

Final Summary Report

CVISN Business Case



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16. Abstract The objective was to evaluate economic justifications and institutional issues affecting motor carriers and State transportation agencies regarding the deployment of CVISN technologies. CVISN (Commercial Vehicle Information Systems and Networks) includes: interstate credentials administration (registration and permitting), electronic screening (transponder-based weigh station bypass), and safety information exchange. This report summarizes two similar but separate business cases, one primarily from the State government perspective and the other from the motor carrier industry perspective. Results are based on interviews with 60 representatives of commercial vehicle-related businesses and agencies. The most important benefits of CVISN are time savings, increased efficiency, and improved opportunities for collaboration between states and motor carrier associations. For motor carriers, an economic analysis based on a 10-year deployment indicates significant, near-immediate financial benefits to carriers from taking part in electronic credentials administration, primarily through the ability to put new trucks into service more quickly. The overall return on investment ratio for electronic credentialing is estimated at 2,971:1. For electronic screening, for all but one of the companies under study, the projected 10-year return on investment ranges from 6.1:1 to 15.9:1, with payback periods of less than one year. For the motor carrier industry, these findings suggest that wider adoption of CVISN technologies would yield significant returns on relatively modest investments.			
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1.0 Introduction, Background, and Methods

1.1 Objective

The purpose of this Commercial Vehicle Information Systems and Networks (CVISN) report is to provide motor carriers and other industry stakeholders with an executive-level, summary description of the benefits and costs of CVISN deployment. The report is intended to help motor carriers and others involved in commercial vehicle operations (CVO) make informed decisions on adoption of CVISN technologies.

The objective of this report is to summarize the findings of two recent, related business cases that have been developed to facilitate further deployment of CVISN technologies:

- A Business Case for CVISN (FHWA 2006)
- Economic Analysis and Business Case for Motor Carrier Industry Support of CVISN (FHWA 2007).

The intended audience includes decision-makers at motor carrier companies (especially larger for-hire and private carriers) and other public- and private-sector stakeholders, such as State transportation officials, private service bureaus, or credentialing brokers, who are interested in CVO. This summary business case presents actual costs, monetized benefits, and qualitative outcomes associated with CVISN technology deployment.

While the two reports cited above are similar in their topic, they differ in their areas of focus. The 2006 report is based on interviews with State government officials and representatives of State trucking associations (industry trade groups). It presents more qualitative perspectives, and focuses on how CVISN is being deployed by the States, especially with respect to how State programs affect the motor carrier industry. The 2007 report, by contrast, is based on interviews with individual for-profit motor carrier companies, both those involved with CVISN and those that are not involved. The 2007 report is more quantitative, reporting actual costs incurred and benefits achieved by motor carriers who have deployed CVISN technologies. The report examines the life-cycle benefits and costs of CVISN deployment, and presents annual and 10-year net benefits estimates as well as carrier return on investment ratios.

This combined summary report synthesizes and presents the highlights of both business case reports, with the purpose of making available a brief, high-level, overview of the findings. Further detail, methodology, and analysis can be found in the two separate business case reports.

This summary report is organized into six sections, as follows:

1. Introduction, Background, and Methods
2. Perceived Barriers and Limitations to Deployment of CVISN Technologies
3. Qualitative Benefits of CVISN
4. Economic Analysis of CVISN Technology Adoption

5. Implications for the Motor Carrier Industry, States, and CVO in General
6. References.

1.2 The CVISN Program

The CVISN program, being led by the Federal Motor Carrier Safety Administration (FMCSA), represents the collection of State, Federal, and private-sector information systems and communications networks that support CVO. CVISN deployment, which was formalized in the mid-1990s, provides a technical framework for electronically collecting and exchanging motor carrier safety and interstate registration and tax payment information and for making that information available at the roadside.

As of August 2007, 18 States have completed deployment of CVISN Core Capabilities and are pursuing Expanded CVISN deployment. [Core Capabilities were formerly known as Level 1 deployment, defined in the Introductory Guide to CVISN (FMCSA 2000)]. Many other States (27) are actively implementing portions of the Core Deployment program, and five states are in the planning and design phase of their work toward Core Deployment. The extent of deployment varies from State to State and from technology to technology. Figure 1 illustrates CVISN program status by State.

