Cuca, Nebraska Motor Carriers Association. November/December, 1993.
27. Truck Services, Inc. *Commercial Vehicle Operations Institutional Issues Study*. Nebraska Department of Roads and U.S. DOT Federal Highway Administration, April 1993. p. 57.
28. Strah, T. "Trucking Through the States." *Transport Topics*. American Trucking Associations: November 1, 1993. p. 60.

29. Interviews with R. Van Johnson, Executive Director, South Dakota Trucking Association. November/December, 1993.
30. Strah, T. "Trucking Through the States". *Transport Topics*. American Trucking Associations: November 1, 1993. p. 65.
31. Interviews with Mike DeHahn, Wisconsin Motor Carriers Association. November/December, 1993.

CHAPTER 4

IDENTIFICATION OF LIKELY ITS-CVO FUNCTIONS AND RELATIVE TIMING OF IMPLEMENTATION IN THE REGION

Introduction

To set a framework for the interviews with lead agency staff members and to help identify interstate institutional issues related to timing of function implementation, the likely ITS-CVO functions and their relative timing of implementation in the region were identified. This identification of relative timing of implementation centered on the applications of ITS-CVO identified by both the FHWA and the study states and was not intended to make predictions regarding long-term plans for implementation of all ITS-CVO services.

ITS-CVO is made up of a number of functions intended to streamline government procedures, reduce motor carrier costs of compliance, increase motor carrier and driver compliance, and promote operating practices that increase transportation productivity and safety. In the draft *National Program Plan for IVHS*, CVO functions are grouped into related areas such as administrative processes, automated roadside safety inspections, and electronic clearance.¹ While some areas of these ITS-CVO functions may overlap, particularly due to data sharing and compliance enforcement needs, for the most part these functions will have widely varying technology and investment needs and varying degrees of institutional and business practice changes that may be necessary for or come about as a result of implementation of these functions.

For example, automated safety inspections would require high-technology equipment implemented at the roadway and, most likely, on-board the vehicle whereas an electronic one-stop shop function for purchasing motor carrier credentials would not require roadway or even on-vehicle technology. Similarly, automated safety inspections and electronic one-stop shop would raise institutional issues that differ in both their nature and their difficulty of resolution. Automated safety inspections require that states not only cooperate but also be willing to accept the results of sensors and systems used in the automated inspection and the results of inspections recently conducted by other jurisdictions. In short, states and agencies will need to trust the technology and other jurisdictions to perform tasks previously handled exclusively by their staff. On the other hand, electronic one-stop shop only requires that states cooperate to provide a single point of request and delivery for commercial vehicle credentials; it does not require states to entrust their credential processing to automated systems or to another jurisdiction.

Because of the differences in technological, financial, and business practice needs and changes required by each function and the institutional differences between

states and agencies, identification of the functions likely to be implemented and the relative timing of their implementation is important to anticipating the types of difficulties that might affect multi-state cooperation in ITS-CVO. It can be assumed that functions implemented during the early stages of ITS-CVO will raise more and different institutional issues than those raised by later functions that occur after states and agencies have built cooperative relationships and attitudes and practices have begun to change.

To identify the ITS-CVO functions and relative timing of implementation for the Midwest, the research team reviewed the draft *National Program Plan for IVHS* and the findings from midwestern state ITS-CVO institutional issues studies and reports from various ITS forums. From these sources, a matrix of general CVO functions was assembled with respect to likely and unlikely general implementing technologies and relative timing of function implementation in the ITS-CVO development cycle. Once developed, the matrix was validated by distribution to the lead agency contact in each of the seven states. A copy of this matrix can be found in Appendix 2.

Likely ITS Functions and Relative Timing of Implementation in the Region

Examination of FHWA ITS plans and operational tests underway and planned provides an indication of the intended direction of ITS-CVO initiatives from the federal perspective. Two user service areas of ITS-CVO have received the most early attention from the FHWA—commercial vehicle electronic clearance and commercial vehicle administrative processes.² More recently, motor carrier safety has received some attention, but these efforts are more recent and are in their very early stages, whereas efforts in the areas of electronic clearance and administrative processes are well underway.

For example, this significant amount of early attention has resulted in a number of FHWA-sponsored research projects and ITS-CVO operational tests to investigate the feasibility and costs and benefits of electronic clearance and administrative process applications. Research investigating electronic clearance includes the Help/Crescent Project, the Advantage I-75 operational test, the Oregon PASS project, and a study investigating the institutional issues of implementing electronic clearance at the U.S.-Canada border.^{3,4} An even stronger indication of the federal commitment to electronic clearance is the goal of the FHWA to have a national prototype for electronic clearance tested and readied for wide-spread deployment by the end of 1997.⁵ Similarly, while no official deployment goals have been stated by the FHWA, commercial vehicle administrative processes have been targeted in the operational test solicitations and awards. Currently, four operational tests investigating ITS applications to commercial vehicle administrative processes are underway or in planning phases. One project examines the feasibility of automating data collection and report filing for motor carrier fuel tax and mileage apportionment while the other three focus on various means for providing electronic one-stop purchase of motor carrier credentials.⁶ Additionally,

the sponsorship of three electronic one-stop tests would indicate that FHWA would like to see this function implemented widely in the near future. In fact, the draft Program Plan indicates development of a prototype national system and a test of such a system by 1998.⁷ However, while the federal role and efforts in ITS are very important to its development and deployment, we should not assume that the FHWA's plans will be strictly adhered to by states. For a number of states in the region one-stop credential purchase may be a higher priority than electronic clearance; thus these states may implement an electronic one-stop credential purchase ITS function ahead of implementing an electronic clearance ITS function.^{8,9,10}

This difference in priorities is evident when examining the state ITS-CVO institutional issues studies completed by study states and the ITS-CVO research being conducted with participation by these states. Such an examination establishes that electronic one-stop purchase of credentials is clearly receiving the attention of the study region. One-stop purchase of credentials was identified as beneficial to motor carriers and state agencies in all four institutional issues studies completed to date by the study states,^{8,9,10,11} and of the four ITS-CVO operational tests being conducted with participation by one or more of the study states, electronic one-stop has by far the most states participating with all the study states being represented in the project.¹² In contrast, while electronic clearance was also identified as beneficial to motor carriers and state agencies in all four completed institutional issues studies,^{8,9,10,11} none of the study states have participated or are currently participating in a test of electronic clearance.

The ITS-CVO service area with the next highest level of participation among states in the region is the operational test investigating automation of data collection and reporting for commercial vehicle fuel tax and mileage apportionment, another commercial vehicle administrative processes function. Three study states, Iowa, Minnesota, and Wisconsin, are participating in this ITS-CVO operational test. Lastly, even the safety applications of ITS-CVO enjoy more study state participation than does electronic clearance—Minnesota and Wisconsin will be conducting an operational test to investigate means of enforcing commercial vehicle out-of-service orders.⁶ Other functions mentioned as promising in the ITS-CVO institutional issues studies conducted by study states include electronic toll and traffic management^{13,14} and automated safety inspections.¹⁵

The involvement of study states in a number of ITS-CVO research activities but not in tests of electronic clearance suggests that other functions may have a higher priority in the region. While we obviously cannot negate the importance of the FHWA's goals for various ITS-CVO functions, it is obvious that the study states and the motor carriers in the region have their own goals as well. Combining these goals, the ITS-CVO functions and their relative timing of implementation in the study states could likely be, in order from early to later:

1. electronic one-stop purchase
2. automated fuel tax and mileage apportionment

3. electronic toll and traffic management
4. electronic clearance
5. advanced (automated) driver and vehicle safety applications.

Although this list does not include all ITS-CVO user functions, it does represent those identified as promising by states at the time of their institutional issues studies. For the most part, the less intensive the function, in terms of both required technology and problems addressed, the earlier it is likely to be implemented. For example, the technology required for automated roadside and on-board vehicle and driver safety inspections requires much more sophisticated technology than does electronic clearance for vehicle weight, credentials, and safety performance (CVSA-like certification). Although the likely timing for the identified functions differs slightly from the development and deployment timing envisioned by the FHWA, keep in mind that not all functions are as easy to implement or as desirable to all states, thus creating differences in the priority for deployment of electronic clearance for in each state.

Implications of Likely ITS-CVO Functions and Relative Timing of Implementation

The implications of ITS-CVO functions and their timing on the interstate institutional issues may be significant. Functions such as multi-state or national electronic clearance or automated safety inspections will require significant investment in roadside infrastructure. As a result, early timing of electronic clearance or similar infrastructure intensive functions will require more cooperation among the states in everything from system development to procurement to everyday operation. Functions like electronic clearance and automated safety inspections also require a much higher level of cooperation with and trust in the agencies of other jurisdictions.

The requirements of large investment and high levels of cooperation create more opportunities for barriers between states. There could be barriers due to differences in system needs, procurement processes, service delivery philosophies, and importance of CVO duties as compared to other responsibilities of the agencies involved. Consequently, early timing of such cooperation and investment intensive functions will cut states short of opportunities to work together in smaller undertakings to identify areas of difference and cooperatively resolve them. The positive aspects of early implementation of such intensive functions is that if states, agencies, and motor carriers can complete this process somewhat successfully and without losing their enthusiasm for ITS-CVO, the implementation of later functions should be somewhat less traumatic as many of the changes necessary to mitigate barriers to multi-state efforts in ITS-CVO will have been made or be underway.

Research completed in the early stages of ITS-CVO development and implementation, such as this study, begins the identification and resolution of barriers to multi-state efforts in ITS-CVO and often results in the beginnings of cooperative efforts among state agencies. In fact, this study brought together department of transportation representatives from the seven study states and created an opportunity for collaboration. As a result, the study states are partners in an ITS operational test of electronic one-stop purchase of motor carrier credentials.¹² Because electronic one-stop is less infrastructure investment intensive than functions such as electronic clearance or automated roadside safety inspections, states will have the opportunity to cooperate and work through some of the institutional issues identified in this study before tackling more investment intensive functions.

1. U.S. Department of Transportation and IVHS America. *National Program Plan for Intelligent Vehicle-Highway Systems*. Volumes 1-2. Draft May 1994.
2. U.S. Department of Transportation and IVHS America. *National Program Plan for Intelligent Vehicle-Highway Systems*. Draft May 1994. Volume 2, pp. 4.1-1 - 4.1-8, 4.4-1 - 4.4-6.
3. Walton, C. "An Update of the Major CVO Corridor Deployments: HELP/CRESCENT/Advantage I-75/CVO Technical Affairs". *Proceedings of the IVHS America 1992 Annual Meeting*. IVHS America, May 1992. Volume 1, pp. 167-171.
4. Harmelink, M. "IVHS at the Borders: The Ontario/Michigan Crossover Strategy." *Proceedings of the IVHS America 1992 Annual Meeting*. IVHS America, May 1992. Volume 1, pp. 190-193.
5. U.S. Department of Transportation and IVHS America. *National Program Plan for Intelligent Vehicle-Highway Systems* Draft May 1994.. Volume 2, pp.4.0-8 - 11.
6. "U.S. DOT Selects 17 New Operational Tests from 63 Submissions." *IVHS America*, Volume IV, Number 5. IVHS America, May/June 1994. pp. 4, 15.
7. U.S. Department of Transportation and IVHS America. *National Program Plan for Intelligent Vehicle-Highway Systems*. Draft May 1994. Volume 2, pp. 4.0-12 - 13.
8. Maze, T.H. and M. Maggio. *Institutional Barriers and Opportunities for IVHS in Commercial Vehicle Operations: An Iowa Case Study*. Midwest Transportation Center, February 1992. pp. 32-34, 83-84.
9. Wienrank, C. and R. Benekohal. *Institutional Issues in Application of IVHS Technologies to CVO in Illinois*. Illinois Department of Transportation and U.S. DOT Federal Highway Administration, June 1994. pp. 92-99.
10. Truck Services, Inc. *Commercial Vehicle Operations Institutional Issues Study*. Nebraska Department of Roads and U.S. DOT Federal Highway Administration, April 1993. pp. 92-96.
11. Beier, F. *Institutional Barriers to the Adoption of Electronic Data Collection and Interchange as It Relates to Commercial Vehicles*. Minnesota Department of Transportation, December 1993.
12. Iowa Transportation Center. *Proposed Field Operational Test: Multi-State One-Stop Electronic Purchase of Motor Carrier Credentials*. January 1994.

13. Maze, T.H. and M. Maggio. *Institutional Barriers and Opportunities for IVHS in Commercial Vehicle Operations: An Iowa Case Study*. Midwest Transportation Center, February 1992. pp. 84-86.
14. Wienrank, C. and R. Benekohal. *Institutional Issues in Application of IVHS Technologies to CVO in Illinois*. Illinois Department of Transportation and U.S. DOT Federal Highway Administration, June 1994. pp. 92, 98.
15. Maze, T.H. and M. Maggio. *Institutional Barriers and Opportunities for IVHS in Commercial Vehicle Operations: An Iowa Case Study*. Midwest Transportation Center, February 1992. pp. 81-83.

CHAPTER 5

IDENTIFICATION OF UNIQUE CHARACTERISTICS OF ITS-CVO DEVELOPMENT AND OPERATION AND THE NEED FOR MULTI-JURISDICTIONAL COOPERATION

Introduction

The development and operation of ITS-CVO differs from the routine development of highway infrastructure in several ways, ranging from its need to transcend jurisdictional boundaries to a lack of standards for ITS-CVO system design, communications, and services. In general, these differences can be categorized into four areas—those arising from the high-technology nature and cost structure of ITS-CVO; those related to a lack of standards for system design, communications, services, and even data; those related to public-private development and funding approaches; and those created by the interstate nature of commercial vehicle operations and, therefore, ITS-CVO.

The interstate nature of CVO is evidenced by the fact that the majority of commercial vehicle traffic in the Midwest is between origins and destinations in differing states (interstate) and through states en route to a destination (bridge traffic) rather than between locations in the same state (intrastate).¹ For the State of Iowa, interstate and bridge traffic account for more than three-fourths of total truck traffic freight tonnage in and through Iowa.¹ Truck traffic is likely to be regional in nature as well. For the State of Iowa, the majority of interstate truck traffic is freight originating in Iowa and destined for one of the study states (Illinois, Minnesota, Missouri, Nebraska, Wisconsin, and South Dakota), or freight destined for Iowa that originated in one of the study states. Similarly, the majority of bridge truck traffic through Iowa is for freight that originated in one of the study states.¹

However, even though the commercial vehicle traffic of the study states is highly regional, the commercial vehicle operators providing these transportation services may provide service to more than one region. Thus not only is compatibility of ITS-CVO functions and systems necessary on a regional basis, but also nationally between regions.

The four areas of differences listed above are highly interrelated, and the interstate nature of ITS-CVO creates an overarching relationship that ties the other three areas even more closely together. For example, there are a number of reasons that standards for ITS-CVO technology and functions are needed. These range from the need to enable wise investment decision-making by creating a larger more stable marketplace to ensuring compatibility among the various functions and technologies. The interstate nature of ITS-CVO further ties these needs together by creating a need for functions and compatibility to be transparent from jurisdiction to jurisdiction and an opportunity for a larger, more stable

marketplace. Such common functionality and compatibility requires common standards, yet standards have not yet been developed. Similarly, the opportunity for a larger, more stable marketplace created by the interstate nature of ITS-CVO cannot be realized without standards. As a result of such interrelationships, these areas are not easily analyzed independent of each other and should be considered together as a web of factors that differentiate the development and operation of ITS-CVO from traditional highway infrastructure development.

Some of these differences, such as the lack of standards, are created by the early stage of development of ITS-CVO and will lessen as ITS-CVO matures or as public and private organizations change to accommodate ITS-CVO. In the meantime, however, such differences are significant and may present barriers to ITS-CVO development. These dissimilarities require approaches to the development and operation of ITS-CVO systems which differ from those used for traditional highway development. These new approaches may not be accommodated under current laws, rules, or practices governing departments of transportation.

In fact, several of these factors suggest a need for multi-jurisdictional cooperation in the development and operation of ITS-CVO functions, a concept not used in traditional highway infrastructure development and operation. This chapter details these differences between ITS-CVO development and operation and traditional highway infrastructure development initiatives, identifies their possible impacts on the development and operation of ITS-CVO user services, and explains how these factors generate a need for multi-jurisdictional cooperation for ITS-CVO.

Unique Characteristics of ITS-CVO Development and Operation

The differences between ITS-CVO development and operation and traditional highway infrastructure development and maintenance can be organized into the aforementioned four categories:

1. High-Technology Nature and Cost Structure of ITS-CVO
2. Lack of Standards for System Design, Communications, Operation, and Maintenance
3. Public-Private Development and Funding Approaches
4. Interstate Nature of Commercial Vehicle Operations and ITS-CVO

The differentiating characteristics of ITS-CVO that fall under these categories may create a need for approaches to development and operation which are not easily accommodated by the current laws, rules, practices, and philosophies

governing highway infrastructure development. The following are definitions of each category of differentiating characteristics and discussions of the various characteristics in each of the four categories.

High-Technology Nature and Cost Structure of ITS-CVO

The attributes of ITS-CVO falling in this category center on the high-technology nature of ITS-CVO and the differences in cost structure between a high-technology industry and a low-technology industry (ITS-CVO as compared to road construction). Attributes of ITS-CVO included in this category raise issues such as: Do states have the technical knowledge and staff to develop, operate, and maintain ITS-CVO systems and services?; and Are current procurement, operation, and maintenance practices suited to the high-cost and fast upward migration of high technology systems like ITS-CVO? The following is a discussion of the differentiating characteristics of ITS-CVO related to the high technology nature and cost structure of ITS-CVO and the issues created by these differences.

High-Technology Nature. A significant difference between development and operation of ITS-CVO and highway infrastructure is the involvement of high-technology systems. Highway infrastructure development and operation involves common technology that does not change quickly. Conversely, ITS-CVO involves a multitude of new and evolving technologies or new applications of high-technology to regulatory and highway and traffic management functions. Several issues related to the high-technology nature of ITS-CVO will impact its development and operation:

- **Privately developed/proprietary technologies create sensitivity to intellectual property/patent/license issues.**² Many of the technologies necessary to support ITS-CVO have been or will be developed by private industry. Consequently, effectively addressing issues associated with intellectual property, patent, and license rights will be necessary to enable the success of ITS industries and to deploy ITS-CVO user services. Two major issues are generated by intellectual property, patent, and license rights: 1) who owns the rights or license to the development when public funds are involved and development costs are shared, and 2) will public information requirements of competitive procurement result in disclosure of intellectual property or confidential cost information to competitors.

The first issue, ownership of rights or license to a development, centers on the questions of what rights or license should a public agency retain when public funds are used to finance all or part of the development and how might these rights affect private industry. In the past, if a public agency paid for the development of technology the public agency could either retain patent or license rights or choose to let private industry retain these rights. In practice, the

public agency generally retained the license or rights to the development. This was fairly straightforward—the public agency would retain the rights or license and the private company would recoup its costs for development entirely from the public agency.

The concepts of partnershiping and shared risk being suggested by publicly funded agencies, such as the FHWA, add to the complexity of this issue.³ Previously when public entities needed to develop new technologies and applications, these public entities paid the development costs of the technologies and applications and then owned the development. Under the concept of public-private partnershiping, private industry may now bear a larger burden of the development costs. As a result, if the public agency receives license or patent rights to distribute the technology to other public agencies, the market for the private partner may be substantially reduced or perhaps even eliminated, thereby placing the private partner's investment at risk. This type of risk might discourage private industry involvement in such partnershiping arrangements. Such issues may necessitate agreements that give the public agency the consideration it has earned through investment in developing and testing the technology yet allow private industry to retain rights that permit marketing and profitmaking from the technology. This provides private industry opportunity for profitmaking and incentive for involvement and investment in the partnership and while recognizing the value of the rights the public agency accrued through its investment. Because of the potential for profit from developments in which public and private partners have shared development costs, states and public agencies may need to develop policies and procedures that enable public agencies to routinely accept payment or in-kind services as part of contracts for ITS deployment and operation, not just in special cases such as research projects and operational tests. However, the opportunities for abuse of powers and perceived abuses possible under such arrangements make gaining acceptance of such policies and procedures and their use very difficult.

