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Review of ITS/CVO Institutional
Issues Studies

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prepared by

Cambridge Systematics, Inc.
150 CambridgePark Drive, Suite 4000
Cambridge, Massachusetts 02140

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Review of ITS/CVO Institutional Issues Studies

Several regional coalitions are developing multi-year programs for commercial vehicle operations (CVO)[1] This program will include the application of Intelligent Transportation Systems (ITS)[2] technologies and services. This report identifies the institutional barriers that are likely to impede the development of ITS/CVO programs, and recommends strategies to overcome these barriers.[3]

OBJECTIVE

Early efforts to apply ITS to CVO focused primarily on the development, demonstration, and integration of specific technologies, such as weigh-in-motion, automatic vehicle identification, and onboard computers. Over the course of these early projects, it became apparent that the most serious barrier to the effective implementation of ITS for CVO may not be the ability to perfect the technologies themselves. Instead, the most significant barriers may be non-technical or "institutional issues" related to statutory, administrative, organizational, and resource constraints on the ability of the affected public sector and private sector organizations to incorporate these technologies into their business operations. The successful implementation of ITS for CVO must address these constraints.

To this end, in 1991 the Federal Highway Administration (FHWA) offered $50,000 to each state department of transportation to study the institutional barriers to the deployment of ITS for CVO. Every state except Hawaii participated in such a study, either independently or as part of a multi-state consortium.

This report reviews the institutional issues studies, and presents a synthesis of their findings. The objective of this review is to answer the following questions:

- What institutional issues have been identified as impediments to the deployment of ITS/CVO services and technologies?

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[1] Commercial vehicle operations comprise three dozen areas of interaction involving public agencies and motor carriers. These include functions such as truck registration, size and weight enforcement, vehicle maintenance and inspection, and fleet routing and dispatching. These transactions are critical for highway safety, carrier productivity, and tax collections.

[2] ITS (formerly known as Intelligent Vehicle-Highway Systems or IVHS) involve the application of advanced and emerging technologies in such fields as information processing, communications, control, and electronics to surface transportation needs. C.f. U.S. Department of Transportation, Joint Program Office for Intelligent Transportation Systems and Intelligent Transportation Society of America, National ITS Program Plan, First Edition, March 1995.

[3] This memorandum is based upon the technical memorandum for the I-95 Corridor Coalition's Project No. 4, Commercial Vehicle Operations Phase II, Task 1, entitled, "Review of ITS/CVO Institutional Issues Studies," prepared by Cambridge Systematics, Inc. (Document number I-95 CC 4-95-02)

- What strategies have been developed to resolve these issues?

- How have the institutional issues studies contributed to the deployment of ITS/CVO services and technologies?

- What lessons can be learned for the development of future CVO programs?

STRUCTURE AND PURPOSE OF STUDIES

The institutional issues studies were intended to provide a "bottom up" perspective on the institutional barriers, as well as the strategies to overcome these barriers and develop a national ITS/CVO program. The objective of the initial round of studies was to document the existing business practices for administering and enforcing commercial vehicle regulations; describe how ITS technologies could be applied to current regulatory programs; and identify the institutional barriers to ITS for CVO.