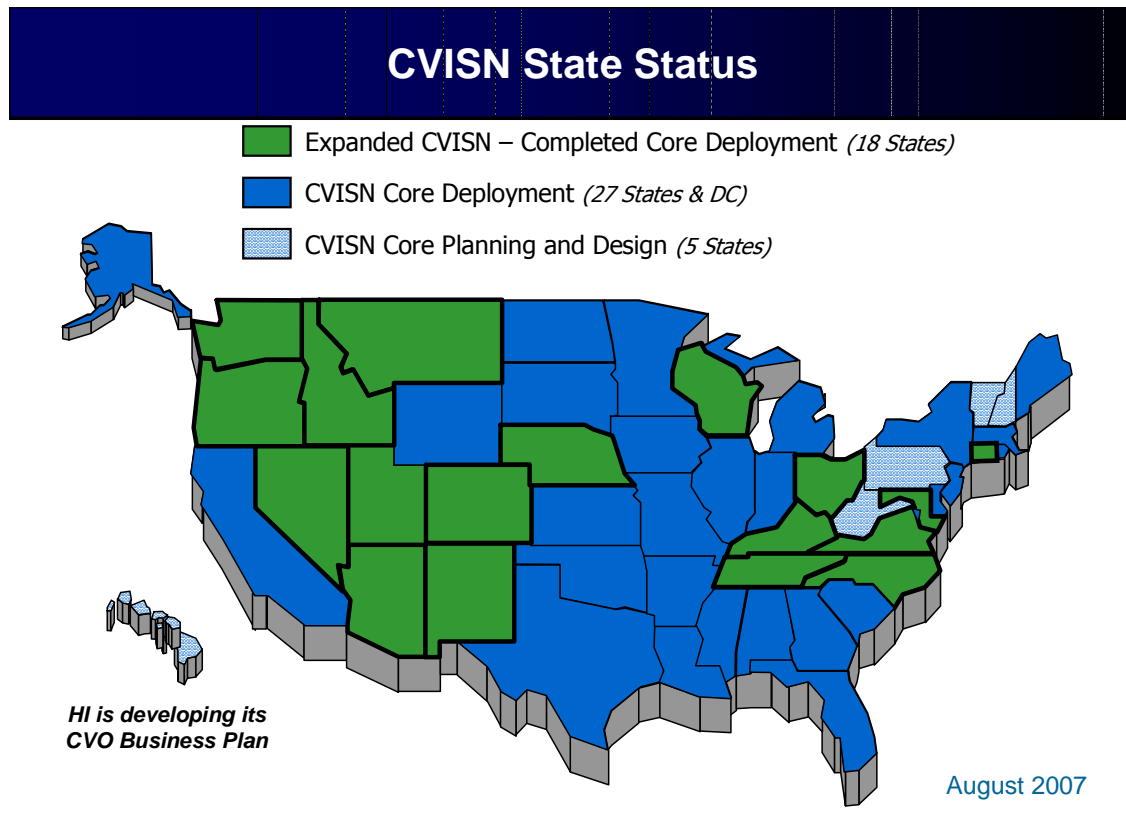


Figure 1. Core CVISN deployment status

(source: Johns Hopkins University Applied Physics Laboratory)

The CVISN program has deployed information systems to support implementation of a set of core capabilities in three areas:

- **Interstate credentials administration**—Using web sites to enable motor carriers and service bureaus or brokers to apply for, pay for, and receive International Registration Plan (IRP) and International Fuel Tax Agreement (IFTA) credentials and certain other types of operating permits, such as trip permits, oversize/overweight permits, or other temporary credentials, electronically.
- **Roadside electronic screening**—Using technology to identify trucks electronically at mainline speeds and allow some safe and legal trucks to bypass weigh stations while focusing the State’s enforcement resources on higher risk carriers and vehicles. Each truck in the program is equipped with a dedicated short-range radio frequency transponder that emits a unique identifying signal. Receivers and transmitters near the road, upstream of the weigh station, communicate automatically with the truck. Using historical and current data, computerized algorithms make a real-time determination as to whether the vehicle should be pulled in for closer inspection. The system then signals the driver to either pass by or enter the weigh station. Although the great majority of trucks are not yet equipped with transponders, almost 500,000 trucks are. These include about 401,000 trucks in PrePass and 93,000 in Norpass (the two leading e-screening programs) as of summer 2007. The States that offer e-screening are seeking to increase the numbers of enrolled trucks.
- **Safety information exchange**—Electronically collecting and exchanging safety performance and other information among States, Federal agencies, motor carriers, and other stakeholders, and transferring these kinds of data between the roadside and various central databases.

These three capabilities rely mainly on State agencies to develop and deploy hardware, software, and network systems, and use these technologies in day-to-day operations and enforcement. To their credit, States have made significant progress in implementing CVISN core capabilities. This summary business case is intended to complement the States’ efforts by increasing motor carriers’ awareness of the economic benefits of participation in the electronic services available as a result of the CVISN program. Numerous benefits of CVISN depend on wider adoption of the technologies. FMCSA is interested in documenting the business benefits for motor carriers.

The two major components of CVISN that are most applicable to motor carrier profitability are electronic credentialing and electronic screening. These two CVISN functions will be the focus of the economic analysis within this summary business case. The benefits of safety information exchange, especially among State government stakeholders, will also be discussed.

1.3 Methodology

A major focus of this summary report is to synthesize the results of two information collection tasks that gathered hard data and stakeholder opinions toward CVISN. Data were collected from motor carriers, State safety and transportation officials, and professional trucking industry associations. Two approaches were used to collect these data.

The **2006 FHWA report** was designed to “qualitatively demonstrate the benefits to motor carriers of an advanced CVISN infrastructure.” Researchers interviewed 15 State CVISN officials in ten States, private trucking association representatives from five States, and two national trucking association executives as part of their effort. The 2006 report also included material from a review of relevant literature since 1996 and information from the State CVISN self-evaluation reporting process.

For the **2007 FHWA report**, motor carriers were contacted directly. Carriers were asked a series of questions designed to collect information on their opinions concerning the effectiveness of CVISN and quantitative information about any specific costs and benefits their company has observed, relative to CVISN deployment. If a carrier had not deployed any CVISN technologies in its business, then callers asked about general awareness of CVISN, and any perceived barriers to deployment. Researchers used telephone and e-mail methods to contact 272 carriers and service bureaus, resulting in 38 completed surveys (for a response rate of approximately 14 percent). All companies operated across State lines. All data collectors used a single interview guide as a script for the phone interviews, and pilot-tested the interview guide in advance.

The primary sources of carrier company contacts for the calling lists were (a) motor carriers in the Federally sponsored Motor Carrier Management Information System (MCMIS) census file and (b) industry-proprietary, geographically representative lists that were derived from States with active CVISN programs and also reflected carriers that are active on State or national trucking associations’ “tax and registration” committees.