The second issue revolves around disclosure of intellectual property related to a development, a method, or a business practice of a bidder/proposer and the potential loss of competitive advantage. The public procurement process often requires full public disclosure of the selected bid or proposal or at least disclosure of cost information. In addition, because of shared investments through public-private partnershiping, the procurement process may require disclosure of cost or audit information related to a proprietary development. This type of disclosure is meant to ensure both the public and private partners that the development costs are real and accountable.

Such requirements create risks that confidential information about a development or a competitive advantage such as cost may be disclosed to competitors. This has not been a problem with highway infrastructure development because of the common technology, materials, and methods—paving machines, concrete, and manual labor do not create intellectual property. ITS-CVO, however, involves new and complex technologies, materials, and methods that may be unique from one company to the next, thus creating such disclosure issues. Public agencies may need to develop new policies or procedures for disclosure and accountability requirements that protect both public and private interests.

- **High development and deployment costs of ITS-CVO technology necessitate risk-sharing between government and private sector.**^{2,3} Much of the technology needed for ITS-CVO functions has been developed for other applications in defense or aerospace. While ITS-CVO will no doubt require some new technology development, what is most needed is the system development and integration of existing technologies to the roadside, the vehicle, and the office.

For example, ITS-CVO may enable an electronic form of a commercial driver license (CDL) that could provide enforcement agencies with quick access to information about the driver, his or her driving record, or other pertinent information. Regardless of the technology used to implement such an electronic CDL (magnetic stripe card, smartcard, holographic encoding, or others), a significant amount of investment must be made to integrate the function into current or new business practices and systems. A number of issues and costs can be identified: some means for enforcement officers or emergency personnel to read the electronic CDL at the roadside, some means for encoding the information on the electronic CDL or in a database, and some means of communicating the information from the database to the roadside or from the roadside to another agency or location. Such integration and infrastructure costs will be significant because commercial vehicle regulation and operation has long utilized paper records and other low-technology approaches, making the move to high-technology and new ways of doing business a major change requiring substantial investment.

Because of the high-development and deployment costs of ITS-CVO and the somewhat unknown nature of the ITS-CVO services market, it is unlikely that either private industry or government alone can bear the entire cost of developing, integrating, and deploying ITS functions and technologies. As a result, public agencies and private industry will need to develop relationships that share risks in the development, integration, and deployment of ITS-CVO functions and technologies. For example, a state agency may ask for an ITS-CVO

function that requires development of new technology or integration of existing technology into a new application.

A public agency could pay the entire cost of this development or integration and then own the various rights to the product or application. However, this may be unnecessary, as other agencies may also be able to use the development or integrated product. Or, the cost of the development or integration may be very high, thus making it infeasible for a single agency to commit the necessary funds. In these cases, an agency or agencies would agree to provide a portion of the development or integration costs as part of the contract. The remaining costs could be shared among other agencies interested in the development or integration or could be assumed by the vendor in exchange for rights to market the developed technology or application.

Such approaches could reduce the cost to the initiating agency (or agencies) and public agencies that subsequently purchase the development by creating opportunity for private industry to profit in other ways. Private industry could market the development to other public or private organizations or apply it for other uses and thus distribute its costs. However, these types of agreements may not be accommodated under current procurement laws and rules or practices.

- **Public agencies may lack the technical knowledge and staffing necessary to effectively design, evaluate, operate, and manage the ITS-CVO systems they need.** Because DOTs and other agencies have long specialized in particular areas, such as building roads or collecting taxes, it is unlikely and perhaps even unnecessary that these public agencies will have sufficient staffing or technical knowledge to effectively procure and operate ITS-CVO systems. Because much of ITS-CVO will use technology and processes that are new to most departments of transportation and other public agencies, designing, procuring, and developing ITS-CVO systems may be beyond the current technical expertise of current staff. Or, perhaps an agency simply does not have or cannot acquire the manpower to carry out any additional duties required by ITS-CVO. Either of these shortages could make development and operation of ITS-CVO functions difficult.

An example might be the maintenance of ITS-CVO systems. Maintenance of ITS-CVO systems will require different knowledge and tools and most likely additional staff than that used for other highway infrastructure maintenance. Without such knowledge and staff, departments of transportation and other public agencies will not be able to maintain ITS-CVO systems.

In addition, such needs for specialized knowledge and staff beg the question of whether departments of transportation and other public agencies should train and staff to meet these needs or whether specialized initiatives like ITS-CVO step beyond the scope of these public agencies. Some public agencies may not want to become expert in or add expert staff to handle the development and operation of ITS-CVO. Other public agencies may not be able to or even want to add the staff necessary for development and operation of ITS-CVO functions due to budget constraints or staffing restrictions.

As a result of the possible shortages of necessary technical expertise or manpower, departments of transportation and other public agencies may need or decide to procure a range of technical and professional services to help them design, evaluate, and perhaps even operate and maintain these systems and services.

- **ITS-CVO systems may best be procured using functional (or performance) specifications rather than technical specifications.**^{2,5} Functional specifications differ from technical specifications in that technical specifications define exactly what requirements a product or service must meet (i.e., a personal computer with a 80486 processor, 16 megabytes of RAM in four megabyte SIMMs, and a one gigabyte SCSI-2 hard drive) while functional specifications define the needs that must be met by the product or service (i.e., a personal computer that will support intensive use in computer aided design (CAD) and includes at least one gigabyte of hard disk space). The range of products or services that might fulfill functional specifications is limited only by the defined needs and not by specific technical details of how these needs must be met (such as a SCSI-2 hard drive).

Currently, departments of transportation and other agencies routinely technically specify roads, bridges, signing, and other procured items. However, the need for highly technical knowledge in a new area such as ITS-CVO makes identification of detailed technical specifications for systems and services to fulfill ITS-CVO functions quite difficult. The possible shortage of manpower to handle these additional efforts will also impede the development of technical specifications for systems and services for ITS-CVO. In these cases, departments of transportation and other public agencies may be best served by specifying what purposes or services must be fulfilled and any compatibilities needed from the system or service. Consultants and vendors could then design workable systems from which the agencies could choose.

The need for compatibility further complicates the development of specifications. Additional technical knowledge would be needed to

design and specify systems that will be compatible with the functions and systems of other agencies and jurisdictions. However, if agencies and jurisdictions cooperate in the development of specifications, compatibility issues could be more easily managed.

Possible barriers to functional specifications for ITS-CVO are that many public agencies may not have experience with functionally specifying high-technology systems and services, or the laws, rules, and practices governing their procurements strongly encourage the use of technical specifications.

- **Deployment, operation, and maintenance costs related to high-technology systems like ITS-CVO call for procurement evaluation that includes life-cycle costing.** In highway infrastructure development, life-cycle cost estimates are sometimes compiled by highway engineers during their evaluation of design options. For example, when selecting paving materials and layer thickness for a new pavement, the design engineer should make comparisons of life-cycle costs over the pavement's design life for each material and proposed thickness. Once a design is selected, the appropriate design and procurement documents are generated to select a contractor to build the identified pavement design. In this and similar cases, life-cycle cost applications may be built into the design process and need not be provided by bidders during the procurement process. For such highway infrastructure development, the competitive bid process focusing on low and conforming bid is an efficient tool because all bids meet the life-cycle costs inherent in the design requirements.

For ITS-CVO, however, life-cycle costs will not typically be accounted for in the design process. In addition, the range of possible technologies and services available to fulfill ITS-CVO needs will also have widely varying deployment, maintenance, and operation costs. Therefore, life-cycle cost estimates should be included as part of the evaluation process. Life-cycle cost estimates are better evaluation criteria than low initial cost for complex systems and services that require specialized technical expertise and equipment for implementation, maintenance, and operation. In addition, when more than one option is possible (such as when the services or goods sought do not lend themselves to technical specifications or competition would be limited by such technical specifications), life-cycle cost estimates can provide a common criteria for evaluating bids and proposals.

Although life-cycle costs can be difficult to estimate to an acceptable degree of accuracy, the ability to compare life-cycle costs estimates

in addition to other evaluation criteria allows public agencies to make the best investment decisions possible with the information available. If life-cycle costs are not requested and considered in the evaluation of bids and proposals, public agencies may not be equipped with the information they need for wise investment decision making.

- **Possibility of numerous services and technologies for fulfilling ITS-CVO needs calls for procurement through methods that accommodate qualitative evaluation criteria.** Unlike highway infrastructure, ITS systems or services may be difficult for departments of transportation to specify and there may be a variety of approaches that could meet the identified ITS need. In these cases, requests for proposals (competitive negotiation) are more desirable than the traditional competitive bid process because it allows for evaluation of these differences and for consideration of other factors such as quality.⁵

Because ITS-CVO systems or services requirements could be met through a number of possible technology and service combinations, there is a possibility of considerable differences between competing bids or proposals and their corresponding costs. Even greater differences are possible when functional specifications are used. As a result of these possible differences in both designs and costs, a combination qualitative measures and quantitative measures (such as life-cycle costing) will be needed to evaluate proposals equitably and effectively and to protect the interests of public agencies.

Cost Structure. One of the primary characteristics differentiating ITS-CVO development and operation from traditional highway infrastructure investments is the high fixed costs. Costs can be categorized into two types: variable costs, which include the costs of labor and materials to produce additional units of output, and fixed costs, which include such costs as development, equipment, and facilities and are required regardless of the level of activity. Development and maintenance of roads, bridges, and signs does not require large investments in technology development, equipment, or facilities and, therefore, has low fixed costs. Such construction and maintenance of highway infrastructure does require substantial labor and materials, creating high variable costs. ITS, on the other hand, has substantial fixed costs for the development, manufacture, and integration of ITS systems and technologies and lower variable costs. Based on these cost structures, the ITS industry must recover its fixed costs before becoming profitable, while traditional highway construction primarily must recover its high variable costs.

These cost structures are significant for the following reasons:

1. Variable costs are more easily accounted for and recovered in any contracting process while fixed costs require complex estimations

and oftentimes negotiations on how much fixed costs can and should be retired as part of any one project.

2. High fixed costs require companies to make substantial investments to enter the market, increase the risk of business failure, and limit the competition in the market place.

The differences in cost structures between the development and operation of ITS-CVO and traditional highway infrastructure development creates a number of issues. These issues range from limited participation in the ITS industry due to high fixed cost investment requirements to the need to create long-term relationships with ITS industry participants to facilitate recovery of fixed costs and growth of a robust ITS marketplace. The following discussion addresses issues related to the differences between the cost structures of ITS-CVO and traditional highway infrastructure development and operation.

- **Limited number of participants in ITS industry due to cost/ complexity of entry makes retention of ITS industry participants is a major issue.** Unlike the highway construction industry where common technology and equipment has encouraged a large number of contractors through easy market entry and exit, ITS often requires high-technology and has relatively few vendors due to extensive challenges to market entry and exit (namely costs associated with the technology and a limited market). Public policies and practices may need to be adjusted to accommodate these attributes to encourage a healthy ITS-CVO industry and competitive marketplace. Open system architectures and long-term relationships with vendors are two practices which can encourage such industry stability while also creating life-cycle efficiencies for public agencies.
- **High fixed costs for development and deployment of ITS-CVO functions suggest a need for long-term relationships with technology and service vendors.** Fundamental to the ITS initiative is the concept that government funds will be used to provide a catalyst for ITS development by the private sector. Because many of the functions of ITS create marketable benefits and/or information, the private sector is expected to bear a large share of the costs of ITS as it pursues the potential profits of the ITS marketplace (such differences in funding approaches are discussed in more detail later in this chapter).^{3,6}

The high fixed costs associated with ITS and, therefore, ITS-CVO development and deployment can be recovered by the private sector in two ways: 1) through high up-front costs to deploying agencies and jurisdictions, and 2) over a period of time through long-term contracts for operation and maintenance services. Which method is used is a concern for public agencies and states more than to the

private sector. The private sector only needs to be able to receive an acceptable rate of return on their investment. How this rate of return is generated is not an issue. Public agencies and states, however, will be affected by how this return is generated. Large up-front costs to generate returns to private industry will mean large funding commitments over a short period of time while generating returns on investment through contracting for services such as operation and maintenance will distribute these costs over time. Some agencies or states may not be able or may not want to make a large funding commitment over a short period, thereby suggesting long-term relationships.

One issue that may affect long-term relationships between public agencies and technology and service providers is whether or not the public agency can contract for longer periods of time (five years, for example). Similarly, differences in the allowable duration of contracts could impede multi-state cooperative efforts by preventing cooperating states from contracting as a group or contracting under the same terms as the other states.

Lack of Standards for System Design, Functions, Operation, and Maintenance Standards for any system, function, or process are intended to ensure the usefulness, effectiveness, dependability, and compatibility of such systems, functions, or processes in the same or similar applications by differing organizations. In other words, standards are guides that when followed ensure the acceptable fulfillment of the goals for a system, function, or process.

Standards also help direct investment decision-making by providing a level of assurance to both buyers and developers—standards encourage buyers to invest by assuring compatibility with other systems following the same standard and encourage developers to invest by assuring a marketplace for their products and services. Standards also effectively generate a larger market for systems, functions, and processes by creating a level of commonality between products meeting the standard and among buyers subscribing to the standard.

Because ITS is an emerging initiative, the actual functions that will make up ITS-CVO and the means for implementing such functions are not yet fully defined. The FHWA and ITS America have worked to define the National Program Plan for IVHS which includes a number of functional areas for ITS applications to commercial vehicle operations,³ but this program plan is by no means all encompassing. There may be ITS-CVO functions that public or private users may want or need that have not yet been defined.

In addition, there are currently no standards for system design, functions, operation, or maintenance for ITS and therefore ITS-CVO. This lack of standards creates barriers that make implementation of ITS-CVO functions difficult for any single state. These barriers include: 1) challenges of developing and deploying ITS-CVO functions without the guidance of such standards, 2) the risk of

implementing non-standard systems and practices that may be incompatible with other systems in the future, and 3) the high costs of such custom systems.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA-91) encourages interoperability¹ among agencies and jurisdictions and promotes the development of standards for ITS functions through independent standards making organizations (e.g., ISO). However, ISTEA-91 does not provide the FHWA with the authority to mandate standards for ITS.

To help set a framework for standards development, the FHWA has funded an effort to develop a national system architecture for ITS and this architecture will address some of the issues associated with standards and compatibility to help ensure compatibility of ITS systems across the country. However, the systems architecture is not intended to define every standard necessary for implementation of ITS functions. It is only intended to create a broad and open framework from which compatible functions and systems which meet the needs of users can be built.³ As a result, some functions and their accompanying standards may need to be defined. In addition, the system architecture will not define the operation and maintenance parameters of ITS functions and systems, thus necessitating development of operation and maintenance standards to ensure transparent integration of these functions from one jurisdiction to the next.

As a result of the limitations on the FHWA and the necessarily broad framework being developed in the architecture study, it will be incumbent upon states to work through consortia or through national standard setting organizations to develop standards that ensure interoperability and promote effective investment decision-making. Organizations which states might work through include the American Association of State Highway and Transportation Officials (AASHTO), the American Association of Motor Vehicle Administrators (AAMVA), the Commercial Vehicle Safety Alliance (CVSA), the International Standards Organization (ISO), the Intelligent Transportation Society of America (ITS America), and the Society of Automotive Engineers (SAE).

States involved in early development and operation of ITS-CVO functions will be faced with developing standards for system design, function, operation, and maintenance. Cooperation among a number of similar states in development of such standards is suggested by the following factors: 1) involvement of a number of states spreads the workload and cost of developing the standards; 2) development of standards that address the needs of a group of states are likely to represent a range of needs and therefore be more broad and more applicable to other states than standards developed by a single state; 3) standards developed and adopted by a larger group call for consideration when other standards are being developed simply due to the combined political power of the group and/or the combined effects of not accommodating the standard; and 4) the wider the application of the standards the larger the market and resulting economies of scale generated by the standards.

Following is a discussion of the general areas for which standards for ITS-CVO will need to be developed and the impacts of the lack of standards in those areas on ITS-CVO development and operation.

Lack of standards for ITS-CVO systems and functions. In addition to the framework to be set by the FHWA ITS systems architecture effort, standards will need to be developed for national and international compatibility, and yet others might apply to functions that are more regional or even local in nature that do not require national compatibility. Thus differing standards may be developed to fit the needs of different regions or jurisdictions. In addition, some states may need and want to undertake ITS-CVO implementation before all the needed standards have been defined. This would necessitate that states interested in such early efforts cooperate in the development of widely applicable standards or run the risk of future incompatibility.

This lack of standards will make development and operation of ITS-CVO functions difficult for a single agency or jurisdiction to pursue due to the high risk of implementing functions and technologies that may not be adopted by other agencies or jurisdictions. Therefore, states linked by the freight types and travel patterns of their commercial vehicle traffic may have similar needs and should cooperate to define ITS-CVO functions and corresponding standards for these functions and the systems used to fulfill them. Such cooperation among agencies and jurisdictions would also ensure compatibility, spread the workload and cost of developing the functions and systems across several agencies or jurisdictions, and generate economies of scale by creating a larger marketplace.

Lack of Standards for Operation and Maintenance of ITS-CVO Systems and Functions. The productivity gains envisioned as possible through ITS-CVO functions could be greatly compromised if the parameters of their operation and maintenance are not similar enough to make them truly useful to motor carrier or public agency users. For example, suppose several contiguous states are cooperating in oversize and overweight permitting. These states decide to check dimensions and weights of vehicles against issued permits by using weigh-in-motion and other technologies. The level of maintenance each state subscribed to could affect the accuracy of each state's system and the integrity of the function by allowing wide differences in accuracy between states. Imagine an oversize and overweight vehicle being cleared by weigh-in-motion and electronic measuring devices in one state only to be cited for being overweight at a weigh station in another due to differences in maintenance schedules and procedures (e.g. system calibration and measurement tolerances) that allowed the accuracy of one state's system to differ from that of the other.

Such differences in operation and maintenance would severely limit the effectiveness and subscription to use of such ITS-CVO functions by motor carriers and agencies by negating much of their value. However, jurisdictions could avoid

these issues by cooperating in developing standards or guidelines defining the operation and maintenance parameters needed to provide consistent, effective, and seamless ITS-CVO functions for public agencies and motor carriers alike.

Public-Private Development and Funding Approaches

Unlike traditional highway infrastructure development which relies on state and federal tax dollars for its development and operation, the development and operation of ITS-CVO is expected to combine both public and private investment. Since its inception, ITS has been seen as an initiative in which private industry is expected to be a major investor in both development and deployment of ITS functions.^{3,6} This private sector role as active investor in bringing about ITS development and deployment is quite different from the private sector's role in traditional highway development as a supplier of products and services. This section discusses these differences between ITS funding and traditional highway infrastructure funding and some important issues created by these differences.

ITS-CVO Will Depend Heavily on Private Sector Development and Marketing.³ Unlike other national investments such as the space program, national defense, and the interstate highway system, the federal government will not be providing the majority of funding needed to implement all promising ITS-CVO initiatives. In addition, states may not be able to allocate the funding levels required for successful development and deployment of ITS-CVO functions and maintain funding required for necessary highway development, operation, and maintenance activities. This competition for funds at federal and state levels creates a paucity of available funding for ITS-CVO. Because many ITS-CVO functions hold substantial benefits and market opportunities for the private sector, federal and state governments hope to share the burden for developing and implementing ITS-CVO functions with the private sector.

In addition, purely public development of ITS-CVO might have the effect of essentially freezing ITS-CVO technology and functions to those levels specified during initial development and implementation. Public initiatives have no outside pressure from competition to drive them to respond to market needs. Without such competitive pressures, public initiatives can be slow to respond to changes in needs. However, such slowness to respond can inhibit the effectiveness of public initiatives by allowing them to become outdated long before change is finally accepted.

Public-private development of ITS-CVO will help avoid this potential problem by bringing private funding and the private sector attributes of competition and customer responsiveness to the initiative. With the success of the public-private initiative more dependent on market acceptance than a purely public initiative, the pressures of competition for market acceptance will help ensure ITS-CVO systems and functions continue to move forward as needs change and technologies evolve.