In all, 19 studies were commissioned: seven multi-state studies, comprising 37 states and the District of Columbia; and 12 single-state studies. Rather than forcing the states into particular groupings, the FHWA let the states find their own partners. The clusters of states that formed generally represent broad regional truck markets, centered in the Southeast, Middle Atlantic, Southwest, and Northwest regions (see Figure I).
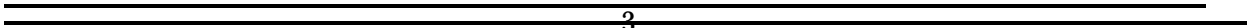
A second phase of the studies, now underway, will emphasize the development and deployment of specific ITS/CVO services (see Figure II).
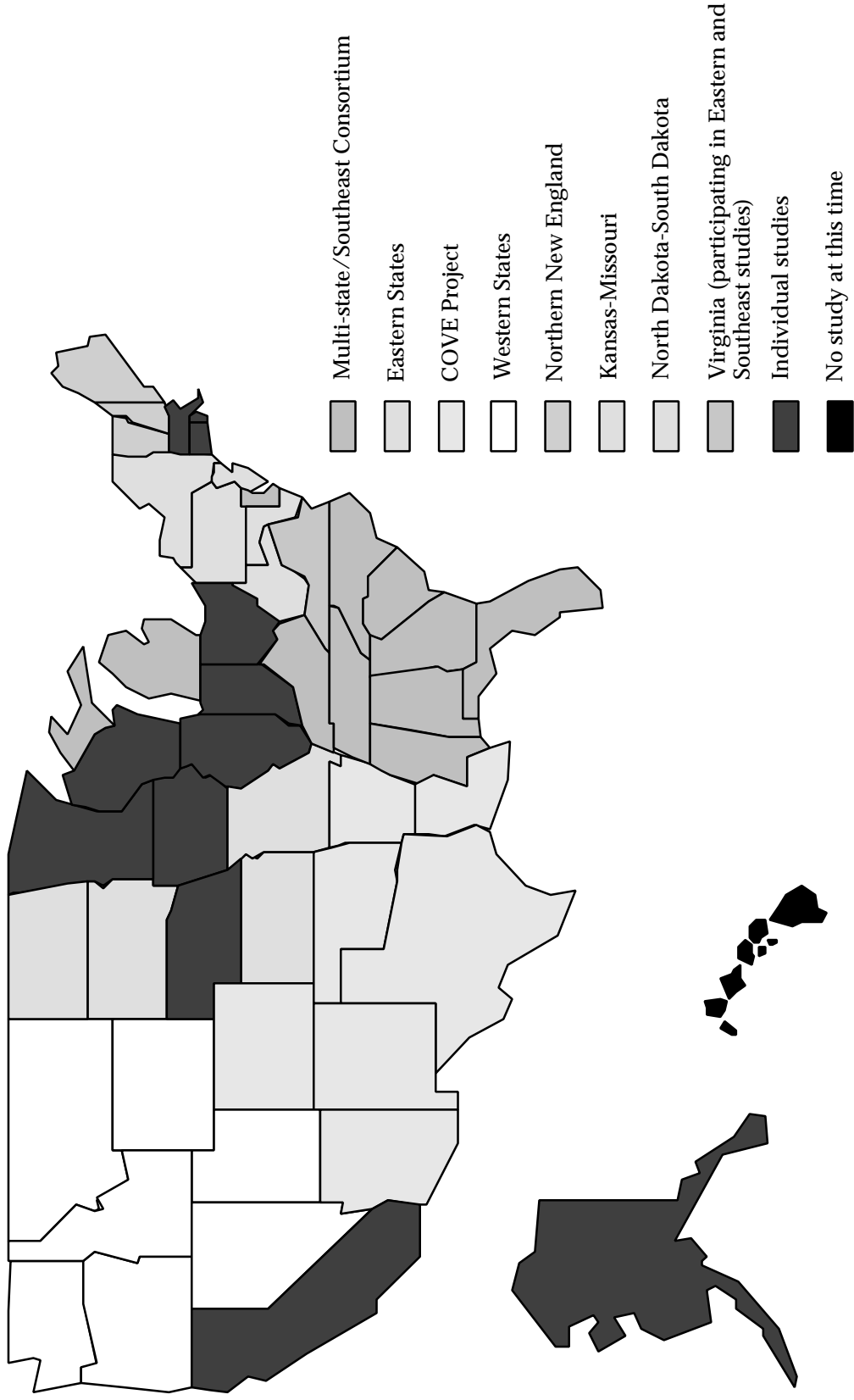
ITS/CVO SERVICES AND TECHNOLOGIES