Carriers chosen from the MCMIS database represented those that were shown to be operating more than 20 power units. The 20-truck minimum company size was chosen because it was thought that these larger carriers would be more likely to (a) have staff dedicated to the credentials and safety/screening functions affected by CVISN, (b) have staff available to participate in telephone interviews, and (c) have deployed some aspect of CVISN, which represented the main target population for the survey. The vast majority of motor carrier companies operate very few trucks; however, the top 20 percent of U.S. carriers by company size are responsible for approximately 80 of all drivers, trailers, and tonnage in the industry (Murray 2007).

Figure 2 summarizes the characteristics of the motor carriers surveyed for the 2007 study. The numbers of States the carriers operate in ranged from 7 to 50, with most carriers reporting 48 States. The vast majority of carriers were for-hire, as opposed to private (company-dedicated) carriers. Fifteen respondents were primarily truckload (TL) carriers; eight were less-than-truckload (LTL), and 11 reported carrying both kinds of loads. Most respondents used dry freight vans most commonly, followed by refrigerated vans and straight trucks. Other trailer types were reported much less frequently. Carriers in this population reported being responsible for between 22 and 90,000 power units, including company-owned, leased, and owner-operator power units.

The data collected from these carriers were analyzed using an economic model to project life-cycle costs and benefits, and to compare these two values to yield an estimated return on

investment for motor carrier companies that choose to adopt CVISN technologies. Findings from the telephone survey were also supplemented by a review of the recent literature on the economic feasibility of CVISN deployment.

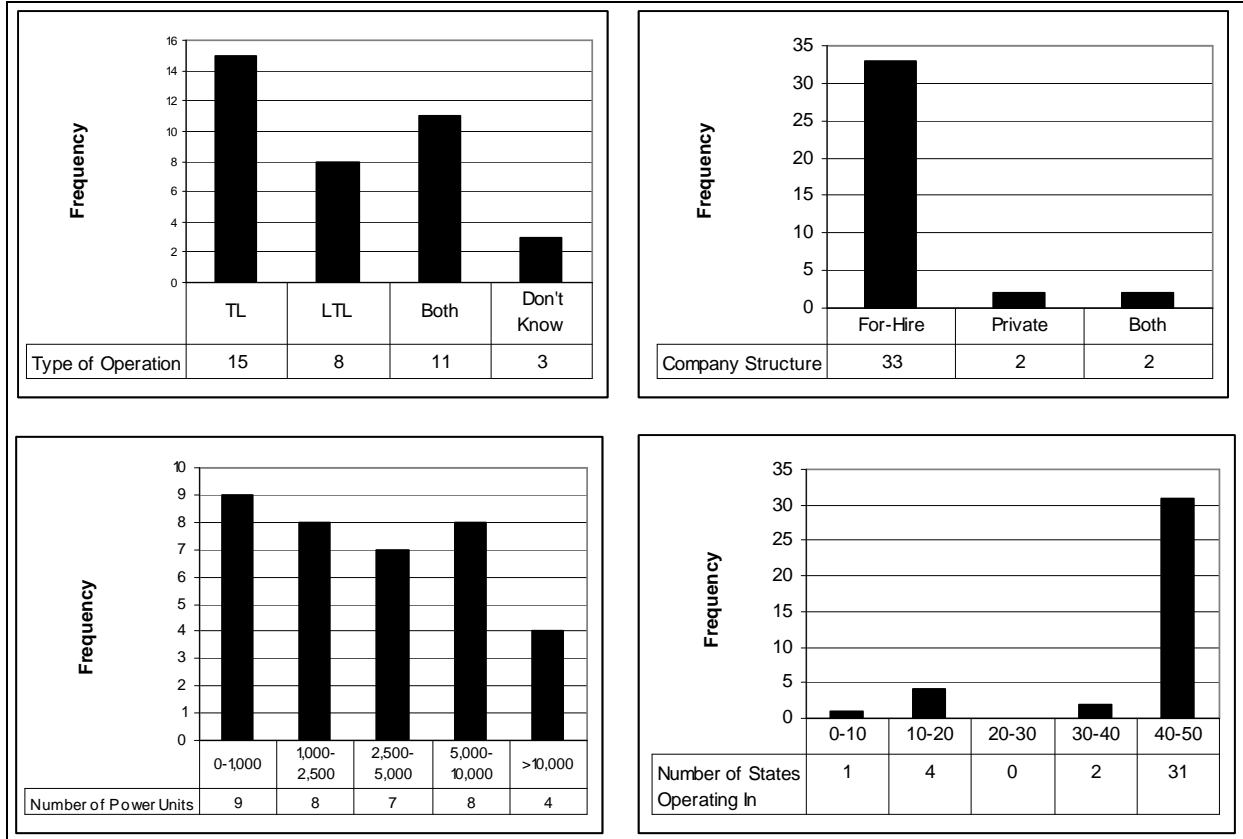


Figure 2. Characteristics of surveyed motor carriers

2.0 Perceived Barriers and Limitations to Deployment of CVISN Technologies

Despite the successful deployment of CVISN technology by many States and motor carriers (as documented in Sections 3 and 4 below), barriers to widespread adoption remain. Among the purposes of both business cases was to learn more about carriers' awareness of and attitudes toward CVISN, and to characterize any actual or perceived institutional and business impediments to further deployment. Table 1 lists the main concerns given by State transportation officials and motor carrier association representatives in the 2006 report (indicated by the ♦ symbol) and concerns given by motor carrier company representatives in the 2007 report (×). The table is organized according to the three CVISN functional areas. The table shows that several of the concerns were voiced by both groups of respondents.