On the other hand, a few functions, such as those related to safety, are less likely to be developed by the private sector yet are very important to the goals set for the transportation system. For safety and other similar functions, the federal government will likely be a major funding source.

Scope and cost of ITS-CVO requires states/jurisdictions to exploit the economies of scale offered by multi-state/region/jurisdiction efforts. The scope of development and investment necessary to make ITS a reality nationwide has been estimated by the FHWA at over \$215 billion.⁶ This is in addition to the approximately \$80 billion in annual costs for necessary highway infrastructure development, operation, and maintenance. Such large-scale investment requirements combine with increasing fiscal pressures at local, state, and federal levels to create a need for efficient development and operation of ITS.

Substantial increases in efficiencies and economies of scale can be generated by multi-jurisdiction, multi-state, and/or multi-region cooperative efforts. Cooperative efforts can create efficiencies in ITS in several ways: 1) improve development by providing a larger pool of ideas from which to draw; 2) reduce redundant costs by eliminating or decreasing individual agency or jurisdiction costs associated with development, procurement, and operation and maintenance; and 3) generate economies to scale by creating a larger marketplace. ITS-CVO development and deployment by large consortiums may also provide several other benefits, including encouraging long-term stability in the ITS industry and reducing the number of systems that must be meshed to achieve national compatibility.

Interstate Nature of Commercial Vehicle Operations and ITS-CVO

The interstate nature of commercial vehicle operations and, therefore, ITS-CVO creates the most significant difference between the development and operation of ITS-CVO functions and the development and operation of traditional highway infrastructure. The development and operation of highways, bridges, and other highway infrastructure is governed by common standards. Similar standards do not currently exist for ITS. In addition, development and operation of traditional highway infrastructure requires very little interaction between states. Conversely, the interaction between states needed for the development and operation of ITS-CVO will require aggressive cooperation between states due to the need for interoperability and coordination of functions, operation, and maintenance with a number of states or, in some instances such as safety, the entire nation.

Commercial vehicles cross jurisdictions frequently and many will log substantial mileage in all 48 contiguous states. In fact, for the State of Iowa, intrastate truck traffic accounts for only 20 percent of the truck traffic freight tonnage while interstate and bridge traffic account for approximately 80 percent of total truck traffic freight tonnage in and through Iowa.¹ Clearly, the majority of truck traffic in the Midwest travels through two or more states.

In addition, truck traffic is likely to be regional. For the State of Iowa, roughly 60 percent of interstate truck traffic originating in Iowa is destined for one of the states involved in this study (Illinois, Minnesota, Missouri, Nebraska, Wisconsin, and South Dakota).¹ Similarly, approximately 56 percent of interstate truck traffic destined for Iowa originates in one of the study states. Bridge traffic through Iowa is also highly regional, with nearly 57 percent of bridge traffic through Iowa originating in one of the study states.¹

However, even though the commercial vehicle traffic of the study states is highly regional, the commercial vehicle operators providing these transportation services may provide service to more than one region. Thus not only is compatibility of ITS-CVO functions and equipment necessary on a regional basis, but also nationally between regions.

As a result, ITS-CVO functions and equipment will need to be interoperable and operation and maintenance parameters of states will need to be coordinated to ensure the seamlessness and efficiency of ITS-CVO. The high level of coordination needed for ITS-CVO, however, may be difficult to realize. Such coordination has not yet been achieved in existing commercial vehicle regulation and regulatory administration, and this lack of coordination creates a great deal of confusion and inefficiency for the motor carrier industry.

Currently, commercial vehicle regulation and regulatory administration varies greatly from state to state. Different states may have different size and weight restrictions for non-standard vehicle configurations and oversize and overweight loads, different public agencies involved in CVO regulatory administration, and different processes motor carriers must use to comply with these regulations.^{7,8,9,10,11} These differences are well-known and create considerable difficulty and compliance costs for commercial vehicle operators.^{12,13}

The need for coordination and uniformity becomes more complex and more urgent with the addition of ITS-CVO functions. ITS-CVO brings additional issues for which uniformity must be addressed and adds investments for which returns in efficiency are expected to be realized. For ITS-CVO to be useful and increase efficiency of both public agencies and motor carriers, high levels of coordination and uniformity in the delivery of ITS-CVO functions will be necessary. If an ITS-CVO function differs from state to state, the function will have no impact on easing the burdens brought about by commercial vehicle regulatory, administrative, and enforcement practices that vary from state to state and thus will be of little use to motor carriers. Agencies and states will need to coordinate the development of ITS-CVO functions and standards for these functions as well as system operation and maintenance.

For example, states will need to agree on the currency and availability of data regarding commercial vehicles, drivers, the motor carrier companies, enforcement actions, and more. Imagine a function for electronically clearing compliant commercial vehicles past weigh stations on a major interstate corridor. Electronic

clearance is intended to increase highway efficiency by allowing properly credentialed and weight-compliant commercial vehicles to bypass stops for weight and credential checks at weigh facilities. Increased productivity may be possible for both motor carriers and enforcement agencies as compliant vehicles save time and money by being allowed to pass and enforcement efforts can be focused on non-compliant vehicles. Such an electronic clearance function requires that current data regarding the vehicles credentials be either stored and read from the vehicle or stored and read from a shared database.

Suppose the states along this corridor did not have an agreement on the currency and access of commercial vehicle credential information. Some states might decide to update data in a batch process once daily, some might update the data in real-time as credentials are issued, and others may only update the data once every three months (quarterly). As a result, the currency of data on commercial vehicle credentials would vary depending on the state which processed the credentials. Such differences in the currency of data for commercial vehicles would greatly reduce the benefits of electronic clearance. If the currency of information available on the electronic clearance system lags behind actual vehicle credentialing, newly credentialed vehicles could be required to stop for credential compliance checks at weigh facilities even though they are in compliance, thus eliminating the benefits of electronic clearance for these commercial vehicles and affected enforcement agencies.

Obviously, the interstate nature of ITS-CVO will require states to cooperate and coordinate in the development of standards and protocols for the design, operation, and maintenance ITS-CVO functions. Without such cooperation, the goals of increased efficiency and highway safety cannot be met as ITS-CVO will not be able to transcend the current limitations of commercial vehicle regulation and regulatory administration.

Conclusion

ITS-CVO is different from traditional highway infrastructure development and operation in its technical nature and cost structure, its lack of standards for systems and functions as well as operation and maintenance, its funding philosophy, and its need to function transparently across jurisdictional boundaries. Most importantly, these factors create a strong need for cooperation among states in development and operation of ITS-CVO functions.

For instance, the technical nature and differing cost structure of ITS-CVO suggest states cooperate to reduce their individual needs for technical expertise and create a larger, more stable market for the ITS industry. The lack of standards for ITS-CVO systems and functions calls for states to cooperate to develop standards that enable wise investment decision-making, ensure compatibility among states and regions, and create economies of scale through a larger market. In addition, cooperation in the development of standards for the operation and

maintenance of ITS-CVO systems and functions is needed to ensure the efficiency and usefulness of ITS-CVO applications to users. The public-private funding approaches expected for ITS-CVO development and operation establish a need for interstate cooperation among states to generate the economies of scale necessary for efficient investment by both the public and private sectors. Lastly, the interstate nature of ITS-CVO creates a need for transparency of systems and functions that cannot be achieved without cooperation among states in the development and operation of ITS-CVO.

Such cooperation among jurisdictions is not common in the development and operation of highway infrastructure. As a result, states and their agencies may be governed by laws, rules, or practices that could present obstacles to their participation in such cooperation. States or agencies may not have the statutory authority to cooperate with other states in procurement or operation and maintenance of ITS-CVO systems and functions.

Other issues generated by the differences between ITS-CVO and traditional highway infrastructure development may also create obstacles to cooperation among states for the development and operation of ITS-CVO. For example, laws, rules, and practices governing procurement by the lead agencies for ITS-CVO may differ greatly from state to state. For example, differences between states in the selection of vendors for ITS-CVO services could make it difficult for states to procure the same ITS-CVO functions, services, and systems as their cooperating partner states, thus negating the benefits of cooperation. Such differences could make the development, deployment, and operation of standard ITS-CVO systems and functions difficult or impossible under current laws, rules, and practices.

Some of the issues generated by the differences between ITS-CVO and traditional highway infrastructure development may be familiar to state agencies, such as intellectual property and disclosure issues associated with privately developed and/or proprietary technology. Others, such as the proposed public/private funding and implementation of ITS-CVO and cooperation among jurisdictions, are relatively new. What is unique about ITS-CVO is its interstate nature, which brings together a number of old and new issues to create challenges that could impede its timely and efficient development, implementation, and operation.

Chapter 6 will detail the potential barriers to interstate cooperation for ITS-CVO. These barriers are generated when the new approaches required by the differences between the development and operation of ITS-CVO and traditional highway infrastructure development collide with current laws, rules, practices of state departments of transportation.

1. Maze, T., Walter, K., and Smadi. *A. Policy Issues of an Iowa Longer Combination Vehicle Network*. Midwest Transportation Center, November 1994. pp. 86-101.
2. IVHS America. *Procurement Issues in IVHS Development and Deployment*. Prepared by the Procurement Task Force of the Legal Issues Committee .
3. U.S. Department of Transportation and IVHS America. *National Program Plan for Intelligent Vehicle-Highway Systems*. Draft May 1994. Volume 1, pp. I-1 - I-17.
4. Nordwall, B. "Military Air Chiefs Lead Way to Efficient Procurement." *Aviation Week and Space Technology*, March 8, 1993. pp. 44-46.
5. Maze, T.H. and K. Waggoner. *Manual on Contracting for Vehicle Maintenance Services*. Iowa Transportation Center, October 1992. p. 39.
6. IVHS America. *Strategic Plan for Intelligent Vehicle-Highway Systems in the United States*. Report No. IVHS-AMER-92-3. May 20, 1992.
7. Maze, T.H. and M. Maggio. *Institutional Barriers and Opportunities for IVHS in Commercial Vehicle Operations: An Iowa Case Study*. Midwest Transportation Center, February 1992.
8. Wienrank, C. and R. Benekohal. *Institutional Issues in Application of IVHS Technologies to CVO in Illinois*. Illinois Department of Transportation and U.S. DOT Federal Highway Administration, June 1994.
9. Beier, F. *Institutional Barriers to the Adoption of Electronic Data Collection and Interchange as It Relates to Commercial Vehicles*. Minnesota Department of Transportation, December 1993.
10. Truck Services, Inc. *Commercial Vehicle Operations Institutional Issues Study*. Nebraska Department of Roads and U.S. DOT Federal Highway Administration, April 1993.
11. Cambridge Systematics, Inc. and JHK Associates Sydec. *Multi-State IVHS/CVO Institutional Issues Study*. Cambridge, MA, October 31, 1993.
12. Maze, T.H. and M. Maggio. *Institutional Barriers and Opportunities for IVHS in Commercial Vehicle Operations: An Iowa Case Study*. Midwest Transportation Center, February 1992. pp. 19-32.
13. Truck Services, Inc. *Commercial Vehicle Operations Institutional Issues Study*. Nebraska Department of Roads and U.S. DOT Federal Highway Administration, April 1993. pp. 57-85.

CHAPTER 6

IDENTIFICATION OF OPPORTUNITIES AND BARRIERS FOR MULTI-STATE COOPERATION IN THE DEVELOPMENT, DEPLOYMENT, AND OPERATION OF ITS-CVO FUNCTIONS

Introduction

As discussed in Chapter 5, the development, deployment, and operation of ITS-CVO systems and functions differs greatly from traditional highway infrastructure development and operation. The most significant of these differences is the need for cooperation among states for ITS-CVO. This need for cooperation as well as other needs suggested by these differences necessitate new approaches to system and service design, procurement, operation, and maintenance. However, these new approaches to system and service development, deployment, and operation and multi-state cooperation for ITS-CVO may not be easy for states to bring about due to barriers presented by current laws, rules, and practices or philosophies of infrastructure development and operation.

Consider the example of a number of states that want to join together to develop, deploy, and operate ITS-CVO systems and functions. These states want to obtain the absolute compatibility and the economies of scale in development and operation costs available in a large, common system. However, because of the differences in procurement laws and rules among these states, they are unable to join in a single large procurement. Unfortunately, procuring each state's portion of the system through its own procurement system may not work either. Differences in the required procurement processes in each state may make it difficult for all states to select the same ITS-CVO technology and service providers, thus making the goal of a common system and its benefits difficult to achieve.

How states resolve such conflicts could normally be left to each individual state, but for each state to independently develop solutions to possible issues may create additional barriers to cooperation among states. To fulfill the need for multi-state cooperation in the development and operation of ITS-CVO, states will need to address such issues in ways that enable or allow cooperation with other states. In fact, the first application of multi-state cooperation for ITS-CVO should be for states to work together to identify such barriers and their resolutions.

This study is an early step toward identifying and resolving the barriers between Iowa and its neighboring states. This chapter summarizes the methods used to identify issues among the study states and details the barriers and opportunities to multi-state cooperation in ITS-CVO development and operation that were identified.

Methodology

To identify the barriers and opportunities for multi-state cooperation in ITS-CVO development, implementation, and operation, two approaches were used. First, the legal codes and administrative rules governing procurement by the identified lead agency for ITS-CVO initiatives in each state were reviewed for requirements or practices that might impede multi-state cooperation or other approaches to development and operation suggested by ITS-CVO. Differences among states were also noted for their potential to create barriers to cooperation. Second, staff from the lead agency for ITS-CVO in each state were interviewed to identify possible barriers or opportunities in the management philosophy of the lead agency and to obtain further information regarding procurement by each lead agency. (For information on how lead agencies were identified, see Chapter 3.)

Review of Legal Codes and Rules Governing Procurement by the Lead Agency for ITS-CVO

The applicable state codes and rules governing procurements by the lead agency for ITS-CVO in each state were obtained through these lead agencies or contacts provided by these agencies. The lead state agency identified for ITS-CVO, the codes and rules governing procurements by these agencies, and the sources providing these codes and rules are shown in Table 6.1.

Table 6.1. Lead Agencies, Relevant Codes and Rules, and Sources for Codes and Rules

Lead Agency for ITS-CVO	Relevant Codes and Rules	Source for Codes and Rules
Illinois Department of Transportation	<i>Standard Procurement Rules and Procurement Services Division Manual</i>	Business Services, Illinois Department of Transportation
Iowa Department of Transportation	<i>Iowa Code and Iowa Administrative Code</i>	Bureau of Support Services, Purchasing, Iowa Department of Transportation
Minnesota Department of Transportation	<i>Public Procurement in Minnesota</i>	Minnesota Guidestar, Minnesota Department of Transportation
Missouri Highway and Transportation Department	<i>Rules of Highway and Transportation Commission and State Purchasing and Printing</i>	Missouri Highway and Transportation Department and Division of Purchasing and Materials Management, Office of Administration
Nebraska Department of Roads	<i>Rules and Regulations of the Nebraska Department of Administration</i>	Materiel Division, Nebraska State Purchasing

Table 6.1 continued

Lead Agency for ITS-CVO	Relevant Codes and Rules	Source for Codes and Rules
South Dakota Department of Transportation	<i>Local Purchase Policy and South Dakota Codified Laws</i>	Division of Finance, Department of Transportation
Wisconsin Department of Transportation	State Procurement Manual	State Bureau of Procurement, Department of Administration

These codes and rules were reviewed and analyzed for requirements or allowances in the lead agency procurement process that would present barriers or opportunities for multi-state cooperation in ITS-CVO development, implementation, and management.¹⁴

The codes and rules were reviewed with particular attention to the following issues:

- Ability of states/agencies to contract for other states or agencies or to buy under other states'/agencies' contracts. The most efficient means for purchasing ITS-CVO systems and services may be for states to procure under one contract, thus allowing the benefits of economy of scale and eliminating redundant costs of each state conducting its own procurement process and vendors responding to all of them. Cooperative procurement would also eliminate barriers created by differences in systems due to independent procurements by states.
- Preferences for in-state/local vendors. Requirements that individual states observe preferences for in-state/local vendors could make it impossible for states to cooperate in the procurement of ITS-CVO systems and services. States will not cooperate in a process that gives preferences for other states' vendors, yet states with such preferences may not be able to waive them.
- Allowable length of contracts. Long-term operations and service contracts are needed to allow states to reduce initial costs while providing a means for ITS vendors to recover their high fixed costs. In addition, the accelerated rate of change and unique maintenance requirements inherent in high-technology systems like ITS-CVO suggests long-term agreements with system and service vendors to help insulate states and public agencies from the high costs associated with these characteristics of ITS. As a result, public agencies

need to be able to enter into long-term service agreements. Limits on the length of contracts states or agencies may enter into could be barriers to these long-term operations and service agreements and to allowing cooperation among states in such ITS contracts.

- Information disclosure policies or practices. Information disclosure requirements may be unfriendly to high technology industries by allowing public access to information on the winning offer, which might contain proprietary or cost information related to a competitive advantage.¹ In addition, auditing or financial disclosure requirements for companies under public contracts also creates the risk of exposing a company's cost structure and any cost advantages to competitors.

Such bid and financial information disclosure requirements could discourage private sector participation in ITS and create issues in cooperating and contracting with the private sector for ITS-CVO due to the possibility of exposing any competitive cost advantages a company or companies may have. Even when disclosure of cost structure or competitive cost information is not an issue, differences in auditing or financial disclosure requirements among states could pose barriers to cooperation in ITS-CVO as a result of the difficulty of meeting each state's requirements.

- Criteria or requirements for qualification to bid/propose. States often have qualifications for companies to bid or propose for public contracts and may maintain lists of qualified bidders who receive direct invitations for bids or proposals. Many companies with possible ITS technologies or services have little or no experience contracting with state government. As a result, such qualification requirements could artificially limit the responses to a bid announcement for ITS. Differences among states in these requirements would also pose barriers to cooperation among states in procurement for ITS-CVO development and operation.
- Emphasis on a low initial price competitive process. Because of the accelerated obsolescence and highly technical maintenance requirements of high-technology systems like ITS, states will be best served by a procurement process that emphasizes bid evaluations utilizing life-cycle costing and easily accommodate other relevant criteria. The low initial price competitive process does not allow for consideration of life-cycle costs or easily accommodate criteria other than price and specifications and therefore may be an invitation for problems such as quickly outmoded technology, unsupported technology, high maintenance costs, future incompatibility, or others that cannot be addressed through this procurement process.

Both the low and conforming bid process and the competitive negotiation process can accommodate either low initial cost or life-cycle costing as the cost evaluation criteria. However, low and conforming bid has traditionally meant low initial cost due to the ease of bid evaluation using specifications and low initial cost as the criteria. Additionally, the low and conforming bid process does not easily allow other evaluation criteria such as quality, technology upgrades, or ease of integration. Competitive negotiation, however, more easily accommodates both life-cycle cost as the cost evaluation criteria and additional considerations. The ability to use life-cycle costs and additional relevant considerations in evaluating bids in ITS procurement will help ensure the best overall investment for public agencies. Public agency requirements for, or emphases on, using the low initial price competitive process may pose barriers to the application of competitive negotiation for ITS facilities and equipment. Certainly, states may differ in these requirements as well, posing additional barriers to the multi-state cooperation needed for ITS-CVO development and operation.

- Non-competitive procurement discouraged or not allowed. The low number of ITS vendors or the need for compatibility with other jurisdictions may create situations in which there is only one feasible provider for the technology or services a public agency wants or needs. Similarly, prior successful relationships with a vendor may suggest future partnerships/contracting with the same vendor. In these cases, non-competitive negotiations could be used to arrive at contract terms for a vendor.

However, public agencies may not be allowed to use non-competitive negotiation. Or, in other cases public agencies may be discouraged from using non-competitive negotiation by requirements or practices that make non-competitive procurement significantly more difficult to administer than traditional competitive procurement methods. Non-competitive processes may require written justification, additional agency approvals, or approval of other administrative branches, possibly even the governor of the state. In addition, many non-competitive bid processes are limited to small or local purchases, often \$5,000 or less, or to procurement of technical and consulting services.¹ Such additional requirements and restrictions discourage the use of non-competitive procurement processes and result in the use of the competitive bid process, which are ill-suited to the high-technology nature of ITS systems and services.