The institutional issues studies demonstrated broad similarities in their examination of critical ITS/CVO technologies, services, and programs. The studies focused on a small list of technologies and services related to the administration and enforcement of motor carrier regulations. Other ITS/CVO services, such as fleet or traffic management, were discussed but not emphasized in the first-round studies.
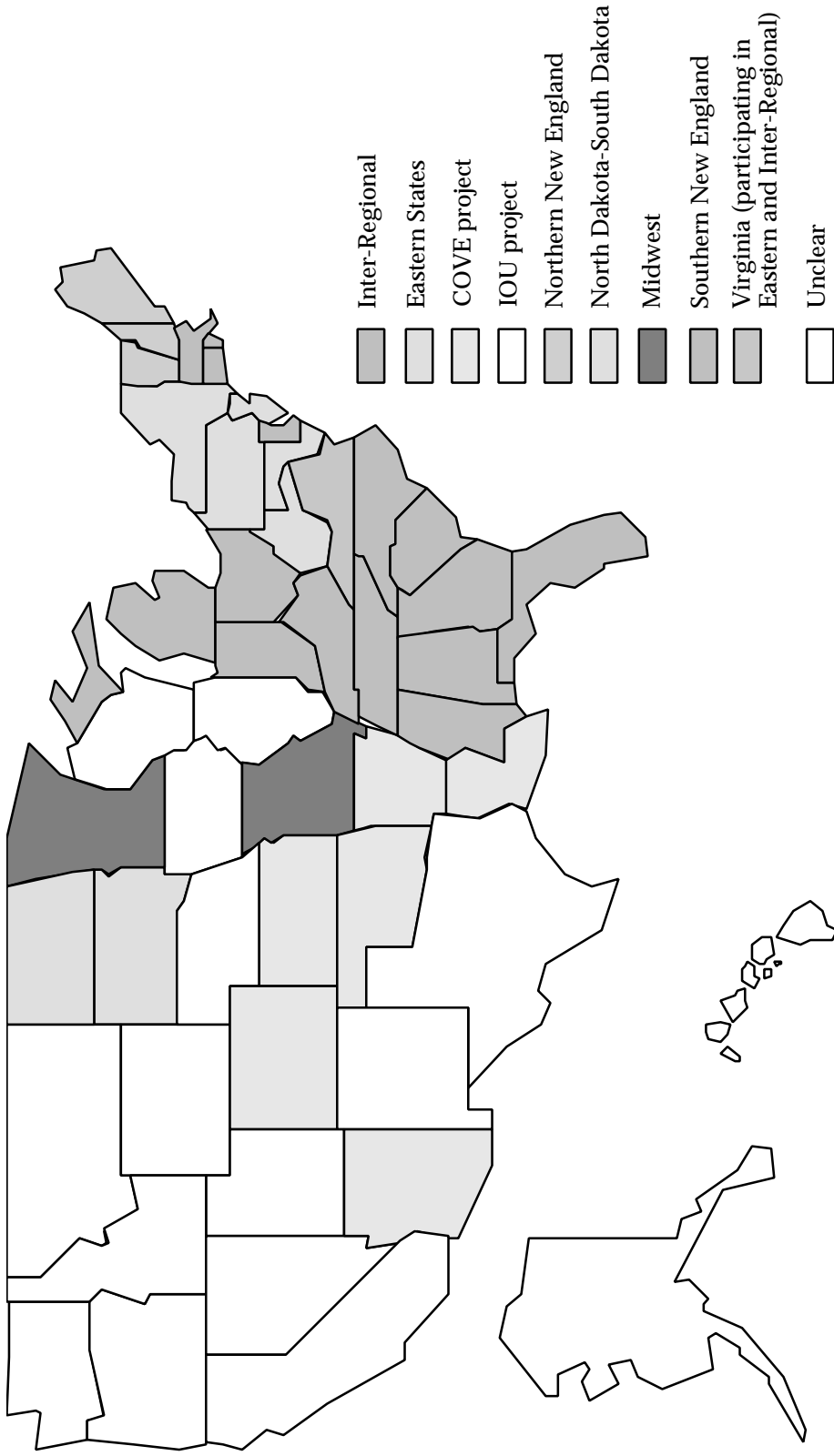
Most of the studies recommended the development of the following four ITS/CVO services (see Table I):