Table 1. CVISN Concerns Voiced by States and Motor Carriers

Concern	Concern Applies To		
	SIE	ES	EC
Increased government regulations	◆	◆ x	◆
Inequities in distribution of benefits	◆		
Perceived reliance on untested or unstable technology	◆	◆	◆
Consistency of the standards that govern CVISN implementation	◆	◆ x	◆ x
High adoption costs for CVISN services		◆ x	◆
Willingness of drivers to comply with implementation	◆	◆ x	◆
Privacy concerns connected with the ready access to records	◆	◆	◆
Sharing information might affect company's competitiveness		x	
Lack of information about capital and operating costs		x	x
Different operating conditions in different states		x	
Inconsistent payment mechanisms across states			x
Administrative duties to keep transponder records updated		x	
Not all permits are available electronically in all states			x
Multiple passwords needed for different state systems			x

Key: SIE = safety information exchange
 ES = electronic screening
 EC = electronic credentialing
 ◆ = from FHWA (2006)
 x = from FHWA (2007)

Motor Carrier Industry. Portions of the motor carrier industry consider the CVISN program as increased government regulation and as a route to expanded revenue collection. Some motor carriers are also concerned that sharing electronic screening information with the government could impact their competitiveness.

There is some lack of clarity on the benefits of CVISN technology adoption. Carriers are concerned that the distribution of benefits from participating in CVISN is not equitable, favoring larger carriers more than smaller carriers. The lack of information on capital costs, maintenance costs, added costs to support interoperability between States, and the lack of quantitative information on benefits is seen as a barrier to adoption of CVISN technologies, especially by smaller carriers. The quantitative cost and benefit information presented below is intended to address these kinds of information needs.

Carriers are concerned that the system would benefit certain groups of drivers, particularly those with clean records. Carriers also perceive that CVISN could be used to track vehicles and to determine driving patterns for hours-of-service (logbook) enforcement, or in an accident investigation situation. Drivers also perceive barriers to CVISN deployment. In general, drivers do not expect to benefit directly from CVISN technology, and they tend not to trust computers or government agencies to fairly track and monitor their operations. Inconsistent interpretation of permitting requirements across jurisdictions makes some drivers reluctant to use on-line credentialing.

Lack of incentives or mandates for motor carriers to participate in electronic screening is seen as another barrier to adoption. The time savings from electronic screening is relevant only in States where motor carriers must routinely stop at weigh stations. For companies operating in other States, there is little incentive for motor carriers to participate in a voluntary screening program.

Lack of standardization of electronic credentialing and electronic screening across States has been cited as a barrier to adoption. Motor carriers desire standardization of bypass guidelines for screening vehicles across all States. Motor carriers have cited the need to have one nationwide transponder and the need to make current data uniformly available across jurisdiction in an accurate, consistent manner to increase interoperability. Standardization of formats for various types of processes involved with obtaining electronic credentialing and screening permits and increasing the number of permits and applications available online across States would also be considered beneficial. Creating a one-stop shop for e-credential administration would be welcomed by the motor carrier industry. Finally, consistently providing for electronic payment for services would help carriers complete permit and credential applications in a timely manner.

State Government. Barriers to CVISN deployment within State government include the following:

- Difficulties in crossing jurisdictional or organizational boundaries, particularly when computer and information technology resources are distributed across several functions and operated by agencies outside the control of the transportation/public safety agencies.
- Integration of State legacy systems and data resources with new, different data exchange requirements needed by CVISN functions.
- Lack of funding from in-State and external sources, to support the needed hardware and infrastructure to support real-time data sharing. For example, internal security, border security, and hazardous materials transport have recently been emphasized, leaving information technology, administration, and safety initiatives with fewer opportunities for funding.
- Need for coordinated marketing of CVISN initiatives.
- Difficulties brought about by turnover of experienced staff in key information technology and “program champion” areas.

A discussion of past, current, and future approaches that carriers and government agencies may use to overcome some of these barriers is presented in Section 5.

3.0 Qualitative Benefits of CVISN

Both of the CVISN business cases describe the benefits of the CVISN program. Table 2 summarizes the main benefits listed by State transportation officials and motor carrier association representatives in the 2006 report (indicated by the ♦ symbol) and the benefits named

by motor carrier company representatives in the 2007 report (×). The table is organized according to whether the benefit accrues primarily to the industry, the State, or both; and also by the three CVISN functional areas. As with the previous table of concerns, this table shows that several of the benefits were recognized by both groups of respondents.

Table 2. CVISN Benefits Comparison

Benefit	Benefit Applies To		Benefit Derived From		
	Carrier	State	SIE	ES	EC
Increased ease of permit application process	◆ ×	◆			◆ ×
Instant access to online data at inspection sites	◆	◆	◆	◆	
More complete level of enforcement, focused on noncompliant drivers	◆	◆	◆	◆	
Improved level of customer service	◆	◆			◆
Document processing cheaper, faster, and more efficient	◆ ×	◆			◆ ×
Improved motor carrier/state relations	×	◆	◆	◆ ×	◆
Reduced number of inspections of low-risk vehicles	◆	◆	◆	◆	
Reduced delays for inspected vehicles	◆			◆ ×	
Improved motor carrier safety keeps costs down	◆		◆	◆	◆
Improvement in data quality and accuracy		◆	◆	◆ ×	◆ ×
Reduced costs (recovery of investment)	×			×	×
Get trucks into service more quickly	×				×
Increase in driver morale and on-time delivery	×			×	
Improved carrier access to electronic records	×			×	◆ ×
Availability of good, timely technical support	×				×

Key: SIE = safety information exchange
 ES = electronic screening
 EC = electronic credentialing
 ◆ = from FHWA (2006)
 × = from FHWA (2007)

The following major qualitative benefits and long-term trends were identified for electronic screening, electronic credentialing, and safety information exchange.