- Difficult process for, no process for, or prohibitions against accepting contributions, funds, in-kind services, or other payments as part of

routine business. Development and deployment of ITS-CVO will be costly. However, ITS-CVO has considerable market potential for private industry. Thus, the high costs and potential for marketing of ITS-CVO encourages partnerships between private industry and public agencies to defray the costs of ITS-CVO and allow private industry profitmaking potential.

Such partnerships may create revenues or other items or services of value that are exchanged among or accrue to the partners, including states or public agencies. As a result, states and agencies may need some means of accepting either revenues, in-kind services, or other contributions from the private sector as part of ITS-CVO development, deployment, and operation efforts.

Interviews with Lead Agencies for ITS-CVO

In addition to the review of codes and rules governing procurement by the lead state agencies, interviews were conducted with staff of these lead agencies (and other agencies as deemed necessary by the lead agency). In every case, staff responsible for ITS-CVO and procurement were interviewed. These interviews focused on gathering further information about the procurement processes of the states and the philosophies and practices of the lead state agencies. Particular areas of interest included:

- experience/knowledge of ITS-CVO,
- lead agency resources such as staff, technical expertise related to ITS-CVO, and commitment to improving business practices through ITS-CVO,
- experience and interest in cooperating with other jurisdictions and private businesses,
- attitudes and experiences related to management of multi-jurisdictional efforts and ITS-CVO, and
- procurement philosophies and practices.

Materials used as background information and as discussion for these interviews are included in Appendix 3.

Findings: Institutional Opportunities and Barriers for Multi-State Cooperation in ITS-CVO

The following discussion of opportunities and barriers for multi-state cooperation in the development and implementation of ITS-CVO systems and services is organized into two sections: those issues related to procurement laws, rules, and practices pertaining to the lead agencies for ITS-CVO and those issues related to

lead agency resources, practices, and philosophies related to ITS-CVO. These opportunities and barriers are discussed below and summarized in Table 6.2.

Each issue is identified and described as presenting an opportunity, a barrier, or both. For the purposes of this research, an opportunity is defined as a law, rule, practice, or philosophy that will enable a state to more easily adapt its highway infrastructure development and operation practices to ITS-CVO or to more easily cooperate with other states in ITS-CVO development, deployment, and operation. A barrier is defined as a law, rule, practice, or philosophy that will impede a state in its development, deployment, and operation of ITS-CVO or its ability to cooperate with other states for developing, deploying, and operating ITS-CVO functions. An issue could present both opportunity and barrier because the issue could be a barrier for some states and an opportunity for others.

Opportunities and Barriers in Procurement Laws, Rules, and Practices

The review of procurement codes and administrative rules applicable to the lead agency for ITS-CVO in each state identified a number of issues that would present barriers for interstate cooperation in ITS-CVO and a few opportunities. However, it must be noted that codes and administrative rules governing procurement are, like any laws or rules, subject to interpretation. Because interpretation may differ depending on former and current business practices as well as the emphasis of the current administration, these findings are based on what the codes may or may not allow and indications of interpretations of these codes by the lead agency for ITS-CVO in each state as discussed in interviews with these agencies.

In-State Vendor Preferences - Barrier. Preferences for in-state vendors could cause problems for multi-state cooperation in procurement of ITS-CVO systems and services because no state is willing to procure under a system that may give advantage to businesses outside their state. As a result, these preference requirements would make it difficult for states to cooperate in administration of a common procurement process. For example, two neighbor states are equipping joint weigh stations with weigh-in-motion (WIM) equipment. To avoid duplication of procurement administrative costs, these states have decided to procure the needed WIMs cooperatively under a common process. However, both states have in-state vendor preferences. Preferences for vendors from both states cannot be accommodated under the same procurement process. Obviously, to make cooperative procurement viable in such a case, both states would have to waive their in-state preference. Such waivers may be difficult to obtain because they would set a precedent that could be used in other procurement situations and would therefore defeat the original intent and purpose of the preference requirements.

Of the study states, Illinois, Iowa, Minnesota, Missouri, Nebraska, and South Dakota have in-state bidder preferences.^{2,3,4,5,6,7} In all cases, these requirements state that the amount of preference will be equal to that of the preferences given or required by the states of non-resident bidders.

In addition to these preference requirements, Minnesota and South Dakota have additional requirements. Minnesota requires that any agency not observing the in-state preference be penalized by reducing that agency's next fiscal budget by the amount of the contract in question. This is very strong encouragement to observe in-state preference requirements regardless of other issues. South Dakota creates preferences for in-state vendors by requiring that differences in transportation costs be included in the bids when at least one bid includes products manufactured in South Dakota (considered in-state when primary place of business is South Dakota).⁸

Other practices can also create preferences for in-state vendors. For example, Iowa and South Dakota have bid lists which allow those vendors on the list to be notified of invitations for bids (IFB) and requests for proposals (RFP). Such bid lists can create preferences by enabling in-state vendors to automatically receive information about IFBs or RFPs that out-of-state vendors do not automatically receive. In the case of Iowa, only firms legally doing business in Iowa can request to be placed on the bidder list.⁹ South Dakota, however, allows any business to request to be placed on its bidder list. For all purposes, in-state vendors are more likely to know about and make such requests, thus possibly creating a list that is heavily weighted toward in-state vendors.¹⁰

Duration of Contract Limitations - Opportunity/Barrier. Long-term relationships between public agencies and the private sector have been identified as necessary to reduce the initial costs of ITS development and integration for states and allow private companies a means of profit-making. The inability of public agencies to enter into such long-term agreements creates a barrier to ITS by inhibiting the private sector's willingness to form public-private partnerships.¹¹

Duration of contract restrictions contribute to this problem when private companies are being asked to develop and share in the costs of ITS yet may not be able to obtain contracts with a long enough duration for them to recover their costs and begin profiting from the efforts. Differences in allowable length of contracts between states could impede multi-state cooperation by making it difficult for the states to agree on a common procurement process and to share in the administration of such a process or to pursue contracts with the same terms and conditions.

In this area, the practices in the study states could serve as an opportunity or a barrier. In general, study states exhibited widely ranging abilities to contract for longer periods of time. For example, Nebraska can write contracts for one year with yearly extensions allowed for a total of up to four years while Iowa has no limitations on the duration of contracts and no requirement for yearly renewals.^{12,13} However, in practice the Iowa Department of Transportation does not usually contract for more than five years, but has contracted for ten years when beneficial.¹³

Like Nebraska, South Dakota and Missouri can contract for longer periods through one-year contracts with yearly renewals.^{14,15} However, Missouri has

contracted for longer periods, such as a five-year contract with two years guaranteed and yearly renewal for the duration.¹⁴ Minnesota can contract for up to five years either through a single five-year contract or through a one-year contract with yearly renewals or any combination not to exceed five years.¹⁶ Similar to Minnesota, Wisconsin can contract for up to five years and has even been able to obtain extensions for a total of ten years when need and benefit to the state justified such extensions.¹⁷ Illinois may write up to a seven-year contract for equipment if fiscal benefit can be demonstrated.¹⁸

The ability of states to commit to long-term contracts or to extend existing contracts creates the opportunity for return on investment and therefore greater likelihood of involvement for private companies. However, some of these states must have a contract renewed yearly, which introduces additional risk for the vendor. Similarly, long-term contract commitments and renewals/extensions are subject to additional scrutiny and usually additional approval processes. Thus, while these approaches are possible they may not be easy to implement. These uncertainties can create a barrier for private industry involvement in ITS.

Most importantly, such differences in practices may make it difficult for states to jointly administer a single procurement process that meets the requirements of all involved states or to individually procure under contracts with similar terms and conditions.

Source Selection Processes - Opportunity/Barrier. Because the competitive bid processes used for traditional procurements may not be well-suited to procurements of ITS-CVO systems and services or cooperative procurements among states, differences in requirements for the use of competitive and non-competitive processes among states and agencies may create barriers to cooperation in ITS-CVO. For example, states may differ on such issues as when competitive processes such as invitations for bids or requests for proposals are used and whether the low (lowest cost bid based on bid criteria, which could be based on initial cost or life-cycle cost) and conforming bid must be selected when inviting bids. Conversely, some states' requirements may have flexible requirements that more easily accommodate the unique challenges of ITS procurements by allowing agencies to choose the best procurement method for the situation without creating additional paperwork or approvals, by encouraging or enabling the use of life-cycle costing, or by allowing other processes that are made appropriate by the differences between traditional procurements and ITS. While most agencies have a number of source selection processes (competitive bids, competitive negotiations, non-competitive negotiations, etc.) available, these agencies may be encouraged by codes, rules, or current practices to use a particular process or processes, such as competitive bid, over other procurement methods.

Of the states involved in the study, Missouri and Nebraska require the use of competitive bids^{19,20} while Illinois and Wisconsin place significant emphasis on the use of competitive bids (invitation for bids) for procurements.^{21,22} Such requirements or emphases create barriers to cooperation with other states when

other processes, such as competitive negotiations (request for proposals) or non-competitive negotiation (sole source), are the most desirable.

However, many of these states temper their requirement for or emphasis on competitive bids by allowing agencies to use other methods in certain situations or when justifiable due to special needs or circumstances. Missouri allows the use of competitive negotiations when procuring professional and general services (such as consulting, maintenance, etc.).¹⁹ Illinois allows the use of source selection processes other than the competitive bid process depending on the specific need as follows: 1) sealed proposals can be used when specifications cannot adequately define the need or when features are difficult to compare; 2) negotiation with one or more vendors when a specific item is unique and necessary.²³ For procurements over \$10,000, Wisconsin only allows the use of source selection processes other than the competitive bid process through waivers that must be justified by any one or combination of special circumstances: 1) when the product or service is one-of-a-kind and therefore not available through more than one source; 2) when patent or proprietary features give the state a superior and necessary utility that cannot be obtained from others and these features are not merchandised through competitive outlets; and 3) when an award cannot be made strictly on specifications or price.²⁴

These exceptions to the requirement or emphasis on using the competitive bid process for procurement allows states to maneuver around some of the barriers to ITS-CVO created by the competitive bid process. For example, even these states with requirements to use or emphasis on the competitive bid process would be able to procure maintenance and other services needed for ITS-CVO through competitive negotiation, which is the most desirable means for procuring services.²⁵

As important as it may be to be able to procure services for ITS through competitive negotiation, procurement of ITS systems or equipment may also be best executed through competitive negotiation. Like services, there are a number of ways that ITS system or equipment needs can be met and additional considerations other than initial price that might be relevant such as quality, ease of integration, or others. Competitive negotiation easily accommodates these factors whereas competitive bidding does not. As a result, the best method for public agencies to procure ITS systems and equipment may be through competitive negotiation. This would also allow public agencies to combine both the procurement of ITS systems and equipment with the procurement of maintenance, technical support, or operation services under the same competitive negotiation process, thus reducing procurement administration and costs.

Unfortunately, most of the study states are either prohibited from using competitive negotiation to purchase equipment or are restricted from using it for equipment purchases exceeding what are usually very low dollar amounts (e.g. \$5,000). Only Minnesota and Iowa are able to use competitive negotiation for the purchase of goods without limits on the dollar amount of the contract or requirements of additional approvals.

Missouri does not allow any process other than competitive bid for purchases of goods.¹⁹ Other study states allow the use of competitive negotiation for the purchase of goods but have restrictions. Generally, Illinois allows competitive negotiation by the Department of Central Management Services (CMS) but not by the Department of Transportation, the lead agency for ITS-CVO. Nebraska does not allow competitive negotiation for purchases of goods over \$5,000 without extensive justification and the signature of the Governor of Nebraska.¹² South Dakota does not allow competitive negotiation for the purchase of goods unless they are part of a research contract.¹⁵ Wisconsin allows competitive negotiation but requires that competitive negotiation procurements for goods or services over \$10,000 be approved by the Department of Administration and possibly even the Governor of Wisconsin.^{26,17}

Because of these restrictions, the lead agencies for ITS-CVO in Illinois, Missouri, Nebraska, South Dakota, and Wisconsin have very limited or no experience in purchasing goods using competitive negotiations. In addition, the lead agency for ITS-CVO in Iowa also has limited experience in purchasing goods using this method due to procurement practices that strongly encourage the competitive bid process.¹³ These restrictions or discouragement from using competitive negotiations in the purchase of goods present will act as barriers to multi-state cooperation in ITS-CVO development and operation. Because competitive negotiations will be the best method for procuring many ITS goods and services both separately and, most likely, as packages, such restrictions and inexperience will make cooperation for ITS-CVO among states difficult. States that have restrictions may not be able to participate in cooperative procurements using competitive negotiation.

Another source selection process that ITS procurement calls for is non-competitive negotiation (sole source). Because of limited participation in the ITS-CVO industry and possible unique or proprietary features of ITS-CVO technologies, states will need to be able to negotiate with just one product or service supplier when necessary. The capability of states to use such non-competitive negotiations for procurements will affect their ability to cooperate in ITS-CVO with other states. If the states want to cooperate in administration of a common procurement process to avoid duplication of administrative costs and create economies of scale, such cooperation may be difficult if an involved state or states cannot use non-competitive negotiations for procurement or have different requirements for when they can be used. This might restrict the range of options under the common process or might exclude the state or states from involvement.

Illinois, Missouri, and Nebraska present significant barriers where non-competitive negotiations might be used, while Iowa, Minnesota, South Dakota, and Wisconsin could present either opportunities or barriers (depending on interpretation and practice) for procurement using non-competitive negotiations.

Illinois has requirements that strongly discourage non-competitive negotiation procurements by suggesting that competitive processes be used first to verify that

only one source exists.^{27,28} Missouri does not, in practice, perform non-competitive negotiation procurements.¹⁴ Nebraska requires that any procurements over \$5,000 with less than three bidders responding be justified and approved by the Governor.¹²

On the other hand, Iowa has requirements that allow non-competitive negotiation procurements under any one of a number of conditions, several of which could be ITS friendly.²⁹ For example, one of these conditions is that the procurement is for technical or professional services in connection with the assembly, installation, servicing (or the instruction of personnel therein) of equipment highly technical in nature. This could fit ITS needs for maintenance or other services by the technology provider without the necessity for a competitive procurement process. Interpretation of these requirements could make it either an opportunity or a barrier. However, Iowa Department of Transportation staff indicated that non-competitive negotiation is possible if reasonable and justifiable under the allowable conditions.¹³ Minnesota has restrictions on the use of non-competitive negotiations for the procurement of goods, but consultant, professional, and technical services are not subject to these restrictions.³⁰ Information gathered during the interview with Minnesota DOT indicates non-competitive negotiation procurements can be made when reasonably justified.¹⁶ South Dakota allows non-competitive negotiation procurements when only one source exists.³¹ In the interview with South Dakota Department of Transportation staff, they indicated that justifying non-competitive negotiation procurements was not a difficult process. Lastly, Wisconsin requires a waiver for use of non-competitive negotiation procurements. Such waivers may be justified as outlined in the discussion of competitive bid requirements. These waivers, however, require the approval of the Department of Administration and, in some cases, the Governor of Wisconsin. Information gathered in the interview with Wisconsin DOT and Wisconsin Department of Administration staff suggest non-competitive negotiation procurements are discouraged in Wisconsin and competitive bidding is strongly preferred.¹⁷

Among the study states, cooperation in ITS-CVO by Iowa, Minnesota, and South Dakota should not be hindered by real needs for non-competitive negotiation procurements. These states require justification for non-competitive negotiation procurements, but, if warranted, such justification is not a significant barrier. In fact, the ease with which the lead agencies from these states indicated they can perform non-competitive negotiation procurements creates an opportunity for cooperation.

On the other hand, non-competitive negotiation procurements could hinder the cooperation of Illinois, Missouri, and Nebraska in ITS-CVO due to current procurement requirements or practices that discourage or exclude non-competitive negotiation procurements. Also, due to strong encouragement to use competitive processes, cooperation by Wisconsin in ITS-CVO efforts involving non-competitive negotiations in procurement may also present a barrier.

Information Disclosure Practices - Barrier. Because the costs of development of ITS-CVO will be borne by both private industry and public agencies, the disclosure of information related to technology and system developments, cost structures, and particular methods or approaches developed will be an issue.¹ Government contracts typically require full disclosure of cost information from private sector consultants and vendors. Such disclosure, however, may put private companies' investment at risk due to the possibility of disclosing competitive cost information to competing companies. Similarly, the procurement processes of many states require that all information in a selected bid or proposal be made public information. This full disclosure of a selected bid puts a company at risk to exposure of confidential information regarding developed methods, processes, designs, or technologies as well as competitive costs to competing companies. Such requirements can discourage private sector involvement in ITS, create difficulties in contracting with private companies, and make cooperation among states difficult due to the number of different disclosure requirements that must be met.

Of the study states, Illinois and Wisconsin have disclosure requirements that may discourage private sector participation in ITS-CVO development and implementation. Illinois procurement rules state that any information submitted by a contract awardee is considered public information. In the case of unsuccessful bidders, any information other than price information which is labeled proprietary will be held confidential.³² In other words, all information submitted by the selected bidder is public information while unsuccessful bidders will be allowed protection of information other than price that was indicated as proprietary in the bid. Such requirements could discourage the involvement of companies with new or more efficient technologies, approaches, or cost structures in contracts with Illinois due to their risk of losing competitive advantages or other trade secrets to competing companies.

Wisconsin's requirements are somewhat different. Wisconsin procurement requirements state that any private firm bidding or proposing must provide a statement that discloses and provides relevant information related to certain conditions. The condition relevant to ITS-CVO is if the bidder/proposer has contracts for providing materials, equipment, or services or anticipates providing materials, equipment, or services to the contracting agency or a person or organization regulated by or receiving state funds from the contracting agency.³³ Under this requirement, private firms may be required to provide relevant information (does not specify what is relevant) about these other business activities in a written statement. Conceivably, this could create a situation in which cost or other proprietary information might be disclosed. However, an exception to the rule is available if the contracting or procuring agency reviews the written statement and prepares a written determination on whether the information disclosed interferes with fair competition and whether or not awarding the contract would be in the best interests of the state.³⁴

Obviously, the Illinois requirement presents an unavoidable barrier while the Wisconsin requirement is a barrier that offers a means for mitigating its effects on private firms and fair competition. Multi-state cooperation in administration of a common procurement process for ITS-CVO will be made more difficult by these disclosure requirements. Other states may not want to subject vendors to the requirements of Illinois and Wisconsin yet Illinois and Wisconsin may not be able to waive the requirements.

Life-Cycle Costing - Opportunity/Barrier. As noted in Chapters 3 and 6, the complexity, cost, and fast-changing nature of high-technology efforts like ITS-CVO call for the use of life-cycle costing to ensure efficient and equitable evaluation of bids or proposals. States unable to accommodate or unfamiliar with life-cycle costing may not be able to effectively evaluate and select bids or proposals in their best interests.

Of the study states, Missouri and South Dakota have procurement provisions that do not allow life-cycle costing. These states do not allow additional considerations to be part of the evaluation of competitive bids.^{14,15,34} On the other hand, Iowa and Nebraska allow the use of additional considerations in the competitive bid process, thus making life-cycle cost considerations possible for evaluation of bids related to ITS-CVO.

More encouraging, however, are the procurement codes and rules of Illinois, Minnesota, and Wisconsin. These states' codes and rules specifically mention life-cycle costing in a manner that might apply directly to ITS-CVO.^{35,36,37} Illinois defines life-cycle costing and notes that its purpose is to ensure lowest total ownership cost during the life of the procured item.³⁵ Minnesota procurement codes and rules require that the lowest responsible bidder be selected but allow the use of life-cycle costing where appropriate to determine the lowest overall bid.³⁶ The determination of when the use of life-cycle costing is "appropriate" is not defined in the Minnesota statutes. Lastly, Wisconsin procurement codes and rules indicate that low-bid contracts should take life-cycle costs into consideration if applicable. In addition, when life-cycle costing is used, the bid selected may not be the lowest initial cost bidder.³⁷

None of these three states' rules define when life-cycle costing is applicable. This suggests the procuring agency may need to request the use of life-cycle costing or show the applicability of life-cycle costing in ITS-CVO procurement. However, even though these states' codes and rules do not define when life-cycle costing might be used, the high cost, accelerated obsolescence, and variability of technology and approaches of ITS-CVO would suggest that life-cycle costing should be used.