- Creating or enhancing information systems or central databases;

- Creating or enhancing electronic data interchange (EDI) and electronic funds transfer (EFT) capabilities;

- Enhancing mobile enforcement capabilities through the use of portable weigh-in-motion (WIM) systems, portable computers, and other technologies; and

- Automating driver and vehicle safety inspections through the use of portable computers, timely roadside access to safety databases, and specialized in-vehicle equipment.

Figure I. Configuration of Phase I ITS/CVO institutional issues studies.

Multi-state/Southeast Consortium

Eastern States

COVE Project

Western States

Northern New England

Kansas-Missouri

North Dakota-South Dakota

Virginia (participating in Eastern and Southeast studies)

Individual studies

No study at this time

Figure II. Possible Phase II ITS/CVO institutional issues studies.

Legend:
- Inter-Regional
- Eastern States
- COVE project
- IOU project
- Northern New England
- North Dakota-South Dakota
- Midwest
- Southern New England
- Virginia (participating in Eastern and Inter-Regional)
- Unclear

A copy of Table I can be found on the disk under the file name table1.doc.

These four services are likely to represent priorities for most ITS/CVO programs. Other services that were recommended include:

- Using dedicated short-range communication (DSRC), WIM, and similar technologies to develop automated methods for verifying credentials and clearing vehicles at weigh stations and other inspection sites;

- Developing a one-stop permit shopping program;

- Deploying electronic toll collection systems;

- Providing basic information services to the trucking industry (such as a toll-free information number);

- Enhancing WIM capabilities; and

- Developing advanced traveler information systems for commercial vehicles.

A central theme of many studies was that improvements to CVO administrative and enforcement activities need not involve advanced technologies. The studies found that in many states, major efficiency gains could be realized simply by making computers and EDI/EFT capabilities more widely available. Most often, the missing element is the capability for different agencies to link systems and share data.

INSTITUTIONAL BARRIERS AND STRATEGIES

The studies displayed a striking degree of commonality in the identification of institutional barriers and strategies to overcome barriers. To compare the barriers across the studies, a framework encompassing three broad categories – mandate, organization, and resources – was used.

Mandate

Mandate barriers and strategies are associated with the legal and political conditions and requirements, or the commercial market, for ITS/CVO programs. Most efforts that significantly affect the way that business operations are conducted require some kind of mandate – from legislation, executive order, popular demand, or market demand. A mandate provides legitimacy and support for action.

Barriers

The studies identified three primary mandate barriers to the ITS/CVO programs. These barriers are as follows:

- **Inconsistent support from the top management of the agencies involved in CVO.** Efforts to implement ITS/CVO services cannot succeed without support from the top management of the public agencies that are involved in CVO. Without this mandate, it is difficult to make the organizational changes or commit the resources necessary to support ITS/CVO

programs. Each agency with commercial vehicle responsibilities – from departments of transportation and revenue to state police and utility commissions – must make ITS/CVO a priority for any major innovation to succeed. However, this support is uneven and inconsistent, both among states and among agencies within a single state. A primary source of this inconsistent support appears to be a lack of customer service orientation among CVO agencies. Other contributing factors include inadequate understanding and appreciation of ITS/CVO services and their potential benefits, as well as uncertain support from state legislatures.