3.1 Qualitative Benefits Derived from Electronic Credentialing

Motor Carrier Industry

- CVISN allows motor carriers to place new trucks on the road faster to begin earning revenue because credentials can be issued far faster. This may save days in the process when comparing traditional mail service with computer processing.

- Motor carrier access to the credentialing system(s) from their own offices may save trips to agency offices entirely and in other cases reduces the wait time at the agency since paperwork has already been completed.
- Last-minute credentialing can be conducted through the use of temporary permits while official documents are sent in the mail.
- CVISN reduces the administrative burden in regulatory compliance, due to electronic credential applications and tax filings. All compliance needs can be handled through a dedicated software interface or terminal.
- Companies save labor on applications. One carrier reported saving about one hour of administrative labor per power unit per year (FMCSA 2004).
- The ease with which permits can be obtained decreases the chance of a carrier having to send trucks out without the appropriate permit.
- Companies reduce their costs and bureaucracy as credentialing conforms to a standard, system-wide architecture.
- Electronic credentialing helps to bring uniformity of credentialing services across North America.

State Government

- Electronic credentialing provides States with financial rewards through greater speed and accuracy of information exchange, and labor savings.
- State employees can approach their electronic credentialing work in a more structured manner, compared to serving the majority of customers face-to-face.
- Administrators and enforcement personnel have more timely access to required information.
- States can make improved analyses of the long-term impact of changes to policies and practices, using measured data from CVISN systems.
- Businesses in remote locations have more reliable access to current information from the State
- Through automation, CVISN brings to light problems in data quality, enabling State officials to make needed changes.

3.2 Qualitative Benefits Derived from Electronic Screening Applications

Motor Carrier Industry

- Through mainline electronic screening, safe and legal carriers are able to incur less delay and provide more efficient movement of freight, saving time and money,
- Carriers improve safety related to reduction in backups onto the mainline.
- Vehicles avoid wear and tear on mechanical systems (clutches, brakes, and drive trains) caused by stopping and starting at weigh stations.
- Drivers can operate more safely without having to slow down, speed up, and merge as often in traffic, which should lead to fewer truck-involved crashes.
- Improved motor carrier safety helps keep costs down (especially insurance).
- Bypass time savings results in fuel savings.
- Electronic screening programs eliminate or reduce the time that enrolled vehicles spend at weigh stations and ports of entry, thereby increasing productivity by allowing drivers to spend more of their time driving.
- Increased efficiencies will enable carriers to guarantee more on-time deliveries and facilitate the more efficient flow of goods, thereby reducing costs further.
- Electronic screening helps to level the playing field for all trucking operations through close monitoring of the drivers. CVISN technology will motivate all drivers and carriers to comply with laws and regulations.
- CVISN technology can help drivers with good safety and performance records to have opportunities to find employment and can help companies to promote the safety records of their drivers.

State Government

- States can better enforce registration, licensing, weight, size, and tax regulations through electronic screening.
- Safe and legal motor carriers receive economic and efficiency benefits from electronic screening, which helps the States by encouraging more carriers to operate in compliance with safety regulations.

3.3 Qualitative Benefits of Safety Information Exchange

Motor Carrier Industry

- Carriers benefit from safer roads when law enforcement officials are able to target the highest-risk carriers from among the traffic stream.
- Improved safety enforcement based on accurate past inspection history and other relevant factors should—in the long term—encourage fleet managers and drivers to comply with safety regulations.
- The reduced numbers of high-risk vehicles on the road should level the playing field for all carriers, increasing the fairness of competition.
- Once real-time inspection reports are available online, multiple inspections of the same vehicle at nearly the same time should be reduced.

State Government

- Electronic processing, file downloads, and remote wireless access to historic databases have enabled inspectors in some States to reduce by half the time required to inspect a truck and prepare an official report.
- While the total amount of time spent by the State in conducting inspections may remain the same, the portion of their time that safe and compliant trucks spend in inspections should eventually decline.

3.4 Qualitative, Long-Term, General Benefits

Motor Carrier Industry

- In States that use CVISN technologies, carriers that offer discount services at the expense of safety or observance of the law are more likely to be caught, reducing the perceived cost of compliance for the more safety-conscious carriers.
- The successful implementation of CVISN has repeatedly been linked to active involvement and support from motor carrier organizations. As such, the development of a CVISN program in a State represents the chance for motor carriers to influence policies and procedures.
- The increased visibility and familiarization of roadside enforcement procedures and systems has greatly reduced animosity and apprehension between commercial vehicle drivers and members of the enforcement community. The two groups understand that they must work together in order to make a safer, more efficient system.

- Motor carriers are able to operate with increased levels of efficiency and effectiveness, and with fewer delays and a more predictable schedule, all of which benefits shippers as well as carriers, thereby helping generate new and repeat business.

State Government

- States have used CVISN deployment as a means of fostering interagency cooperation and lifting institutional barriers, improving relationships among various State departments.
- CVISN has applications to the increasingly important security field, through the sharing of CVO information across agencies and jurisdictions.