That Illinois, Minnesota, and Wisconsin clearly include life-cycle costing in their general procurement rules and the possibility of applying additional evaluation considerations other than conformance and cost exists in Iowa and Nebraska suggests that an opportunity exists for agencies in these study states to apply life-

cycle costing to ITS-CVO procurements when it is in the interests of these states. Certainly, the need for life-cycle costing in ITS-CVO procurement should not present a legal barrier to any of these five states. On the other hand, the lead agency from Nebraska indicated during the interviews that life-cycle costing may pose a challenge for them in terms of staff time and capabilities.¹²

Cooperation in procurement involving life-cycle costing will be a considerable issue for Missouri and South Dakota. These states present absolute barriers to life-cycle costing in that their strict competitive bid requirements applicable to ITS do not currently allow for consideration of factors other than conformance to specifications and initial cost for the purchase of goods.^{14,15,19}

Bid Specification Processes - Barrier. As discussed in Chapters 3 and 6, functional specifications may be more appropriate for ITS-CVO than technical specifications due to the diversity of technologies and approaches available to fulfill ITS-CVO functions and the specialized knowledge needed to technically specify such complex systems. As a result, whether current laws, rules, and practices allow the use of functional specifications and what level of experience state agencies have with functional specifications will create opportunities or barriers for interstate cooperation for ITS-CVO.

While the review of laws and rules did not bring to light any specific prohibitions or restrictions on using functional specifications in lieu of technical specifications, the procurement processes of the study states do not lend themselves to the use of functional specifications in the procurement of goods. As discussed in the section on source selection processes earlier in this chapter, public agency procurement in the study states heavily emphasizes the use of competitive bidding for the procurement of goods. The competitive bid process assumes clear definition of the requirements the goods must meet, which allows evaluation of bids on price. Such clear definition of the goods needed strongly encourages technical specification. In addition, competitive negotiation, the source selection process which works well with variations in approaches and equipment, and, therefore, functional specifications, is restricted or prohibited for the procurement of goods in many of the study states. Hence, the nature of public agency procurement in the study states does not lend itself to the use of functional specifications for the purchase of ITS-CVO equipment.

Due to restrictions on or prohibitions against competitive negotiation for the purchase of goods, Illinois, Minnesota, Missouri, Nebraska, South Dakota, and Wisconsin may present barriers to cooperation in ITS-CVO procurement where functional specifications are needed. While procurement of goods using competitive negotiation is allowed for the lead agency in Iowa, the overall philosophy of procurement administration in Iowa to emphasize competitive bidding could also pose a barrier to cooperation in procurements needing functional specifications.

Opportunities and Barriers Related to the Lead Agencies for ITS-CVO

Interviews with representatives from the agencies identified as the lead agencies for ITS-CVO in the study states uncovered a number of opportunities and barriers in the those issues related to lead agency resources, practices, and philosophies related to development and operation of ITS-CVO. Discussion of these opportunities and barriers is organized into consideration of each lead agency's resources available for ITS-CVO, such as commitment to ITS-CVO and ability to staff for ITS-CVO; interpretations of the possibility of their agency engaging in cooperative procurements with other jurisdictions; and philosophies on the management of possible multi-state cooperative ITS-CVO projects.

Lead Agency Commitment to ITS-CVO - Opportunity. To make ITS-CVO a reality, commitment from the lead agency in each state is needed. These lead agencies will need to "champion" ITS-CVO in their state to gain the policy and financial support of both the state and motor carriers. A strong commitment to improving efficiency in the administration and enforcement of commercial vehicle regulation was voiced by the lead agencies of the study states.^{12,13,14,15,16,17,38} In each case, the lead agency agreed that ITS-CVO functions will play a role in improving commercial vehicle regulatory administration and that their agency would champion ITS-CVO functions when clear benefits to their regulatory administration of commercial vehicles and motor carriers operating in and through their state could be realized. Such support creates an opportunity for Iowa and these neighboring states to cooperate in the development and operation of ITS-CVO functions. As a result of this common interest in improving commercial vehicle regulatory administration, these states should work together to 1) identify areas of commercial vehicle administration from which their regulatory agencies and motor carriers would benefit and are common to these states; 2) identify barriers to their cooperation in developing, integrating, and operating the identified ITS-CVO functions and to obtaining the efficiencies and economies of scale available through large cooperative efforts; and 3) implement solutions to the identified barriers to multi-state cooperation; and 4) implement, operate, and maintain the ITS-CVO functions to ensure continued compatibility and economies to scale.

Capability to Staff for ITS-CVO - Barrier. Public agencies and the motor carrier industry will need some period of time to phase in the infrastructure and business practices necessary for ITS-CVO functions. Because deployment, integration, and use of ITS-CVO by both public agencies and motor carriers will happen over a number of years and possibly decades, public agencies will continue to use current business practices, equipment, and staff for administration of commercial vehicle regulation while also working to incorporate new business practices and duties associated with ITS-CVO. In addition, ITS-CVO systems will require new technical knowledge and training to design, operate, and maintain them.

Until ITS-CVO begins generating enough benefits to allow manpower and resource redistribution, public agencies may not be able to add the staff required

to support ITS-CVO functions and operate and maintain the necessary ITS-CVO infrastructure while continuing current practices. The lead agencies in all the study states indicated that ITS-CVO would bring about additional duties for which they did not currently have staff or, in some cases, technical expertise.^{12,13,14,15,16,17,38} These shortfalls are expected to cause some problems for the lead agencies of all the study states, but the lead agencies for ITS-CVO in Iowa, Missouri, Nebraska, South Dakota, and Wisconsin indicated they would face significant difficulties in acquiring additional staff to meet the technical expertise and manpower needs of ITS-CVO either due to budget limitations or actual limitations on staff levels.^{13,14,12,15,17} These difficulties in meeting technical expertise and manpower needs of ITS-CVO will pose a significant barrier to ITS-CVO and multi-state cooperative efforts.

One possible solution to these difficulties in meeting the technical expertise and manpower needs of ITS-CVO is for lead agencies to contract for services from another organization (private industry or perhaps even another public agency or other public organization that does not face such difficulties) to meet a significant portion of these needs. In fact, Nebraska, Missouri, and South Dakota indicated a strong interest in contracting for services to meet additional staff needs to acquire the technical expertise and manpower necessary to bring about ITS-CVO.^{12,14,15}

Ability to Participate in Cooperative Procurements - Barrier. In Chapter 6, two differences between ITS-CVO and traditional infrastructure development that suggest cooperation in procurement of ITS-CVO were identified: 1) the need for interoperability of ITS-CVO systems, functions, operation, and maintenance due to the interstate nature of ITS-CVO and 2) the need to take advantage of economies of scale due to the high cost of ITS-CVO. Cooperative procurement among multiple states would ensure interstate interoperability of ITS-CVO by enabling lead agencies to purchase ITS-CVO systems and services from the same providers. Cooperative procurement would also allow lead agencies to realize efficiencies by creating economies of scale and consolidating procurement costs and eliminating the redundant costs of each state individually procuring ITS-CVO systems and services.

Of the study states, the lead agencies for ITS-CVO in Iowa and Minnesota indicated that cooperating with other jurisdictions in procurement would be possible.^{13,16} In the case of Iowa, such cooperative procurement is allowed but not specifically encouraged by the laws and rules governing procurement by the Iowa DOT. Procurement officials in Minnesota, however, have a good deal of experience in cooperative procurements, including contracts that allow public healthcare agencies from more than 20 states to procure pharmaceuticals from multiple suppliers under the same agreement.¹⁶ Such agreements are possible for the lead agency for ITS-CVO, the Minnesota DOT, as well.¹⁶ Therefore, the Minnesota DOT presents an opportunity for cooperation in procurements by multiple jurisdictions for ITS-CVO.

During interviews, the lead agencies for ITS-CVO initiatives (all DOTs) in Illinois, Missouri, Nebraska, South Dakota, and Wisconsin indicated that participation by their agencies in cooperative procurement would be difficult or impossible for a number of possible reasons.^{3,7,14,12,15,17} These include political pressures to make state expenditures in state, strict competitive procurement requirements, differing requirements related to socioeconomic programs or minority set-asides, and other issues. However, several of these lead agencies suggested a common solution for mitigating this barrier. Lead agencies in Missouri, Nebraska, South Dakota, and Wisconsin all suggested that they would be most likely to be able to cooperate with other states in procurements through an independent public or non-profit organization such as AASHTO, IFTA, or a some other organization in which their participation could be approved through the necessary procedures.^{14,12,15,17}

Management Philosophies Possible for ITS-CVO - Barrier. Prior to the interviews, the lead agencies for ITS-CVO in the study states were given a range of procurement and management scenarios to review and be ready to discuss during the interview. These scenarios can be found in Appendix 3. The management scenarios ranged from traditional to progressive as follows: 1) each state individually managing their ITS-CVO systems, 2) a cooperative management board on which each state is a member and has an equal vote, 3) their state managing the system for all cooperating states with guidance from an advisory board, and 4) another state managing the system for all cooperating states with guidance from a management board.

The discussion of these scenarios and the possibility of their agency participating in each scenario was intended to provide an indication of the level of cooperation possible for lead agencies in management of multi-state ITS-CVO systems. Scenarios 1, 2, and 3 provide each state with the same or greater control over ITS-CVO than other cooperating states while scenario 4 gives another state more control over ITS-CVO than the other states. If a lead agency indicated they might consider participation in all management scenarios including scenario 4, they were considered an opportunity in management philosophy. If a lead agency restricted their considered participation to any combination of 1, 2, and 3, they were considered a barrier in management philosophy because of their need to maintain control over ITS-CVO management.

From discussions of these scenarios, most of the study states were designated barriers to new philosophies of management for ITS-CVO. Iowa, Minnesota, Nebraska, and South Dakota indicated that management scenario 1 (each state manages their own) would be most likely with possible participation in management scenario 2 (management board consisting of cooperating states).^{13,16,12,15} Illinois was deemed to pose a management philosophy barrier, but indicated that scenarios 1 through 3 would be possible.³⁸ Wisconsin indicated that management scenario 2 would be most likely, while management scenarios 3 and 4 might be possible if circumstances strongly suggested their use.¹⁷ These states

all cited a need to maintain control over their interests as the reason for their responses.

Missouri, however, indicated that it could be involved in any of these management scenarios, even scenario 4, if necessary.¹⁴ The possibility for involvement in even the most progressive scenario offered is made possible by an oversight structure that requires only approval of the Missouri Highway Commission rather than their legislature or governor. Lead agency representatives explained that the Highway Commission is guided by transportation needs and therefore proposed actions or changes that hold clear benefits for highway transportation do not usually become mired in other politics.¹⁴

The bright spot in these barriers to management philosophy is that even though states wish to maintain equal or greater control over ITS-CVO than other cooperating states, all lead agencies indicated a possibility of participating in scenario 2, a cooperative board representing each state equally. Such a cooperative board, while possibly not the most efficient means of managing ITS-CVO efforts, allows states to work together for ITS-CVO to overcome other barriers.

Conclusion

As the identified lead agencies for ITS-CVO in the study states, state departments of transportation will face significant barriers to cooperation in multi-state efforts for ITS-CVO. These barriers range from procurement processes that are not well-suited to ITS-CVO or cooperation among jurisdictions to a shortage of staff available for ITS-CVO efforts. Opportunities for ITS-CVO were few, with the most unanimous opportunity being the lead agencies' commitment to utilizing ITS-CVO for improving administration of CVO regulation and providing efficiencies for both public agencies and motor carriers. Table 6.2 summarizes the barriers and opportunities presented by the lead agency for ITS-CVO in each state as detailed earlier in this chapter. As might be suggested by the number of barriers identified, a great deal of effort on the part of study states will be necessary to overcome these barriers. Possible options for the study states to use in mitigating the identified barriers are discussed in Chapter 7.

Table 6.2 Summary of Institutional Opportunities and Barriers to Multi- State Efforts in ITS-CVO By State

	Procurement Laws, Rules, and Practices							Lead Agency		
	In-State Preference	Length of Contract	Source Selection Process	Information Disclosure	Life-Cycle Costing	Bid Specifications	Commitment	Management	Procurement	Staffing
Illinois	B	O/B	B	B	O	B	O	B	B	B
Iowa	B		O	B		O	O	B	O	B
Minnesota	B		O/B		O	B	O	B	O	B
Missouri	B		O/B			B	O	O	B	
Nebraska	B		B			B	O	B	B	B
South Dakota	B	O/B	B		B	B	O	B	B	B
Wisconsin	B		O/B		O	B	O	O/B	B	B

O = Opportunity; B = Barrier; O/B = could present Opportunity or Barrier

1. IVHS America. *Procurement Issues in IVHS Development and Deployment*. Prepared by the Procurement Task Force of the Legal Issues Committee .
2. Illinois Department of Central Management Services. *Standard Procurement Rules*. Bureau of Support Services, Procurement Services Division, Illinois Department of Central Management Services. September 1992. Section 9.2, p. 9-3.
3. Iowa Code. Chapter 18, 18.6(1).
4. Minnesota Statutes. Section 16B.102, Subdivision 1.
5. Revised Statutes of Missouri 1991. Sections 34.070 and 34.073.
6. Rules and Regulations of the Nebraska Department of Administration, Materiel Division, State Purchasing. Title 9, Chapter 4, 003.
7. South Dakota Codified Laws, 1993. Sections-23-12.2 and 5-23-21.2.
8. South Dakota Codified Laws, 1993. Section 5-23-13.
9. Iowa Administrative Code, 1989. Section 761—20.4(1).
10. South Dakota Codified Laws, 1993. Section 5-23-10.1.
11. Peterson, C.N., and D.S. Olson. *Institutional Barriers to IVHS: Defense Company Interviews and Case Study Report*. Prepared for the U.S. Department of Transportation/RSPA/Volpe, National Transportation Systems Center. April 12, 1994. p. 1-4.
12. Interview with Robert Miller, Jon Ogden, and Jim Pearson, Nebraska Department of Roads. May 1994.
13. Interview with Ruth Skluzacek and Kermit Wilson, Iowa Department of Transportation. June 1994.
14. Interview with Bob Lannert, Phil Morgan, Richard Walter, Clay Wester, and Bill Wilson, Missouri Highway and Transportation Department. June 1994.
15. Interview with Thomas Devany, David Huft, Norman Humphrey, and Dean Schofield, South Dakota Department of Transportation, and Myron Rau, South Dakota Highway Patrol. May 1994.
16. Interview with Laurie Anderson, Marthand Nookala, Ray Starr, and Jim Wright, Minnesota Department of Transportation, and Don Olson, Minnesota Department of Administration. May 1994.
17. Interview with Phil DeCabooter, Carson Frazier, and Alice Morehouse, Wisconsin Department of Transportation, and Gabrielle Cook and Dave Johnson, Wisconsin Department of Administration.

18. Illinois Department of Central Management Services. *Procurement Services Division Manual*. Bureau of Support Services, Procurement Services Division, Illinois Department of Central Management Services. September 1992. Section 16.0, p. 17-3.
19. Revised Statutes of Missouri, 1991. Section 34.040.
20. Rules and Regulations of the Nebraska Department of Administration, Materiel Division, State Purchasing. Title 9, Chapter 2, 001.
21. Illinois Department of Central Management Services. *Standard Procurement Rules*. Bureau of Support Services, Procurement Services Division, Illinois Department of Central Management Services. September 1992. Section 1.515.
22. *State Procurement Manual*. State of Wisconsin, Department of Administration. November 1993. PRO-C-1.
23. Illinois Department of Central Management Services. *Standard Procurement Rules*. Bureau of Support Services, Procurement Services Division, Illinois Department of Central Management Services. September 1992. Sections 1.515, 1.520, 1.530.
24. *State Procurement Manual*. State of Wisconsin, Department of Administration. November 1993. PRO-C-1, C-9, C-13.
25. Maze, T.H. and Kathleen Waggoner. *Manual on Contracting for Vehicle Maintenance Services*. Prepared for the University Research and Training Program, Office of Technical Assistance, Federal Transit Administration, U.S. Department of Transportation. October 1992. p. 39.
26. *State Procurement Manual*. State of Wisconsin, Department of Administration. November 1993. PRO-C-1, C-12.
27. Illinois Department of Central Management Services. *Procurement Services Division Manual*. Bureau of Support Services, Procurement Services Division, Illinois Department of Central Management Services. September 1992. Section 4.3.
28. Illinois Department of Central Management Services. *Standard Procurement Rules*. Bureau of Support Services, Procurement Services Division, Illinois Department of Central Management Services. September 1992. Section 1.520, 1.530.
29. Iowa Administrative Code, 1989. 761—20.3(3) c., f.(1)(2)(6)(7)(9)(10), g.
30. Minnesota Statutes. Section 15.061.
31. South Dakota Codified Laws, 1993, Section 5-23-3.1.

32. Illinois Department of Central Management Services. *Standard Procurement Rules*. Bureau of Support Services, Procurement Services Division, Illinois Department of Central Management Services. September 1992. Section 1.2460.
33. *State Procurement Manual*. State of Wisconsin, Department of Administration. November 1993. Wisconsin Statutes 16.705(5), 16.77(2), 19.45(6).
34. Revised Statutes of Missouri, 1991. Sections 34.040.
35. Illinois Department of Central Management Services. *Procurement Services Division Manual*. Bureau of Support Services, Procurement Services Division, Illinois Department of Central Management Services. September 1992. Section 1.3.12.
36. Minnesota Statutes. Section 16B.102.
37. *State Procurement Manual*. State of Wisconsin, Department of Administration. November 1993. PRO-E-19.
38. Interview with Larry Burton, Joseph Ligas, and Charles Sikaras, Illinois Department of Transportation. June 1994.

CHAPTER 7

POSSIBLE STRATEGIES FOR MITIGATING THE INSTITUTIONAL BARRIERS TO MULTI-STATE COOPERATION IN ITS-CVO

Introduction

The differences between ITS-CVO and traditional highway infrastructure development (Chapter 5) were shown to result in significant institutional barriers (Chapter 6). These barriers suggest substantial changes are needed in development, procurement, and operation practices and philosophies of the lead agencies for ITS-CVO in the study states to enable multi-state development, deployment, and operation of ITS-CVO. Many of the barriers arise from laws, rules, and practices governing development and operation of traditional highway infrastructure clashing with the needs of high-technology infrastructure development and operation for ITS-CVO. As a result, the methods for mitigating these barriers must effect changes to these laws, rules, and practices. In those cases where changing the laws, rules, or practices would be very difficult or very unlikely, these methods must create some means for completing ITS-CVO development and operation without invoking these laws, rules, and practices. These methods must also address the multi-state cooperation and changes in business practices and philosophies of the lead agencies for ITS-CVO needed for multi-state development, deployment, and operation of ITS-CVO.

Because the issues facing the lead agencies for ITS-CVO differ from state to state and agency to agency, no single approach may be the best for every lead agency/state in the study. In addition, coordination among the lead agency for ITS-CVO in each state will be needed to ensure the changes made coincide with the goal of multi-state cooperation in ITS-CVO. Consequently, mitigating the barriers to multi-state efforts for ITS-CVO will require a combination of approaches.

This chapter describes methods for mitigating the barriers to multi-state development, deployment, and operation of ITS-CVO and reports the application, advantages, and disadvantages of each. These and other methods will be considered for inclusion in a regional action plan in Phase II of this study.