- **Limited support from the motor carrier industry.** Uneven and inconsistent support for ITS/CVO programs also is evident in the motor carrier industry and among third-party service providers. Most major ITS/CVO programs – apart from purely internal reengineering of state administrative processes – require that the motor carrier industry be a full partner in achieving the change. Industry support often has been limited because of fears about the use of technology for enforcement and revenue enhancement. Other contributing factors include the lack of well-defined ITS/CVO products, services, and benefits for motor carriers; concerns about equity and the impact of new technologies on smaller carriers; and concerns about data privacy, security, and use.

- **Statutory, regulatory, and administrative impediments.** In many states, the current language of statutes and regulations does not reflect the advent of modern communications systems and information technologies. References to "written communication" or "paper" credentials that are "carried" in vehicles or by drivers, if strictly enforced, would prohibit the widespread use of EDI, EFT, and DSRC.

Potential Impact on ITS/CVO Programs

These mandate barriers are likely to impede efforts to implement ITS/CVO programs in many regions. Generating support for an ITS/CVO program from the many state agencies that affect CVO throughout a region, as well as from legislative chambers and state houses, is difficult. Congestion and highway safety are well-recognized problems, but few regional stakeholders appear to realize that all of the affected states and agencies, as well as the motor carrier industry, must work together toward a common solution. The critical hurdle to achieving this top-level buy-in is the lack of understanding about CVO services, ITS technologies, and the need for change. Agencies must be convinced that investments in advanced traffic and fleet management systems, and the streamlining of administrative processes, will support their efforts to improve safety, productivity, and economic growth.

Similarly, support from the motor carrier industry for ITS/CVO services is uncertain. The diverse motor carrier industry often is divided on public policy issues. Most motor carriers agree that congestion is a problem and that improving productivity is a priority, but not all see ITS/CVO services as a solution.

Strategies

The major strategies to overcome these mandate barriers include the following (see Table II):

- **Involve the top leadership of major agencies** in the development and implementation of the ITS/CVO program, to foster a sense of "ownership" and secure "buy in." Work with

Table II. Mandate barriers and strategies.

Barrier	Strategies
Inconsistent agency support	Involve top leadership in planning and development; conduct information programs; document early successes
Limited motor carrier support	Conduct outreach programs; make participation voluntary; emphasize services with broad appeal to the industry; use a third party to manage data
Outdated statutes and regulations	Draft enabling language or legislation

middle and line-managers from state agencies on the details of deployment, and help nurture a customer service orientation.

- **Conduct education and information programs** among public sector agencies and motor carriers to raise the level of understanding about the structure, objectives, and functions of CVO, as well as the technologies and potential benefits associated with ITS.

- **Make carrier participation voluntary,** particularly in the early stages of program development. An explicit policy supporting voluntary participation will channel early benefits to the carriers who are willing to support deployment and make the required investment in necessary equipment. It also will relieve fears about the use of technology for revenue enhancement.

- **Begin with less controversial applications that will benefit a broad range of carriers.** The early stages of the ITS/CVO program should emphasize services that have broad appeal within the motor carrier industry.

- **Document the early successes of ITS/CVO projects.** Although the major demonstration projects (Heavy-vehicle Electronic License Plate [HELP] and Advantage CVO) are relatively well documented, less information is available about many of the other ITS/CVO projects and operational tests across the nation. Better documentation of these projects, and widespread dissemination of their results, can help agency and carrier managers understand the processes and technologies involved. Documentation also can make the case for agencies or carriers to invest their own time and resources in further deployment.

- **Promote changes in outdated statutes, regulations, and rules.** Agencies can draft enabling legislation or language, seek support from key legislators and administrators for the changes, and identify opportunities in existing laws and regulations where flexible language supports ITS/CVO services.

Organization

Organization barriers and strategies relate to the ways in which organizations are structured and administered, and how they respond to or implement change. ITS/CVO programs encompass three dimensions of organizational relationships: agency-to-agency, state-to-state, and agency-to-carrier.