In general, the qualitative benefits reported by respondents coincided closely with the quantitative, economic benefits identified, as described in the following section.

4.0 Motor Carrier Economic Analysis of CVISN Technology Adoption

The benefits and costs that would be incurred by a motor carrier that elects to deploy CVISN technology for electronic credentialing and electronic screening were estimated (FHWA 2007). Motor carriers were asked to provide both one-time, startup costs for deploying CVISN technologies and recurring, annual costs for operations and maintenance of CVISN technologies. The following sections provide the summary-level, bottom-line, return-on-investment data for both electronic credentialing and electronic screening, plus tabulated data for two hypothetical scenarios. Further details—including governing assumptions, cost and benefit factors, primary and secondary information sources, the original survey or interview guide, and a simplified return-on-investment calculator tool for carriers—can be found in FHWA (2007).

4.1 Costs and Benefits of Electronic Credentialing for Motor Carriers

Table 3 presents the return on investment (ROI) analysis results for a scenario using the mean values from the motor carrier companies providing data for the economic analysis. As a point of reference, the mean number of power units per motor carrier in the economic analysis was 7,451. Over the 10-year ROI time horizon, total net benefits per carrier are estimated at \$3.6 million (\$360.5 thousand average annual), resulting in an overall return on investment of 2,971:1 and a payback period of less than one month. The base year of the analysis in Table 3 is 2007, and all monetary values are presented in constant 2007 dollars. The declining values from year to year are the result of the application of a 7% discount rate used to achieve constant dollar expressions.

Most of the surveyed motor carriers indicated that both the startup and annual recurring costs associated with electronic credentialing were minimal. Startup costs totaled \$275 per company, with the main contributors being system training and computer technical support. Annual recurring costs totaled \$125, consisting again of needed training and technical support.

Table 3. Results of electronic credentialing ROI analysis, mean value scenario (\$2007)¹

Year	Benefits				Costs			Net Benefits
	Labor	Materials and Postage	Increased Fleet Utilization	Total	Initial	Recurrent	Total	
2007	\$10,347	\$2,508	\$413,065	\$425,920	\$275	125	\$400	\$425,520
2008	9,958	2,414	397,546	409,918	-	117	117	409,801
2009	9,584	2,323	382,610	394,518	-	109	109	394,408
2010	9,224	2,236	368,236	379,696	-	102	102	379,594
2011	8,877	2,152	354,401	365,430	-	95	95	365,335
2012	8,544	2,071	341,086	351,701	-	89	89	351,612
2013	8,223	1,993	328,271	338,488	-	83	83	338,404
2014	7,914	1,919	315,938	325,771	-	78	78	325,693
2015	7,617	1,846	304,068	313,531	-	73	73	313,459
2016	7,330	1,777	292,644	301,752	-	68	68	301,684
Total	\$87,618	\$21,241	\$3,497,866	\$3,606,725	\$275	\$939	\$1,214	\$3,605,511

On the benefits side, compared with the conventional (legacy or paper-based) method of obtaining credentials, carriers adopting CVISN technology were assumed to save \$4.13 per transaction in administrative labor costs, plus \$1 per transaction in material and postage costs.

The most significant reported benefit of electronic credentialing is the time value of increased fleet utilization, meaning that a carrier is able to put a new truck into service more quickly when using electronic credentialing. Motor carriers stated that electronic credentials reduced the time required to place new trucks into service by 3 to 4 days, at a savings of \$371 per truck (\$106 * 3.5). The dollar values were based on financing costs of purchasing a new truck. If the truck is idle at the trucking terminal, then it is assumed not to be generating any revenue for the company. The share of the fleet required to wait for new credentials in a given year was estimated at 15 percent based on data presented in the CVISN Model Deployment Initiative (MDI) Final Report (FHWA 2002). The concept of the fleet utilization benefit was also based on the 2002 MDI report.

Evidence collected from motor carriers suggests that the level of savings associated with increased fleet utilization will differ from company to company. For example, if there are other parallel activities required to place a truck into service (painting, equipment installation, etc.) that can be performed while awaiting credentials, the actual difference in service time between the legacy (paper-based) system and electronic credentialing may be less. Based on contacts made with motor carriers and a credentialing broker in support of this study, additional conclusions regarding the increased fleet utilization estimate include the following:

- Motor carriers generally work diligently to ensure that trucks never sit idle for extended periods of time for any reason, including waiting for credentials

¹ Annual benefit estimates reflect both forecast growth in the number of heavy truck registrations (3 percent annually) and the applied discount rate (7 percent). Annual cost estimates are not tied directly to the number of heavy truck registrations and, therefore, were not forecast to grow in real terms over the 10-year analysis time horizon.

- Cost savings will vary by State based on the number and types of credentials required, and the time required for the State to process credentials and issue plates
- Temporary registrations are available in some States and can be distributed via fax or e-mail for use while the carrier waits for permanent plates to be delivered
- Larger carriers have generally streamlined the process of placing new trucks into service and would not experience long waiting periods; smaller carriers could find it more difficult to expedite the credentialing process and could wait several days for credentials
- One credentialing broker indicated that she could work with dealers to obtain copies of required paperwork with all relevant vehicle information, and obtain and send all permits and plates to the motor carrier before the new owner takes possession of the vehicle.

As shown in Table 3, however, even assuming that a company achieves no “fleet utilization benefit” from deploying CVISN electronic credentialing, the company would realize a significant return on its investment (approximately 90:1 over 10 years) from the labor and material/postage savings alone.