Methods for Mitigating Institutional Barriers to Multi-State Cooperation for ITS-CVO

The differences between ITS-CVO and traditional highway infrastructure development described in Chapter 6 and the related barriers to multi-state efforts in ITS-CVO identified in Chapter 6 cut across several areas. In general, these areas can be summarized as follows: 1) a need to resolve conflicts between current laws, rules, and practices of highway infrastructure development and operation

and those needed for ITS-CVO; 2) a need to resolve barriers due to shortages of resources such as staff and/or technical expertise due to the addition of ITS-CVO to current department of transportation activities and the high-technology nature of ITS-CVO; and 3) a need for cooperation in standard making for functions and operation and maintenance of ITS-CVO to ensure compatibility and usefulness and to create economies to scale for public agencies. There are three general methods possible for mitigating barriers to multi-state efforts in ITS-CVO that address the areas listed above:

1. Change current laws and rules governing the lead agency for ITS-CVO in each state to accommodate the different needs of ITS-CVO and facilitate interstate cooperation.
2. Mitigate institutional barriers by contracting for services for part or all of ITS-CVO to private industry.
3. Avoid state or agency specific barriers created by current laws, rules, practices, and philosophies governing the lead agency for ITS-CVO and create a vehicle for cooperation by working through a new or existing independent, public sector or private non-profit organization that is not subject to the same constraints as the states and their public agencies (examples of such organizations are given in the discussion of this method).

None of these methods is a stand-alone solution to the institutional barriers to multi-state cooperation for ITS-CVO. For example, contracting with private industry to provide ITS-CVO services may mitigate barriers such as a public agency lack of technical knowledge or staff but will not mitigate those issues related to procurement requirements that will force ITS-CVO to be procured under a system ill-suited to deal with the procurement issues raised by ITS-CVO. Each method may be more appropriate for some barriers than for others, and each differs in its advantages and disadvantages. In the case of many public agencies, some combination of all three of these approaches may be needed to mitigate the various barriers to interstate cooperation they face. The following is a discussion of each of these methods, their advantages and disadvantages, and their likely applications.

Changing Laws and Rules Governing the Lead Agency for ITS-CVO in Each State

On the surface, changing the laws and rules governing the lead agency for ITS-CVO in each state to facilitate interstate cooperation would seem to be the most direct method for mitigating related institutional issues. Advantages include being able to eliminate the actual source of the barriers and being able to coordinate changes in each state to allow cooperating states to have very similar requirements for development, deployment, and operation of ITS-CVO. However, actually achieving the necessary changes in laws and rules governing the lead

agency for ITS-CVO in each state would be difficult or inadvisable for a number of reasons:

1. Achieving the necessary changes in laws and rules in any given state may not be possible or may not be timely. The political system is complex and unpredictable; therefore, gaining the coordinated support necessary to sponsor and gain approval for such changes in state laws and rules may be difficult or may take too long.
2. Coordination among states to achieve widespread changes in laws and rules within each state would be difficult to accomplish. To be effective, changes in the laws and rules governing the lead agency for ITS-CVO in each state would have to be coordinated so that the changes resulted in each lead agency being able to conduct development, procurement, and operation of ITS-CVO in the same ways as the other lead agencies. However, obtaining agreement on policies and practices at the agency level can be quite difficult due to the number of people and differing philosophies involved, obtaining agreement and support at the state and multi-state legislative levels would be even more difficult. State legislators have their own concerns, views, and agendas and getting the legislators in just one state to agree is difficult. Getting legislative support and approval for changes in laws and rules in a number of states simultaneously may be next to impossible.
3. Changes in laws and rules could result in unwanted precedents. Many of the laws and rules governing the lead agency for ITS-CVO in each state also govern other functions of the lead agency (such as paving roads) and other public agencies. As a result, changes in laws and rules to accommodate ITS-CVO might set unwanted precedents that would allow other public agencies to request additional changes in the laws and rules.

These factors make sweeping changes in state laws and rules governing the lead agencies for ITS-CVO an improbable solution. However, some changes in state laws and rules governing the lead agencies for ITS-CVO may be necessary. For example, states may want to pursue one of the other approaches for mitigating barriers, such as becoming part of an independent organization charged with development, deployment, and operation of ITS-CVO within and among member agencies and their respective states. In some cases, state laws or rules may need to be changed to enable participation in such an organization, or legislative approval may be needed to give agencies the authority to enter into cooperative interstate organizations, efforts, and agreements.

Because of the difficulty of effecting changes in laws and rules, this method of addressing barriers should only be considered in those cases where multi-state cooperation for ITS-CVO cannot take place without some legislative changes or

authority. In addition, changes in laws and rules can only remove or lessen the barriers to multi-state efforts in ITS-CVO and enable interstate cooperation among the lead agencies. They cannot provide a vehicle for the necessary coordination and cooperation among the lead agencies for ITS-CVO and the states.

Contracting ITS-CVO to the Private Sector

Contracting services from the private sector is often done for one or more of the following general reasons: 1) to reduce costs, 2) to gain access to additional staff and/or technical expertise, equipment, or facilities, and 3) to realize better services (and reduced costs) by taking advantage of private industry incentives for innovation and efficiency. As related in Chapters 1 and 5 of this report, ITS-CVO can benefit from all of these advantages. Reducing costs would lower the level of public funding necessary for ITS-CVO and reduce the financial barriers to multi-state ITS-CVO. Gaining access to additional or better technical expertise, equipment, or facilities would reduce barriers related to staff and technical expertise, equipment, or facilities resource or quality of resource limitations. And harnessing the private sector incentives for innovation and efficiency would help ensure the best solutions to ITS-CVO needs and responsiveness to change (upgrades) as needed by public agency and motor carrier ITS-CVO users.

Upon first consideration, contracting with the private sector for ITS-CVO appears as if it would greatly diminish the institutional barriers confronting multi-state efforts for ITS-CVO. Public agencies could conclude that contracting with a private business entity to meet ITS-CVO development, deployment, and operation needs would be a one-stop solution for mitigating barriers to multi-state cooperation in ITS-CVO. In fact, the lead agencies from Missouri, Nebraska, and South Dakota specifically indicated that contracting portions of ITS-CVO to the private sector may be necessary due to staffing and expertise shortfalls^{1,2,3} and the remaining states indicated that acquiring additional staff and taking on additional duties would be difficult.^{4,5,6,7}

Contracting for services from private industry, however, has its own disadvantages, including those that could increase the barriers to multi-state efforts in ITS-CVO. Disadvantages in contracting for services that could create new barriers or increase the impacts of existing barriers include 1) inflexibility to change during duration of contract, 2) loss of absolute control over ITS-CVO functions, 3) loss of capital assets, and 4) loss of internal expertise.

Most importantly, contracting ITS-CVO to private industry cannot solve two major areas of barriers identified in Chapter 6—issues related to competitive procurement of ITS-CVO equipment and services and issues that suggest a need for cooperation among public agencies and states (such as the need to cooperate in developing standards for ITS-CVO functions and operating and maintenance procedures). Identifying and contracting with a private entity to provide ITS-CVO would be subject to the same procurement requirements that create the barriers to multi-state efforts in ITS-CVO identified in Chapter 6. Requirements

and encouragement to use the low-bid competitive process for procurements would mean that lead agencies would still be confronted by a number of barriers to multi-state cooperation for ITS-CVO, such as the inability to use the competitive negotiation process for procuring goods, inability to non-competitively procure services and goods, inability to accommodate additional considerations (such as life-cycle costs) in the bid process, and differences in allowable duration of contracts. These barriers will prevent lead agencies from eliminating compatibility issues through selection of the same supplier of systems and services for all cooperating states, using all relevant information to ensure wise investment decisions, and obtaining the best ITS-CVO systems and services for the dollar rather than the lowest responsive bid.

Taken by itself, contracting ITS-CVO to the private industry cannot mitigate the primary institutional barriers to multi-state ITS-CVO efforts. However, for those barriers related to lead agency staff, technical expertise, and equipment and facility resources, contracting with the private sector is a viable method for mitigating these barriers. Contracting out portions of ITS-CVO development, deployment, and operation to the private sector will be necessary in some cases, therefore contracting for ITS-CVO services from the private industry must be accommodated under any solution to institutional barriers to multi-state efforts in ITS-CVO.

Utilizing an Independent, Public or Non-Profit Organization for Multi-State ITS-CVO Efforts

The use of independent public or non-profit organizations to solve problems that affect more than one jurisdiction and require cooperation among the affected jurisdictions is not a new idea. A number of precedents for such organizations exist in transportation, including organizations such as the American Association of Motor Vehicle Administrators (AAMVA), the American Association of State Highway and Transportation Officials (AASHTO), or public, multi-state instrumentalities such as transportation authorities or development districts.

AASHTO, for example, was formed to propagate standards for highway infrastructure at a time when highway travel was developing and state departments of transportation were faced with ensuring the developing highway system would be appropriately safe and navigable across the country. AASHTO standards began with roadway marking and signing and has continued through pavement, bridge, and roadway design. Today, states cooperate in AASHTO to perform research relevant to the states and to update existing highway design standards or develop new standards as required.

An example with direct parallels with ITS-CVO can be found in AAMVAnet, Inc., which was formed to fulfill a mandate of the Commercial Motor Vehicle Safety Act of 1986. This legislation mandated the adoption of a national standard for licensing drivers of commercial vehicles known as the Commercial Driver License (CDL). Like ITS-CVO, the implementation of this national license

required high levels of information sharing among public agencies that had differing laws, rules, and practices for administering the same regulatory functions (driver licensing). Unlike ITS-CVO which can design its systems from essentially a clean slate, state departments of motor vehicles already had their own information systems for driver licensing. Because these information systems differed greatly and state departments of motor vehicles were quite concerned over the security and integrity of their databases, an overarching information system had to be developed to provide information sharing among all the states while ensuring database security and integrity. To accomplish this AAMVAnet, Inc. was formed by the members of AAMVA to design and implement this overarching information system.

The fact that AAMVAnet, Inc. is a direct non-profit, private extension of AAMVA was key to its success. AAMVA is an independent association for public administrators of departments of motor vehicles. This link gives AAMVAnet, Inc. the advantage of public agencies knowing that AAMVAnet is acting in the public interest but with more of the freedom of a private business. As a result, AAMVAnet, Inc. was able to gain access to all states' department of motor vehicles databases and thus provide the information sharing necessary for the national CDL program.

HELP, Inc. is an example of a non-profit, private organization providing ITS-CVO systems and services to public agencies. States become members of HELP, Inc., and are represented on its Board of Directors. HELP, Inc., provides electronic clearance and other ITS-CVO functions to the member states. Participation in HELP, Inc., assures states of compatibility with other states who are also members. HELP, Inc., provides communications and data interchange, system maintenance, and system management to the states. However, member states must still build and operate their own infrastructure (weigh stations, ports of entry, etc.) to provide data to the HELP, Inc., system and the states themselves.

There are a number of advantages of working through an independent public or non-profit private organization like AASHTO, AAMVAnet, Inc., or HELP, Inc. to provide an overarching organization for facilitating the development, deployment, and operation of ITS-CVO by multiple states and agencies. Most significantly, such independent organizations provides two advantages that are key to mitigating a majority of the institutional issues affecting multi-state efforts for ITS-CVO:

- Operate in the interests of cooperating members without being held to all laws and rules applicable to each individual member.
- Provide a vehicle for cooperation.

These two characteristics of independent public or non-profit private organizations allow solutions to some of the most pressing of the institutional issues identified in Chapters 5 and 6—those issues related to the need for cooperation

among states in ITS-CVO and those related to procurement laws and rules that differ from state to state and, in many cases, do not allow the use of procurement methods best-suited to ITS-CVO. An independent public or non-profit private organization gives state agencies a vehicle for cooperation in which they feel comfortable and can be assured the organization is working in their interests. Because a number of states and agencies with differing laws, rules, and practices cooperate in such independent organizations, these organizations develop their own overarching rules and practices that participating members accept as a requirement of membership.

Public agencies often must seek legislative or gubernatorial approval to participate in these independent organizations on the behalf of their state. As a result, agencies can act through their affiliation with the independent organization under its rules and practices without being subject to the laws, rules, and practices that would normally govern such actions if the public agency were acting through its own system. Such an independent public or non-profit, private organization would enable multi-state efforts in the development, deployment, and operation of ITS-CVO by allowing departments of transportation to cooperate in the development of standards for ITS-CVO functions, systems, operation, and maintenance and to work through procurement and operation practices that are less restrictive than those of individual states and agencies and better suited to the needs of ITS-CVO.

In addition to mitigating the barriers to multi-state cooperation for ITS-CVO and providing a means for such cooperation, however, the model organization for ITS-CVO might also have legislative authority to raise revenue and build and operate infrastructure on the behalf of the public. ITS-CVO will require infrastructure and moneys to pay for this infrastructure and the services it provides and enables. The most direct and efficient means for ensuring compatibility, efficient procurement and operation, and adequate revenue raising would be to create an instrumentality to carry-out these tasks on behalf of the cooperating states. The examples of public and private non-profit organizations discussed, such as AAMVAnet, Inc., and HELP, Inc., do not have and cannot be given such authority. These organizations can support public agencies core public activities (i.e., driver and vehicle licensing, education, etc.), but only legislatively authorized instrumentalities can assume public agency responsibilities such as raising revenue and building infrastructure.

Airport, port, and transit authorities are examples of multi-jurisdictional and even multi-state organizations that have such powers. A prime example of such an instrumentality is the Port Authority of New York and New Jersey (see Appendix 5). The Port Authority can raise revenue on its own behalf through fees and taxes, build and operate air, rail, water, and mass transit infrastructure, and assume responsibilities and duties of other public agencies to support the transportation needs of the public. The Port Authority was formed to eliminate duplication of services and other inefficiencies that existed at that time.

Development and operation of ITS-CVO is a very similar situation. If ITS-CVO is developed, implemented, and operated individually by states and public or private non-profit organizations, a number of inefficiencies will exist in duplication of procurement efforts, ensuring compatibility among jurisdictions, providing staff to design, operate, and maintain ITS-CVO systems, and raising revenues to fund ITS-CVO. A public corporate instrumentality for ITS-CVO would eliminate these inefficiencies and many of the barriers to ITS-CVO identified in this study. Such an instrumentality, an ITS-CVO authority if you will, could lead states in standard making for ITS-CVO functions and system design, operation, and maintenance; efficiently procure ITS-CVO systems and services for a number of states and their public agencies through one process; provide a single point of responsibility for operation and maintenance of ITS-CVO; and simplify revenue raising for ITS-CVO through specific use fees or other methods.

A cooperative ITS-CVO authority may also address the issues states face in relinquishing authority and/or responsibility to another state. As discussed in Chapter 6, the lead agencies for ITS-CVO in the study states indicated that relinquishing their individual states' responsibilities and direct authority over ITS-CVO to another state would not be likely. An ITS-CVO authority, however, would be an extension of each state. Therefore transferring authority to such an organization may be less threatening for states than relinquishing authority to a separate and independent entity such as another state. This option is supported by indications by all the lead agencies that participation in a cooperative ITS organization might be possible.

While creating such an instrumentality is the most clear and direct means for mitigating the existing barriers to ITS-CVO development, deployment, and operation, there are obstacles to formation of an ITS-CVO authority. States may have some difficulty in committing the resources necessary and/or in obtaining legislative approval for such an authority. In addition, an independent organization for multi-state development, deployment, and operation of ITS-CVO is not a total solution by itself. For example, some laws and rules governing department of transportation development and operation of highway infrastructure will need to be changed, and other issues, such as shortages of staff and technical expertise, may need to be addressed. The concept of an ITS-CVO authority, however, is a promising option, providing solutions to most of the barriers to multi-state cooperation for ITS-CVO while creating few of its own.

Conclusion

Mitigating the barriers to multi-state cooperation for ITS-CVO development, deployment, and operation can be approached by one or a combination of the three methods discussed in this chapter. The lead agencies for ITS-CVO in the states studied should consider working through a non-profit private organization or a public instrumentality to provide an overarching, cooperative mechanism for the development, deployment, and operation of ITS-CVO. Such an organization

would allow these lead agencies greater freedom in procuring and operating ITS-CVO systems without requiring wholesale changes in current laws or administrative rules governing development and operation of routine highway infrastructure. Any necessary changes in laws and rules or legislative or gubernatorial approvals to participate in such an organization would be easier to attain than wholesale changes in each state's laws, rules, and practices.

Working through such an organization, these lead agencies could develop standards for ITS-CVO functions, systems, operation, and maintenance and realize economies of scale provided by standard making and the creation of a larger marketplace. Barriers such as shortages of expertise and staffing would be minimized by such an organization because the cooperative organization would eliminate redundant duties for each state and provide the standards and guidelines necessary for public agencies to contract portions of ITS-CVO to the private sector if necessary while maintaining interoperability and maximum benefit for public agency and motor carrier users.

In Phase II of this study, the results of this research will be reported to an audience of state agency administrators from the study states, private ITS service and equipment providers, and motor carriers at a working meeting. The methods for mitigating the institutional barriers to ITS-CVO and the recommendation described in this chapter will be considered along with other possible methods for inclusion in a prioritized action plan to be developed as a result of this Phase II meeting.

1. Interview with Bob Lannert, Phil Morgan, Richard Walter, Clay Wester, and Bill Wilson, Missouri Highway and Transportation Department. June 1994.
2. Interview with Robert Miller, Jon Ogden, and Jim Pearson, Nebraska Department of Roads. May 1994.
3. Interview with Thomas Devany, David Huft, Norman Humphrey, and Dean Schofield, South Dakota Department of Transportation, and Myron Rau, South Dakota Highway Patrol. May 1994.
4. Interview with Larry Burton, Joseph Ligas, and Charles Sikaras, Illinois Department of Transportation. June 1994.
5. Interview with Ruth Skluzacek and Kermit Wilson, Iowa Department of Transportation. June 1994.
6. Interview with Laurie Anderson, Marthand Nookala, Ray Starr, and Jim Wright, Minnesota Department of Transportation, and Don Olson, Minnesota Department of Administration. May 1994.
7. Interview with Phil DeCabooter, Carson Frazier, and Alice Morehouse, Wisconsin Department of Transportation, and Gabrielle Cook and Dave Johnson, Wisconsin Department of Administration.

APPENDIX 1
CVO AGENCIES BY STATE AND RESPONSIBILITY

Table A1-1. CVO Agencies by State

State	Service	Agency
Illinois	Prorate (Registration)	Secretary of State, Commercial and Farm Truck Division
	Operating Authority	Commerce Commission
	Fuel Tax	Department of Revenue, Motor Fuel Tax Division
	Oversize/Overweight	DOT, Permit Office
	Hazardous Materials	DOT, Commercial Vehicle Safety Section
	Size and Weight Enforcement	State Police
	Safety Inspections (roadside)	State Police
Iowa	Prorate (Registration)	DOT, DMV, Office of Motor Carrier Services
	Operating Authority	DOT, DMV, Office of Motor Carrier Services
	Fuel Tax	DOT, DMV, Office of Motor Carrier Services
	Oversize/Overweight	DOT, DMV, Office of Motor Carrier Services
	Hazardous Materials	DOT, DMV, Office of Motor Carrier Services
	Size and Weight Enforcement	DOT, DMV, Office of Motor Vehicle Enforcement
	Safety Inspections (roadside)	DOT, DMV, Office of Motor Vehicle Enforcement
Minnesota	Prorate (Registration)	Department of Public Safety, Prorate and Reciprocity
	Operating Authority	DOT, Motor Carrier Services
	Fuel Tax	Department of Public Safety, Prorate and Reciprocity
	Oversize/Overweight	DOT, Road and Vehicle Information and Services
	Hazardous Materials	DOT, Enforcement Section
	Size and Weight Enforcement	Department of Public Safety, State Patrol
	Safety Inspections (roadside)	Department of Public Safety, State Patrol
Missouri	Prorate (Registration)	Dept. of Revenue, Highway Reciprocity Commission
	Operating Authority	Dept. of Economic Development, Div. of Transportation
	Fuel Tax	Dept. of Revenue, Office of Miscellaneous Taxes
	Oversize/Overweight	Highway and Transportation Department
	Hazardous Materials	Highway Patrol
	Size and Weight Enforcement	Highway Patrol
	Safety Inspections (roadside)	Highway Patrol, Kansas City and St. Louis Police

Table A1-1. CVO Agencies by State cont.