Barriers

The studies identified three primary organization barriers. These barriers are as follows:

Lack of intrastate coordination among agencies involved in motor carrier administration and enforcement. Lack of communication, cooperation, and coordination among CVO agencies within a single state is a fundamental obstacle to achieving meaningful improvements in current CVO administrative and enforcement activities. In every state, CVO responsibilities are fragmented among multiple agencies. The goals and priorities of these agencies often are unclear or inconsistent. Redundancies and overlapping responsibilities often create "turf wars" among agencies involved in CVO. These conflicts can lead to disagreements about the objectives and configurations of ITS/CVO programs.

- **Lack of uniform regulations and policies across states.** Organizational complexity is as much a problem across states as it is within states. The problem is not just lack of coordination among states; it also encompasses outright conflicts in regulations and policies. Issues relating to intrastate organization quickly multiply when multiple states become involved in a single truck movement. For example, states with large numbers of weigh stations tend to be more concerned with preclearance than are states that rely primarily on mobile enforcement. This is but one example of where differing priorities for state CVO programs lead to conflicting needs for ITS/CVO services.

- **Lack of cooperation and trust between state agencies and motor carriers.** Historically, state agencies and motor carriers have had difficulty developing cooperative, non-adversarial relationships. For the most part, carriers have seen the state only as a regulator and collector of fees and taxes. Motor carriers have no perception of being a "client" of state services, and many state agencies are not oriented toward providing customer service to the trucking industry. Carriers and agencies often have difficulty communicating, and frequently are unable to work together.

Potential Impact on ITS/CVO Programs

Even if a mandate develops in support of an ITS/CVO program, it is not clear that the public and private organizations in the region are prepared to implement the changes that the program would require. Coordination and communication among multiple layers of organization are a significant hurdle that an ITS/CVO program must overcome. In each region, a multitude of state agencies, local governments, toll authorities, and port authorities have responsibility for some piece of the CVO process. This dispersion of authority is associated with overlapping responsibilities, conflicting priorities, and bureaucratic stalemate, both within and among states. The historical lack of cooperation and trust between agencies and carriers poses another organizational challenge.

Strategies

The major strategies to overcome these organization barriers include the following (see Table III):

- **Create formal inter-agency, multi-state, public/private working groups to improve communication.** Participants in the institutional issues studies indicated that the use of working groups dramatically improved communication and information sharing about CVO activities. These working groups have continued to meet in several states and regions.

- **Clarify the role of each state and agency, and designate a lead agency to develop and implement particular ITS/CVO services.** The working groups must make all agencies aware of the role they play in CVO, and where agency responsibilities and objectives may overlap or conflict. Once roles are defined more clearly, the next step is to develop more efficient coordination among agencies. The institutional issues studies demonstrated that multiple agencies can work together to analyze problems; now, this process must be extended to develop solutions and put them into operation.

- **Develop state, regional, and national ITS/CVO business plans and agreements.** The development of formal, written plans can resolve many concerns about roles and priorities, as well as identify future projects. Policies, plans, and programs must be developed at three

Table III. Organization barriers and strategies.

Barrier	Strategies
Lack of coordination among agencies	Create a formal inter-agency working group; clarify agency roles; designate a lead agency; develop a state CVO plan
Lack of uniform regulations and policies across states	Create a formal inter-state working group; pursue multi-state agreements; develop a regional and national CVO plan
Lack of cooperation and trust agencies and carriers	Create a formal public/private working group; involve carriers in planning and implementation

levels: the state level, because state agencies have first-line responsibility for administering and enforcing commercial vehicle regulations; the regional level, because many truck trips occur in multiple states; and the national level, because of the need to ensure uniformity of services for carriers that operate in multiple regions.

- **Involve carriers in ITS/CVO planning and implementation.** The major trucking industry associations such as the American Trucking Associations (ATA) and National Private Truck Council (NPTC) played a valuable role in the institutional issues studies. However, participation by individual carriers usually was limited by time constraints. Creative ways to obtain input and support from carriers that do not require major time commitments must be developed. Communication between agencies and carriers must be enhanced.