Using the same factors described above, Table 4 illustrates the savings from adopting electronic credentialing for a hypothetical carrier with 1,000 power units. As the table shows, there would be benefits for the year of about \$57,000 per carrier or \$57 per power unit. The added costs for the first year shown would only be about \$275. Once again, the greatest part of the benefits results from increased utilization for newly credentialed trucks that would be put into service more quickly than would have been possible without CVISN.

Table 4. Benefit/cost analysis from adopting electronic credentialing through CVISN for hypothetical fleet with 1,000 power units^a

Startup Costs of Computer Upgrades/ Training (per carrier)	Increased Utilization	Labor and Material/Postage Savings Per Transaction	Savings in First Year of Program
\$275	\$371 per truck for 15% of fleet (150 trucks) affected Total Utiliz. Benefit for Fleet: \$55,650	\$1.74 saving per power unit [((\$4.13 labor + \$1.00 postage = \$5.13 per transaction) *0.34 transactions per power unit = \$1.74] Total Labor/Postage Benefit for Fleet: \$1,744	Added Cost: (\$275) or about \$0.28/power unit First-Year Total Benefit: \$57,394/fleet First-Year Net Benefit: \$57,119 for fleet or \$57/power unit
a. Based on benefits estimated in FHWA (2007)			
Note: Numbers may not total exactly due to rounding			

4.2 Costs and Benefits of Electronic Screening for Motor Carriers

Table 5 shows the return on investments (ROI) obtained by motor carriers that were surveyed for the 2007 business case report. The benefits estimates are based on the number of transponders in service for a motor carrier. Of the 18 carriers shown in the table, all but one have ROI ratios (investment compared to benefits) ranging from 6.1:1 to 15.9:1. The data in the table clearly

Table 5. Results of electronic screening ROI analysis

For-Hire or Private	Number of States Operated Within	Truckload, Less than-Truckload (LTL)	Units Equipped with Transponders	Annual Benefit	Startup Costs	Annual Recurrent Costs	Total Present Value 10-Year Benefits	Total Present Value 10-Year Costs	ROI Ratio	Payback Period
For-Hire	13	LTL	200	233,949	-	33,600	1,895,652	272,255	7.0	N/A
Both	11	Truckload	212	247,986	-	33,072	2,009,391	267,977	7.5	N/A
For-Hire	48	Truckload	475	\$555,630	-	\$91,200	\$4,502,173	\$738,978	6.1	N/A
For-Hire	48	Truckload	500	585,108	-	72,029	4,741,025	583,637	8.1	N/A
For-Hire	48	Truckload	1,000	1,169,747	657	780,000	9,478,258	6,320,862	1.5	<1 year
For-Hire	39	Not Known	1,103	1,289,646	109,148	145,530	10,449,780	1,288,352	8.1	<1 year
For-Hire	48	Truckload	1,400	1,637,646	-	184,800	13,269,562	1,497,402	8.9	N/A
For-Hire	50	Both	1,452	\$1,698,473	\$1,095	\$192,448	\$13,762,431	\$1,560,468	8.8	<1 year
For-Hire	48	Truckload	2,500	2,924,368	-	330,000	23,695,646	2,673,933	8.9	N/A
For-Hire	48	Truckload	2,900	3,392,267	-	382,800	27,486,949	3,101,762	8.9	N/A
For-Hire	15	Both	3,300	3,860,166	-	396,000	31,278,253	3,208,719	9.7	N/A
For-Hire	48	Truckload	3,395	3,971,292	-	407,400	32,178,687	3,301,091	9.7	N/A
For-Hire	48	LTL	5,589	6,537,425	-	410,000	52,971,616	3,322,159	15.9	N/A
For-Hire	33	LTL	8,550	10,001,338	-	747,700	81,039,109	6,058,483	13.4	N/A
For-Hire	49	LTL	9,000	10,527,725	4,950,000	900,000	85,304,325	12,242,544	7.0	<1 year
For-Hire	48	Truckload	9,100	10,644,699	902,279	1,277,500	86,252,151	11,253,639	7.7	<1 year
For-Hire	50	Truckload	9,800	11,463,522	-	823,200	92,886,932	6,670,247	13.9	N/A
For-Hire	48	Both	25,500	29,828,553	-	2,754,000	241,695,588	22,315,184	10.8	N/A

show that the adoption of electronic screening by carriers results in far more financial benefits than costs and that, especially for larger carriers, utilizing CVISN electronic screening would pay significant financial dividends. Table 5 is sorted according to the number of power units equipped with transponders.

Two anomalous values appear in the Startup Cost column of Table 5. One carrier representative indicated that it cost their company \$550 per power unit to begin electronic screening, including the cost of a toll transponder system for use in the Midwest and Northeast. This same carrier also reported operating 9,000 power units, for a total startup cost of \$4.9 million. A different carrier reported investing \$900,000 in transponder hardware plus 80 hours of labor related to deploying transponders, plus 24 hours of labor related to starting membership in screening program(s), for a total startup cost of \$902,279. No further details on these unusually high reported startup costs were obtained during the calls. The majority of carriers responding to this survey reported incurring low or no startup costs for electronic screening.

The results of the electronic credentialing analysis suggests that large operations are able to reduce the per-unit costs associated with recurrent membership fees and transponder maintenance, thus increasing their return on investment. Figure 3 demonstrates that motor carrier operations are achieving positive returns to scale as it relates to investment in electronic screening technology. Note that data from one company with 25,500 power units and an ROI ratio of 10.8 was excluded from Figure 3 due to its impact on the scale of the x-axis and the visual appearance of the figure.