State	Service	Agency
Nebraska	Prorate (Registration)	DMV, Interstate Registration Section
	Operating Authority	Public Service Commission
	Fuel Tax	State Tax Commission, Division of Motor Fuels
	Oversize/Overweight	Dept. of Roads, Carrier Enforcement and Permit Section
	Hazardous Materials	State Patrol and Truck Enforcement
	Alcohol/Tobacco	<u>Tobacco</u> : Dept. of Revenue
	Size and Weight Enforcement	State Patrol and Truck Enforcement
	Safety Inspections (roadside)	State Patrol and Truck Enforcement
South Dakota	Prorate (Registration)	Department of Revenue, Division of Motor Vehicles
	Operating Authority	Public Utilities Commission
	Fuel Tax	Department of Revenue, Division of Motor Vehicles
	Oversize/Overweight	Highway Patrol, Motor Carrier Division
	Hazardous Materials	Highway Patrol, Motor Carrier Division
	Alcohol/Tobacco	<u>Alcohol</u> : Department of Revenue
	Size and Weight Enforcement	Highway Patrol, Motor Carrier Division
	Safety Inspections (roadside)	Highway Patrol, Motor Carrier Division
Wisconsin	Prorate (Registration)	DOT, Motor Carrier Services Section
	Operating Authority	DOT, Motor Carrier Services Section
	Fuel Tax	DOT, Motor Carrier Services Section, Fuel Tax Unit
	Oversize/Overweight	DOT, Motor Carrier Services Section
	Hazardous Materials	DOT, DOT, Motor Carrier Services Section (regulation) and Division of Highway Patrol (enforcement)
	Size and Weight Enforcement	DOT, State Patrol
	Safety Inspections (roadside)	DOT, State Patrol

APPENDIX 2
SCENARIO PRIORITIZATION MATRIX

Likely Timing of Implementation

Early	Later			
<p>1</p> <p>Electronic One-Stop Credentials</p> <ul style="list-style-type: none"> • Linked state and federal agency databases (similar to CDLIS). • Application made either electronically or by paper. • Processed by agency personnel. • Credentials deliverable in both electronic form using devices such as smartcards, etc. and traditional paper form. • Complete elimination of paper in application process possible. 	<p>2</p> <p>Automated Electronic Fuel and Mileage Apportionment and Reporting</p> <ul style="list-style-type: none"> • On-board locational/mileage data recording system. • Point-of-fueling electronic record of gallonage data. • Software for motor carrier/service company generation of electronic reports. • State administration data collection standards and EDI system protocols and operation. 	<p>3</p> <p>Electronic Toll and Traffic Management</p> <ul style="list-style-type: none"> • Uses on-board data for vehicle identification. • Carriers required to set-up EFT. • Carriers would be able to designate in advance those toll facilities authorized for electronic payment. • System would perform toll payment while maintaining user security (only user has record of who, when, and where of toll payment). • Linked systems and databases (similar to CDLIS) create virtual national system for ETTM administration. 	<p>4</p> <p>Electronic Clearance for Weight and Credentials</p> <ul style="list-style-type: none"> • On-board data for routine driver, vehicle, and pertinent load information. • Linked state and federal databases for more extensive driver and carrier data. • Roadside readers access on-board data. Non-routine information accessed in linked databases. • WIMs for weight. • Safety preclearance based on motor carrier's historical and real-time safety data (premier carrier concept). 	<p>5</p> <p>Advanced Driver and Vehicle Safety Applications</p> <ul style="list-style-type: none"> • Integrated with preclearance utilizing premier carrier concept. • Improved roadside inspection techniques and equipment. • Would be able to use data from on-board electronics and sensors such as ABS, engine management, etc. • Safety databases would be state operated and linked with Safetynet.
<p>Most Likely</p>	<ul style="list-style-type: none"> • Single public or private entity operating a true national database. • Single point for requests, processing, and payment. • Single private or public entity would process requests according to laws/rules/regulations of jurisdictions and collect and distribute fees appropriately. • No paper copies needed for application or proof of credentials. 	<ul style="list-style-type: none"> • Stateline beacon system to record entry into/exit from jurisdictions and miles traveled within. • On-board mileage tracking system used in conjunction with beacons. • On-board metering of fuel used and replace. • Single public or private entity to administer fuel and mileage reporting and revenue collection and distribution. 	<ul style="list-style-type: none"> • Individual, closed systems for each toll entity. • Standard vehicle ID/communication device. • Motor carriers would need to set up toll payment account (EFT or other) with each toll entity. • Existence of data regarding who, when, and where of toll facility use. 	<ul style="list-style-type: none"> • AVI in conjunction with national base. • All information would reside in national database. • Truck would only carry means of uniquely identifying vehicle and driver. • Self-weighting trucks reporting weights when interrogated. • Safety preclearance using a combination high-speed automated inspections of key vehicle/driver performance parameters and historical safety data.
<p>Least Likely</p>	<ul style="list-style-type: none"> • Integrated with preclearance using a single national database. • Safety preclearance based on historical safety data and remote vehicle/driver inspection using on-board sensors for key vehicle/driver performance parameters. • Roadside vehicle/driver inspections using a combination of automated inspections equipment and on-board sensors for key vehicle/driver performance parameters. 	<ul style="list-style-type: none"> • Integrated with preclearance utilizing premier carrier concept. • Improved roadside inspection techniques and equipment. • Would be able to use data from on-board electronics and sensors such as ABS, engine management, etc. • Safety databases would be state operated and linked with Safetynet. 	<ul style="list-style-type: none"> • AVI in conjunction with national base. • All information would reside in national database. • Truck would only carry means of uniquely identifying vehicle and driver. • Self-weighting trucks reporting weights when interrogated. • Safety preclearance using a combination high-speed automated inspections of key vehicle/driver performance parameters and historical safety data. 	<ul style="list-style-type: none"> • AVI in conjunction with national base. • All information would reside in national database. • Truck would only carry means of uniquely identifying vehicle and driver. • Self-weighting trucks reporting weights when interrogated. • Safety preclearance using a combination high-speed automated inspections of key vehicle/driver performance parameters and historical safety data.

Likelihood of Scenario

**APPENDIX 3
BACKGROUND MATERIALS AND SCENARIOS FOR
INTERVIEWS WITH LEAD AGENCIES FOR ITS-CVO**

INTERSTATE COOPERATION FOR IVHS/CVO STUDY

LEAD STATE AGENCY AND PROCUREMENT INTERVIEWS

State:

Background Information:

NAME	TITLE	AGENCY	ADDRESS	PHONE AND FAX

1. How long have you been in your current position? _____ years

2. How would you rate yourself in terms of knowledge related to your job responsibilities?

(circle one)

very knowledgeable knowledgeable moderately knowledgeable

unknowledgeable very unknowledgeable

3. How long have you been involved in IVHS/CVO? _____ years

4. How long has your agency been involved in IVHS/CVO? _____ years

5. How would you rate yourself in terms of IVHS/CVO knowledge?

(circle one)

very knowledgeable knowledgeable moderately knowledgeable

unknowledgeable very unknowledgeable

6. How would you rate your agency in terms of IVHS/CVO knowledge?

(circle one)

very knowledgeable knowledgeable moderately knowledgeable

unknowledgeable very unknowledgeable

INTERSTATE COOPERATION FOR IVHS/CVO DEVELOPMENT AND IMPLEMENTATION

First, thank you again for your participation in our study. Second, we want to outline a few of the areas we will be discussing with you in our meeting and provide some questions that will help you prepare for our discussions. These are just a few questions that will demonstrate the thrust of the meeting and the information we are interested in.

Relationship and Philosophy Regarding Commercial Vehicle Operations (CVO)

Is CVO a major portion of your agency's business or is it merely a blip on your screen?

What is your philosophy toward who (public agencies or private companies) should pay for IVHS/CVO or how the costs should be shared?

What are the relationships between the various agencies/departments with CVO jurisdiction?

How would you describe your agency's major functional thrust? As a regulator of CVO or as service/enforcement agency or something else?

How would you describe your agency's relationship with the CVO industry? Adversarial, friendly, amicable, etc.

Procurement History

Does your agency have experience with the procurement of specialized high-technology equipment such as computers, weather/road condition sensors, photo radar, weigh-in-motion equipment, etc.?

Has your agency had experience with any IVHS operational tests?

Has your agency/state made or attempted changes or additions in laws, administrative rules, or processes to facilitate contracting for major initiatives like IVHS?

How much experience does your agency have in contracting for technical services?

Has your agency ever contracted for services or equipment for more than one year (contracts that are subject to yearly approval by the agency/state government don't count)?

Has your agency ever granted rights-of-way, license to use, etc. in exchange for services or the use of equipment/facilities?

Has your agency used sole-source contracts for major projects such as IVHS?

Does your agency use lease arrangements for its high cost, high technology needs?

Does your agency have experience in using functional specifications?

Has your agency worked with other agencies to design a basic specification for equipment or services to create scales of economy for the procuring agencies and the bidders?

Procurement Practices and Bid Evaluation

What is the preferred method for soliciting bids for large projects (RFP to approved list, advertisement, etc.)?

Is it easier for your agency to RFP for low and conforming bid than it is to sole source or use negotiations?

Does your procurement system allow long-term contracts for services or equipment (contracts that aren't subject to yearly budget approval)?

Does your bid evaluation process use life-cycle costing measures?

Does your agency or procurement system favor technical specifications over functional specifications?

Does your procurement system allow flexibility in its process for rating bids? For example, does the system allow for additional consideration of bids that exceed specifications or offer other items/services not requested but desirable?

Has your agency ever used prequalification of bidders?

Is your agency interested in purchasing off-the-shelf rather than proprietary or developmental products?

Management and Staffing Philosophy

Has your agency privatized any services or functions that it previously performed? For example, drivers license administration, data processing, maintenance, etc.?

If your agency did not have staff with appropriate expertise or training to design, operate, or maintain a high-tech system, would contracting for these services be an option?

Would your agency be willing to administer a system that was operated in your state and other states?

Would your agency be willing to assign its responsibilities to another agency or even another state if necessary?

Is your agency allowed to make such assignments or take on responsibilities of other agencies/jurisdictions?

Resources

Does your agency have the staff or capability to add staff with the expertise necessary to operate and maintain high-tech systems like IVHS/CVO?

Is your agency able to commit funding for more than one year without being subject to yearly budget approvals?

Does your agency have the resources or ability to raise the resources necessary for new initiatives like IVHS/CVO?

Leadership

Is your agency the "lead" or primary agency for IVHS/CVO initiatives in your state?

Is making IVHS/CVO a reality a goal of your agency?

How committed is your agency to IVHS/CVO efforts?

Does your agency have the political resources to make IVHS/CVO a reality?

Are there other agencies with CVO jurisdiction or that would be involved in IVHS efforts?

Will they be willing or helpful partners in making IVHS/CVO a reality?

IVHS/CVO PROCUREMENT, OPERATION, AND MANAGEMENT SCENARIOS

Please read the following IVHS/CVO management scenarios and procurement options and make comments on the advantages and disadvantages you see for each, the ease or difficulty with which your agency/state could accommodate/ implement each management or procurement option, and your perceptions of which methods of procurement are best suited for each management option for the system/service.

Background Scenario

Your state has agreed to enter a multi-state IVHS consortium that will be providing electronic clearance and some automated safety inspection functions along major highways in the Midwest and Upper Great Plains. To fulfill your agreement, your agency/state must procure an electronic system and/or service provider that will deliver high-speed weigh-in-motion (HSWIM), automatic vehicle identification (AVI), automatic driver credential and identity verification, automated Safetynet data updating and carrier/vehicle/driver flagging from exception reports, and automated vehicle systems interrogation that allows remote inspection through an on-board system that monitors brake/ABS, engine, and lighting systems condition and performance.

To carry out these functions, you or your service provider will need the following basics:

- HSWIMs
- Communications network linking your equipment, all sites in your state, and your state to other consortium states and the FHWA. This may require in ground fiber-optic cable, radio-based systems, satellite communications, or other methods or any combination of these methods.
- Computer systems to integrate information gathered by all sensors and databases in your state, from the consortium, and from federal agencies and run decision-making software to give the bypass or pull-in signal to trucks.
- Software to interpret the data received from the truck, the HSWIM, the Safetynet database, and other facilities in the consortium's network and make decisions on bypass/pull-in.
- Vehicle Interrogation/Reader Devices for each site. These read data from the vehicle to support the following functions:

Automatic Vehicle Identification (AVI)

Driver Credential/Identity Verification

Remote On-Board Systems Inspection

- **System maintenance.** This might be done through additional agency/state technical staff with the necessary training or service agreements with vendors/other technical service providers.
- **System operation and management.** This could be done through additional agency/state technical staff with the proper training or service agreements with technical/management service providers.

In addition to those basic needs, your agency/state may also need to periodically upgrade the system, software, or maintenance and operation/management plans as new functions are implemented.

Your agency/state has several options for procuring, maintaining, and operating this IVHS/CVO electronic clearance and safety checking system/service. Some of these options are summarized on the following pages.

Management Scenario I

The multi-state consortium you have joined has agreed that each state will be responsible for the management of their electronic clearance and automated safety functions systems. As a result, your agency/state will have the flexibility to procure, maintain, operate, and upgrade the system so long as it meets the minimum performance requirements of the consortium.

Procurement Options:

- A.** Your agency/state bids the project through the traditional process of low and conforming bid. The bid only covers the initial equipment and installation to provide electronic clearance and automated safety functions that meet the consortium's minimum performance standards—it does not address maintenance, operation, or any future upgrades to the system. Once the system is installed, your agency/state will need to train staff to maintain and operate the system and request bids when future upgrades are needed. As a result of this approach, your agency/state may have a number of vendors working independently on your system over the years.
- B.** To leverage more buying power, your agency/state joins a number of other consortium states (perhaps even the entire consortium) in a combined procurement package to obtain each state's electronic clearance and automated safety functions system. The bid will adhere to traditional low and conforming bid processes except that one bid will cover all the cooperating states and

each state will pay its portion of the total cost. The bid only covers the initial equipment and installation for each state to provide electronic clearance and automated safety functions that meet the consortium's minimum performance standards—it does not address maintenance, operation, or any future upgrades to the states' systems. Once the system is installed, each agency/state will need to train staff to maintain and operate the system and request bids when future upgrades are needed. As a result of this approach, your agency/state may have a number of vendors working independently on your system over the years.

- C. Your agency/state and the other consortium members have joined together to purchase the electronic clearance and automated safety functions systems using a competitive bid process that includes a pre-qualification round designed to select the top three bid packages based on a rating system that uses life-cycle costing and transaction cost estimates to compare the proposals. Once the top three bids have been identified, the consortium members will meet with these vendors and then select the best overall bid. In addition to the actual electronic clearance and automated safety system and installation, the bids will also include maintenance and upgrades as part of the package. Except for the actual operation and management of the system, your agency/state will not be required to maintain, upgrade, or otherwise be involved with the actual hardware/software of the system except to outline needs for upgrades or enhancements. Your agency/state will only deal with the original bidder company (or companies) throughout the life of the project (as agreed in the contract).

To defray the costs of the system, the consortium states have agreed and received approval from their state governments to share the infrastructure communications system with the vendor, who may offer other services or sell time on the system to other public or private entities (a number of restrictions are placed on the use of the system to protect the state and the public while still allowing other public agencies and private industry access to potential uses and markets). In addition, the state could agree to provide non-sensitive data to the vendor or share user for a fee or other consideration.

- D. To allow your agency/state and the rest of the consortium states to focus resources on motor carrier enforcement, your agency/state and the consortium have decided to privatize the entire electronic preclearance and automated safety inspection system. Using the prequalification process described in C, the consortium will select the best bid for the service based on life-cycle costing and transaction cost comparisons between purchase and operation of the system by the consortium and provision of the services you want by the bidders (a comparison of purchase vs. service). The consortium and the vendor will be protected by length of contract and performance agreements that ensure the private vendor an opportunity to recover his costs while also allowing the consortium the ability to terminate the contract if necessary.

The responsibilities your agency/state will have is to use the system for enforcement, let the vendors know what you need, and pay fees for the use of the system. The vendor will be responsible for providing, maintaining, operating, and managing the system to provide the consortium with the services/data the states need. Helping to minimize the cost to your agency/state and the consortium for using the system is the fact that the private vendor can use the system to offer a number of other services to both motor carriers and other businesses.

To ensure privacy and protect the states from the sale or unauthorized use of data they have paid to have collected, the consortium has a very detailed agreement with the vendor specifying who owns certain types of information gathered (such as weight, vehicle license, driver license, and safety information) and for what purposes the information can be used. The vendor can be supplied certain types of information at the request of the carrier for a service. For example, a motor carrier may want to receive instant, automatic notification when one of his trucks or drivers is placed out of service. The state could provide a flag on the system for each truck placed out of service but only provide access to this flag by the vendor at the motor carrier's request. If the motor carrier wanted the service, they would then request that the state release out-of-service flag information to the vendor for use in that service. The state could then be compensated or receive other consideration for their role in providing the requested service.

Management Scenario II

Your agency/state has agreed with other consortium members to appoint and abide by the decisions of a management board that will manage the electronic clearance and automated safety functions systems in the consortium states as a consortium-wide IVHS/CVO network. The management board will consist of representatives from each state who have equal voting powers. The management board will make decisions concerning what systems and services the consortium will be using to implement the IVHS/CVO system, what functions will be offered, and how and by whom the system will be operated and maintained.

Depending on the decisions the consortium makes about how the system and services will be procured and who operates and maintains the system, your agency/state could have responsibilities ranging from financing, procuring, operating, maintaining, and upgrading the system/services to only using, financing, and helping to make decisions and recommendations about the system.

Procurement Options:

- A. Your agency/state bids the project through the traditional process of low and conforming bid. The bid only covers the initial equipment and installation to provide electronic clearance and automated safety functions that meet the

consortium's minimum performance standards—it does not address maintenance, operation, or any future upgrades to the system. Once the system is installed, your agency/state will need to train staff to maintain and operate the system and request bids when future upgrades are needed. As a result of this approach, your agency/state may have a number of vendors working independently on your system over the years.

- B. To leverage more buying power, your agency/state joins a number of other consortium states (perhaps even the entire consortium) in a combined procurement package to obtain each state's electronic clearance and automated safety functions system. The bid will adhere to traditional low and conforming bid processes except that one bid will cover all the cooperating states and each state will pay its portion of the total cost. The bid only covers the initial equipment and installation for each state to provide electronic clearance and automated safety functions that meet the consortium's minimum performance standards—it does not address maintenance, operation, or any future upgrades to the states' systems. Once the system is installed, each agency/state will need to train staff to maintain and operate the system and request bids when future upgrades are needed. As a result of this approach, your agency/state may have a number of vendors working independently on your system over the years.
- C. Your agency/state and the other consortium members have joined together to purchase the electronic clearance and automated safety functions systems using a competitive bid process that includes a pre-qualification round designed to select the top three bid packages based on a rating system that uses life-cycle costing and transaction cost estimates to compare the proposals. Once the top three bids have been identified, the consortium members will meet with these vendors and then select the best overall bid. In addition to the actual electronic clearance and automated safety system and installation, the bids will also include maintenance and upgrades as part of the package. Except for the actual operation and management of the system, your agency/state will not be required to maintain, upgrade, or otherwise be involved with the actual hardware/software of the system except to outline needs for upgrades or enhancements. Your agency/state will only deal with the original bidder company (or companies) throughout the life of the project (as agreed in the contract).

To defray the costs of the system, the consortium states have agreed and received approval from their state governments to share the infrastructure communications system with the vendor, who may offer other services or sell time on the system to other public or private entities (a number of restrictions are placed on the use of the system to protect the state and the public while still allowing other public agencies and private industry access to potential uses and markets). In addition, the state could agree to provide non-sensitive data to the vendor or share user for a fee or other consideration.

- D. To allow your agency/state and the rest of the consortium states to focus resources on motor carrier enforcement, your agency/state and the consortium have decided to privatize the entire electronic preclearance and automated safety inspection system. Using the prequalification process described in C, the consortium will select the best bid for the service based on life-cycle costing and transaction cost comparisons between purchase and operation of the system by the consortium and provision of the services you want by the bidders (a comparison of purchase vs. service). The consortium and the vendor will be protected by length of contract and performance agreements that ensure the private vendor an opportunity to recover his costs while also allowing the consortium the ability to terminate the contract if necessary.