Resources

Resource barriers and strategies relate to the availability of key human, financial, and technical resources to produce an ITS/CVO program.

Barriers

The studies identified four common resource barriers, as follows:

- **High anticipated public and private implementation costs.** The potential cost of ITS/CVO technologies and services was identified as a barrier in every study. Funding needs include one-time capital costs for purchasing and installing equipment and for developing information systems, as well as ongoing costs for operations, maintenance, and personnel training. Cost concerns are real because of funding constraints at most CVO agencies, as well as the relatively low priority given to CVO by most state governments. The lack of demonstrated, quantifiable benefits to justify the new technologies and systems exacerbates this concern. In addition, agencies and carriers are concerned about how the costs of ITS/CVO programs will be allocated, and whether their share of costs will be in proportion to their share of benefits.

- **Lack of technical expertise among the current personnel of many CVO agencies.** Many agencies are hindered in their ability to implement ITS/CVO programs because their personnel have had limited exposure to communications and information technologies. Transportation agencies historically have been oriented around skills such as highway engineering and planning. ITS/CVO program support requires a different set of skills, including expertise in electronics, computer programming, and information systems.

- **Lack of public sector data processing capabilities, and the incompatibility of existing systems among and within states.** Inventories of existing equipment and systems confirm that many public sector agencies currently lack the data processing and information systems that are capable of handling the wide variety of data and tasks required by most ITS/CVO programs. In addition, many of the existing systems are not compatible across agencies and across states.

- **Lack of national technical standards.** The lack of clear national standards for many technologies contributes to agency and carrier reluctance to invest in ITS systems for fear that they will deploy technologies that are destined for obsolescence. Areas that need standards

include transponder capabilities, communications protocols, data definitions, and vehicle and carrier identifiers.

Potential Impact on CVO Programs

The major resource barrier facing most CVO programs will be a lack of funding. Fiscal conditions among most levels of government are tight. In addition, large numbers of CVO stakeholders raise concerns about the distribution of costs and benefits. Strengthening the mandate for ITS/CVO may increase the availability of existing funds. Efforts must be made to secure federal and state monies for large-scale programs.

The major technological hurdle is the incompatibility of existing information systems across agencies and states. Technology is less likely to be a pressing issue in regions with leading high-tech industries and a high level of formal educational attainment among area workers.

Strategies

The major strategies to overcome these resource barriers include the following (see Table IV):

- **Develop an incremental implementation plan.** Start with low-cost technologies and use the savings generated by early efforts to expand the system. An incremental approach can build support for the program, particularly as early successes are documented and publicized. An incremental approach would begin with small-scale pilot programs and operational tests, and move toward wide-scale deployment. From a cost perspective, a well-planned incremental approach that generates early cost savings can be leveraged to finance additional ITS/CVO services. From a technical perspective, beginning with relatively simple technologies can give staff time to move up the learning curve.

- **Develop a broad-based funding plan** that includes a combination of federal, state, local, and private sector resources. Federal funding can provide seed money, but ongoing program support will require a strategy to increase state and carrier investments. Agencies and motor carriers must be encouraged to share the costs of the ITS/CVO program in a reasonable manner.

- **Expand and leverage staff expertise** through a combination of offering training programs to existing staff; recruiting staff with specialized skills in engineering, electronics, information systems, law, finance, and other areas; and retaining outside contractors, where appropriate.

- **Invest in new equipment and software.** An early emphasis of ITS/CVO program expenditures should be to procure new computers, software, and data communications capabilities that are state-of-the-art and compatible with those of other states and agencies. States and agencies should cooperate in systems development and implementation.

- **Encourage the development of national technical standards** for automated communication. National agreement on the protocols for DSRC, EDI, and EFT would help achieve interstate system compatibility.

Table IV. Resource barriers and strategies.

Barrier	Strategies
High anticipated public and private implementation costs	Adopt an incremental implementation plan; develop a broad-based funding plan; document costs and benefits
Lack of technical expertise among current personnel of state agencies	Begin with simple technologies; set up training programs; recruit new staff or retain outside contractors as needed
Incompatibility of existing information systems across states	Invest in new equipment and software; cooperate in systems development and implementation
Lack of national technical standards	Encourage the development of standards

RECOMMENDATIONS FOR REGIONAL CVO PROGRAMS

The analysis of the institutional issues studies reveals several lessons that regional ITS/CVO consortia should apply in developing their long-term ITS/CVO programs:

- **Form and support multi-state, multi-agency working groups.** The establishment of formal working groups proved to be one of the most valuable contributions of the institutional issues studies. The most successful groups have endured beyond the projects' completion to implement some of the recommendations. All regions should identify opportunities to form strong, cohesive working groups. Federal or state resources will be necessary to ensure continuity of participation in these groups.

- **Incorporate the full spectrum of agencies involved in CVO.** The more successful institutional issues studies benefited from participation by a wide range of CVO agencies – not just state DOTs, but also state police, revenue departments, public utility commissions, and toll authorities. Unless all of these agencies begin to communicate and work together, it will be impossible to achieve an effective solution to the organizational problems facing CVO. Many of these agencies are not members of a regional consortium and must be engaged in the process.

- **Seek private sector participation.** It is clear from the institutional issues studies that many state agencies do not understand fully the needs and desires of the motor carrier industry. The studies experienced varying degrees of success in involving the motor carrier industry. Most working groups included representation from the American Trucking Associations (ATA), the National Private Truck Council (NPTC), or another association, but less than half of all studies benefited from dedicated participation by individual motor carriers. Regional consortia must develop innovative ways to involve motor carriers in the planning process.

- **Include a major outreach effort.** The regional consortium must reach out to all relevant agencies and to the private sector to increase the awareness of, and participation in, ITS/CVO programs. The institutional issues studies highlighted widespread deficiencies in the awareness and appreciation of not only particular ITS technologies, but also the full scope of CVO. The development of a common framework for understanding ITS and CVO would enable more substantive discussions among the CVO stakeholders in the corridor.

- **Document the costs and benefits of ITS/CVO projects.** Benefit/cost analysis has been the weak link of the institutional issues studies. Although formal benefit/cost analysis often requires a large data collection effort, the regional consortium must develop information on the benefits and costs of its projects to build support and diffuse concerns about funding.

- **Address the needs of individual states.** The experience of the institutional issues studies suggests that multi-state projects are better able to address the full spectrum of challenges facing interstate trucking and CVO regulation. However, single-state projects are more adept at generating tactical recommendations and supporting the implementation process. Regional consortia should recognize that the challenges, political systems, and personalities involved in CVO vary across states. The process for developing and implementing the ITS/CVO program must provide both a common vision for the region and a means for individual states to pursue projects of interest.

Table I. ITS/CVO programs recommended by institutional issues studies.

Programs	Selected Studies							
	Eastern States	NNE	CT	MA	South East	COVE	Western States	CA
Set up/enhance information systems/central database	◆	◆	◆	◆	◆	◆	◆	◆
Enhance EDI and EFT capabilities	◆	◆	◆	◆	◆	◆		
Enhance mobile enforcement capabilities	◆	◆	◆	◆	◆	◆	◆	
Automate driver/vehicle safety inspections	◆	◆	◆	◆	◆	◆	◆	
Develop and deploy electronic preclearance	◆	◆		◆	◆	◆	◆	◆
Test/implement one-stop shopping concept	◆		◆	◆	◆	◆		◆
Automate toll collection	◆	◆		◆				
Develop basic information services for motor carriers	◆	◆	◆	◆				
Monitor international border clearance		◆				◆	◆	◆
Enhance WIM capabilities		◆			◆	◆	◆	