The responsibilities your agency/state will have is to use the system for enforcement, let the vendors know what you need, and pay fees for the use of the system. The vendor will be responsible for providing, maintaining, operating, and managing the system to provide the consortium with the services/data the states need. Helping to minimize the cost to your agency/state and the consortium for using the system is the fact that the private vendor can use the system to offer a number of other services to both motor carriers and other businesses.

To ensure privacy and protect the states from the sale or unauthorized use of data they have paid to have collected, the consortium has a very detailed agreement with the vendor specifying who owns certain types of information gathered (such as weight, vehicle license, driver license, and safety information) and for what purposes the information can be used. The vendor can be supplied certain types of information at the request of the carrier for a service. For example, a motor carrier may want to receive instant, automatic notification when one of his trucks or drivers is placed out of service. The state could provide a flag on the system for each truck placed out of service but only provide access to this flag by the vendor at the motor carrier's request. If the motor carrier wanted the service, they would then request that the state release out of service flag information to the vendor for use in that service. The state could then be compensated or receive other consideration for their role in providing the requested service.

Management Scenario III

The consortium has decided to name one state as manager of the multi-state electronic clearance and automated safety system. The state chosen (not your agency/state) has extensive experience in IVHS research and application ranging from CVO to traffic management to rural traveler information. This manager state will be guided by a steering committee that ensures the needs of each state in the consortium are addressed, but the manager state will have considerable flexibility in making decisions regarding system design, operation, and mainte-

nance. Your agency/state and the other states have agreed to abide by the manager state's decisions unless a major issue arises that requires the attention of the steering committee.

As a result of this management structure, your agency's/state's responsibilities will depend on the methods and scope of procurement. For example, if all states are going to individually procure their systems/services and the lead state will coordinate these procurements and manage the system, your agency/state could have the responsibility to procure the system as well as any maintenance or upgrades. On the other hand, if the states procure all systems and services, including maintenance, operation, and upgrades, in one large cooperative contract, your agency/state may have few responsibilities other than to use the system and ensure your system needs are recognized and met.

Procurement Options:

- A. Your agency/state bids the project through the traditional process of low and conforming bid. The bid only covers the initial equipment and installation to provide electronic clearance and automated safety functions that meet the consortium's minimum performance standards—it does not address maintenance, operation, or any future upgrades to the system. Once the system is installed, your agency/state will need to train staff to maintain and operate the system and request bids when future upgrades are needed. As a result of this approach, your agency/state may have a number of vendors working independently on your system over the years.
- B. To leverage more buying power, your agency/state joins a number of other consortium states (perhaps even the entire consortium) in a combined procurement package to obtain each state's electronic clearance and automated safety functions system. The bid will adhere to traditional low and conforming bid processes except that one bid will cover all the cooperating states and each state will pay its portion of the total cost. The bid only covers the initial equipment and installation for each state to provide electronic clearance and automated safety functions that meet the consortium's minimum performance standards—it does not address maintenance, operation, or any future upgrades to the states' systems. Once the system is installed, each agency/state will need to train staff to maintain and operate the system and request bids when future upgrades are needed. As a result of this approach, your agency/state may have a number of vendors working independently on your system over the years.
- C. Your agency/state and the other consortium members have joined together to purchase the electronic clearance and automated safety functions systems using a competitive bid process that includes a pre-qualification round designed to select the top three bid packages based on a rating system that uses life-cycle costing and transaction cost estimates to compare the proposals. Once the top three bids have been identified, the consortium members

will meet with these vendors and then select the best overall bid. In addition to the actual electronic clearance and automated safety system and installation, the bids will also include maintenance and upgrades as part of the package. Except for the actual operation and management of the system, your agency/state will not be required to maintain, upgrade, or otherwise be involved with the actual hardware/software of the system except to outline needs for upgrades or enhancements. Your agency/state will only deal with the original bidder company (or companies) throughout the life of the project (as agreed in the contract).

To defray the costs of the system, the consortium states have agreed and received approval from their state governments to share the infrastructure communications system with the vendor, who may offer other services or sell time on the system to other public or private entities (a number of restrictions are placed on the use of the system to protect the state and the public while still allowing other public agencies and private industry access to potential uses and markets). In addition, the state could agree to provide non-sensitive data to the vendor or share user for a fee or other consideration.

- D. To allow your agency/state and the rest of the consortium states to focus resources on motor carrier enforcement, your agency/state and the consortium have decided to privatize the entire electronic preclearance and automated safety inspection system. Using the prequalification process described in C, the consortium will select the best bid for the service based on life-cycle costing and transaction cost comparisons between purchase and operation of the system by the consortium and provision of the services you want by the bidders (a comparison of purchase vs. service). The consortium and the vendor will be protected by length of contract and performance agreements that ensure the private vendor an opportunity to recover his costs while also allowing the consortium the ability to terminate the contract if necessary.

The responsibilities your agency/state will have is to use the system for enforcement, let the vendors know what you need, and pay fees for the use of the system. The vendor will be responsible for providing, maintaining, operating, and managing the system to provide the consortium with the services/data the states need. Helping to minimize the cost to your agency/state and the consortium for using the system is the fact that the private vendor can use the system to offer a number of other services to both motor carriers and other businesses.

To ensure privacy and protect the states from the sale or unauthorized use of data they have paid to have collected, the consortium has a very detailed agreement with the vendor specifying who owns certain types of information gathered (such as weight, vehicle license, driver license, and safety information) and for what purposes the information can be used. The vendor can be supplied certain types of information at the request of the carrier for a service. For example, a motor carrier may want to receive instant, automatic

notification when one of his trucks or drivers is placed out of service. The state could provide a flag on the system for each truck placed out of service but only provide access to this flag by the vendor at the motor carrier's request. If the motor carrier wanted the service, they would then request that the state release out of service flag information to the vendor for use in that service. The state could then be compensated or receive other consideration for their role in providing the requested service.

Management Scenario IV

The consortium has decided to name your agency/state as manager of the multi-state electronic clearance and automated safety system. Your agency/state will be guided by a steering committee that ensures the needs of each state in the consortium are addressed, but your agency/state will have considerable flexibility in making decisions regarding system design, operation, and maintenance. The other states have agreed to abide by your decisions unless a major issue arises that requires the attention of the steering committee.

As a result of this management structure, your agency's/state's responsibilities will depend on the methods and scope of procurement. For example, if all states are going to individually procure their systems/services and the lead state will coordinate these procurements and manage the system, your agency/state could have the responsibility to procure your state's system, as well as any maintenance or future upgrades, and manage the operation of the consortium-wide system. On the other hand, if the states procure all systems and services, including maintenance, operation, and upgrades, in one large cooperative contract, your agency/state would be responsible for overseeing and managing the entire system, including procurement of the system, maintenance, upgrades, and all agreements (such as cost-sharing, data ownership and use, performance standards, etc.) between the consortium and the vendors/service providers.

Procurement Options:

- A. Your agency/state bids the project through the traditional process of low and conforming bid. The bid only covers the initial equipment and installation to provide electronic clearance and automated safety functions that meet the consortium's minimum performance standards—it does not address maintenance, operation, or any future upgrades to the system. Once the system is installed, your agency/state will need to train staff to maintain and operate the system and request bids when future upgrades are needed. As a result of this approach, your agency/state may have a number of vendors working independently on your system over the years.
- B. To leverage more buying power, your agency/state joins a number of other consortium states (perhaps even the entire consortium) in a combined procurement package to obtain each state's electronic clearance and automated

safety functions system. The bid will adhere to traditional low and conforming bid processes except that one bid will cover all the cooperating states and each state will pay its portion of the total cost. The bid only covers the initial equipment and installation for each state to provide electronic clearance and automated safety functions that meet the consortium's minimum performance standards—it does not address maintenance, operation, or any future upgrades to the states' systems. Once the system is installed, each agency/state will need to train staff to maintain and operate the system and request bids when future upgrades are needed. As a result of this approach, your agency/state may have a number of vendors working independently on your system over the years.

- C. Your agency/state and the other consortium members have joined together to purchase the electronic clearance and automated safety functions systems using a competitive bid process that includes a pre-qualification round designed to select the top three bid packages based on a rating system that uses life-cycle costing and transaction cost estimates to compare the proposals. Once the top three bids have been identified, the consortium members will meet with these vendors and then select the best overall bid. In addition to the actual electronic clearance and automated safety system and installation, the bids will also include maintenance and upgrades as part of the package. Except for the actual operation and management of the system, your agency/state will not be required to maintain, upgrade, or otherwise be involved with the actual hardware/software of the system except to outline needs for upgrades or enhancements. Your agency/state will only deal with the original bidder company (or companies) throughout the life of the project (as agreed in the contract).

To defray the costs of the system, the consortium states have agreed and received approval from their state governments to share the infrastructure communications system with the vendor, who may offer other services or sell time on the system to other public or private entities (a number of restrictions are placed on the use of the system to protect the state and the public while still allowing other public agencies and private industry access to potential uses and markets). In addition, the state could agree to provide non-sensitive data to the vendor or share user for a fee or other consideration.

- D. To allow your agency/state and the rest of the consortium states to focus resources on motor carrier enforcement, your agency/state and the consortium have decided to privatize the entire electronic preclearance and automated safety inspection system. Using the prequalification process described in C, the consortium will select the best bid for the service based on life-cycle costing and transaction cost comparisons between purchase and operation of the system by the consortium and provision of the services you want by the bidders (a comparison of purchase vs. service). The consortium and the vendor will be protected by length of contract and performance agree-

ments that ensure the private vendor an opportunity to recover his costs while also allowing the consortium the ability to terminate the contract if necessary.

The responsibilities your agency/state will have is to use the system for enforcement, let the vendors know what you need, and pay fees for the use of the system. The vendor will be responsible for providing, maintaining, operating, and managing the system to provide the consortium with the services/data the states need. Helping to minimize the cost to your agency/state and the consortium for using the system is the fact that the private vendor can use the system to offer a number of other services to both motor carriers and other businesses.

To ensure privacy and protect the states from the sale or unauthorized use of data they have paid to have collected, the consortium has a very detailed agreement with the vendor specifying who owns certain types of information gathered (such as weight, vehicle license, driver license, and safety information) and for what purposes the information can be used. The vendor can be supplied certain types of information at the request of the carrier for a service. For example, a motor carrier may want to receive instant, automatic notification when one of his trucks or drivers is placed out of service. The state could provide a flag on the system for each truck placed out of service but only provide access to this flag by the vendor at the motor carrier's request. If the motor carrier wanted the service, they would then request that the state release out of service flag information to the vendor for use in that service. The state could then be compensated or receive other consideration for their role in providing the requested service.

APPENDIX 4

**PROCUREMENT METHODS FOR PROMOTING PRIVATE
SECTOR INNOVATION AND IMPROVING PUBLIC SECTOR
INVESTMENT DECISION MAKING**

A number of procurement approaches are needed to promote private sector innovation in ITS-CVO and to enable wise investment decision making on the part of lead agencies for ITS-CVO. These include the use of life-cycle costing, performance specifications in lieu of technical specifications, rewarding vendors offering superior product or service performance, and two-step procurement where technical proposals are submitted prior to cost proposals.¹ Because ITS development, deployment, and operation will rely heavily on private sector development of ITS technology and services, the ability to include these and other additional criteria and features in the evaluation of bids and proposals is necessary to ensure maximum benefit per dollar from investments in ITS. However, current procurement processes used by departments of transportation may not be equipped to handle these needs.

Life-Cycle Costing

Life-cycle costing is the process of estimating the total costs over the life of a particular good, service, or proposed plan of action, including such items as maintenance costs, opportunity costs, training costs, and depreciation costs. Procurement using life-cycle costing accounts for costs other than initial price, which is the greatest evaluation factor in a low and responsive bid approach. As a result, bids and proposals are evaluated on the merits of their total costs rather than whether they are the lowest responsive bid or proposal.^{1,2,3} Using life-cycle costing in the evaluation of bids and proposals improves investment decisionmaking by enabling consideration of cost factors other than initial cost. Life-cycle costing promotes innovation by rewarding bids and proposals whose overall life costs are lower than those of competing bids even though their up-front costs (dollar amount of bid or proposal) may be higher.

Because ITS-CVO systems are complex and will demand services and fine-tuning long after they are installed, an accurate estimate of total system costs will be both difficult and imperative.^{2,3} Of the many possible strategies for life-cycle costing, two possible strategies are well-suited to properly account for life-cycle costs of complex systems. The first is based on a chronological approach where costs are assigned to specific phases of a project including the program initiation phase, demonstration and validation phase, full-scale development phase, production phase, deployment phase, and operational phase.² The second approach divides the life-cycle of a system into functional areas based on the types of activity being undertaken, such as research and development, production, operation and support, and disposal. Support costs include maintenance, testing, training, personnel, equipment, and materials.³ Regardless of the exact method chosen, life-cycle costing should be used for procurement of high-technology systems like ITS to ensure good investment decisionmaking while promoting innovation and competition among private industry suppliers of goods and services.

Use of Performance or Functional Specifications

There are four types of specifications used in procurement:

- **technical** specification describing the product or service in detail;
- **performance-based or functional** specification describing the level of performance or functionality that must be met by a product or service;
- **reference** specification naming the independent standards the product or service must meet; and
- **proprietary** specifications referring to a brand name or particular model.

Technical specifications are the type of specification most commonly used in procurements by departments of transportation. Technical specifications describe a product or service in detail, allowing little or no room for differences among bidders in their approach to the product or service. An example of a technical specification might be for a computer, where the size of the internal hard disk might be specified (ie. 540 megabytes). All responding bids would need to meet this technical specification for the size of the hard disk to be considered. Technical specifications require that the procuring agency have the expertise to define the product or service solution that is acceptable, thus limiting possibilities to only those envisioned by the procuring agency when developing the technical specifications.

Performance or functional specifications, however, differ greatly from technical specifications by defining only the performance or functions expected from a product or service and allowing bidders to meet these performance or functional requirements. The use of performance or functional specifications relieves the procuring agency of some of the need for technical expertise since they only need to define what the product or service needs to do rather than exactly how it will be done or what equipment will be used. Using performance or functional specifications also encourages innovation, allowing private industry the freedom to develop their best services or products to meet the specified levels of performance or functionality rather than restricting them to solutions envisioned by the soliciting agency.¹

Adjusting for Superior Products or Services

Better investment decisionmaking and innovation are also encouraged by bid/proposal evaluation systems that include mechanisms to reward vendors who offer products or services that are distinctly superior to competing products or services in ways that add value such as improved durability, greater user-friendliness, or lower operating costs. Mechanisms for adjusting bid/proposal evaluation

to account for these valuable differences, such as reducing the cost score of the bid/proposal relative to other bids/proposals or evaluating life-cycle costs, invite vendors to offer better solutions by allowing them to remain competitive with other bidders/proposers even though their bid/proposal is more expensive in simple dollar terms.¹

Two-Step Procurement Processes

A two-step procurement process that evaluates the technical aspects of proposals before asking for cost proposals stimulates innovation by allowing public agencies and vendors to envision the best solutions possible and then fitting them to actual needs and budget limitations.¹ This allows public agencies to evaluate proposals on their technical merits, and then compare the best of these based on costs.

Allowing for Additional Evaluation Criteria

In addition to using life-cycle costs as a criteria for evaluation, public agencies may need to accommodate other relevant criteria in their source selection process as well. In evaluating proposals for high technology systems, long term factors such as upgradability, expandability, and reliability are often considered.⁴ As more emphasis is placed on the costs of future modifications to an initial system, future compatibility with these systems will be crucial. Consequently, vendors involved at the outset of system development may have a significant advantage over other vendors for future contracts. For example, an Internal Revenue Service contract with the Sperry Corporation for mainframe computers upgrades was justified as a sole source contracts on the grounds that only new Sperry machines were software-compatible with existing systems.⁵

Adjusting for Extra Items of Value

Similar to adjusting bid/proposal scores for products or services offering superior performance, methods will have to be established for evaluating bids that include "extra" but desirable elements. Development of ITS-CVO systems is ongoing and not all of their technical capabilities have been conceived by the public sector. Consequently, private sector vendors may include features in their proposals that have not been specified, yet have value. The procuring agency needs to be able to assign credit for such innovation when applicable. For example, Kelman documents how the Veteran's Administration handled a similar situation by assigning monetary values (rather than a point score) to desirable features included in an RFP to standardize its office-automation equipment.⁶ The intent was that if the vendor could provide a feature for the same or less than the assigned value, their overall bid would be reduced by the amount of the value assigned to the feature, therefore making their bid more competitive.

References

1. Rothwell, R. "Technology-Based Small Firms and Regional Innovation Potential: The Role of Public Procurement." *Journal of Public Policy*, Volume 4, 1984. pp. 248-282.
2. Stewart, R. and A. Stewart. *Managing Millions, An Inside Look at Government Spending*. John Wiley & Sons, Inc., 1988.
3. Seldon, R.M. *Life Cycle Costing: A Better Method of Government Procurement*. Westview Press. Boulder, CO., 1979.
4. Kelman, S. *Procurement and Public Management*. The American Enterprise Institute. Washington, D.C., 1990, p. 20.
5. Kelman, S. *Procurement and Public Management*. The American Enterprise Institute. Washington, D.C., 1990, pp. 153-60.
6. Kelman, S. *Procurement and Public Management*. The American Enterprise Institute. Washington, D.C., 1990, p. 149.

APPENDIX 5
EXAMPLE OF A PUBLIC CORPORATE
INSTRUMENTALITY: PORT AUTHORITY OF
NEW YORK AND NEW JERSEY

One notable example of cooperation among states to address specific needs on a regional basis is the Port Authority of New York and New Jersey. The Port Authority is a municipal corporate instrumentality of the two states. Governed by 12 commissioners and an executive director, the Authority is responsible for constructing and operating airports, bridges, tunnels, buildings, mass transit facilities, and waterfront development property. The commissioners, six from each state, are appointed by the governors, and the actions they take at authority meetings are subject to gubernatorial veto.¹

The two states have provided the authority with considerable independence. The Port Authority, for example, has full power to purchase, construct, lease, and/or operate any terminal or transportation facility within its district.⁴ Furthermore, the states have given the Port Authority power to borrow money on bonds or other obligations and to charge for the use of its facilities. Although the two states have subordinated many of their rules to those created by the authority, some state rules still apply. Any laws for example, under the jurisdiction of the public service commission (or like body) that pertain to private corporations, apply to facilities owned, operated, or leased by the Port Authority.⁵ Such an approach could be useful for enabling a multi-state organization for the development, deployment, and operation of IVHS-CVO consortium, allowing those laws and rules of individual states that create barriers to be replaced, and other laws or rules that are relevant but do not create barriers to be retained.

The Port Authority requires significant legislative support and involvement. The two states, for example, are required to annually appropriate funds for the salaries, office, and other administrative expenses not recovered from the tolls, fares, fees, and rentals collected by the authority.⁶ The legislatures of both states, in turn, require that on major projects, they be provided with a report of the proposed project including summaries of project costs, revenues, financial feasibility, marketing studies, and engineering, design, and environmental aspects of the project.¹ Similar oversight and involvement would be necessary for ITS as well, allowing states and agencies to ensure their interests and the interests of their constituents are being served.

A prime impetus for the creation of the Port Authority was that intense competition among railroads in the New York/New Jersey port area was resulting in duplication of services and other inefficiencies due to lack of coordination and that the public interest was not being well served.³ In order for a multi-state IVHS/CVO organization to gain acceptance, a similar public service need may have to be demonstrated.

References

1. New Jersey Statutes, Annotated Titles 31 and 32.
2. Encyclopedia Americana. Volume P, pp. 420-421.
3. New York and New Jersey Port and Harbor Development Commission. *Preliminary Joint Report*. Albany, NY, J.B. Lyon Company, Printers, 1918.
4. Encyclopedia Americana. Volume P, pp. 420-65.
5. Encyclopedia Americana. Volume P, pp. 420-69.
6. Encyclopedia Americana. Volume P, pp. 420-72.