Assumptions to compare the costs and benefits associated with electronic screening were made based on literature values and information collected from motor carriers in the business case interviews. The time saved per bypass was assumed to be between 3 and 5 minutes, and an average truck enrolled in a screening program was assumed to make 135 bypasses per year (PrePass 2007). The operating cost for a heavy truck was assumed to be \$2.16 per minute, based on ATA data from 2003, inflated to 2007 dollars (Oregon Department of Transportation 2006). Recurring costs for belonging to e-screening program (typically charged pro rata based on the number of power units enrolled per carrier) are shown as reported by responding motor carrier companies.

Table 6 illustrates the savings from adopting electronic screening for a hypothetical carrier with 1,000 power units, assuming that 60% of the company's power units are equipped with a transponder. As the table shows, there would be operating cost savings for the year of about \$1,171 per truck equipped with a transponder, or a total benefit of over \$702,000 for the company operating 600 transponder-equipped trucks. The added costs would only be about \$130 per year for each transponder-equipped truck, or \$79,200 for the company. The net benefit in the first year (total benefits minus total costs) would be more than \$620,000 for this hypothetical company.

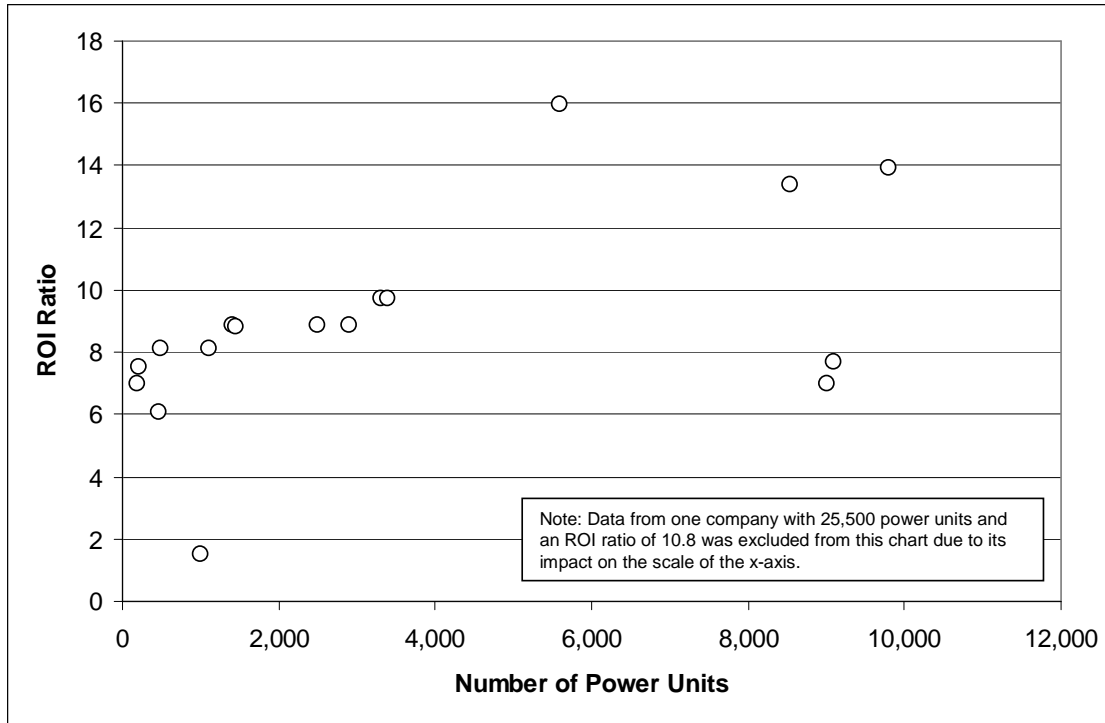


Figure 3. Relationship between the number of power units and ROI ratio

Table 6. Benefit/cost analysis from adopting electronic screening through CVISN for hypothetical fleet with 1,000 power units (60% enrollment in e-screening)^a

Costs of Transponder	Savings in Truck Waiting Time at Weigh Stations	Savings From Average Number of Bypasses	Savings Per Truck With a Transponder in Carrier Fleet	Total Annual Cost for Transponder Operation	Total Savings for Fleet: 60% of Trucks Equipped with Transponders
Initial: No Cost Annual: \$132 per transponder	4 minutes * 135 Bypasses = 540 minutes per truck per year	135 * \$8.68 per Bypass	\$1,171	\$79,200 with 60% of trucks equipped with transponders	Total Benefit \$702,600 for fleet of 600 enrolled trucks Benefit minus annual costs \$623,400
a. Based on benefits estimated in FHWA (2007)					
Note: Numbers may not total exactly due to rounding					

5.0 Implications for the Motor Carrier Industry, States, and CVO in General

CVISN appears to have the potential to help States and motor carriers achieve significant benefits. In the 2006 business case, motor carriers and the trucking industry in general were anticipated to benefit from CVISN through

- Bypass time savings and increased driver safety from not having to wait in long lines at weigh stations
- Opportunities to verify driver qualifications in a more timely way at the time of hiring
- Reduced numbers of trips to State licensing/permitting agency offices, and reduced time at the State office when trips are still required
- The development of a one-stop shop within each State for electronic credentials administration, permitting (e.g., Heavy Vehicle Use Tax, oversize/overweight permits), and other related CVO transactions
- The adoption of consistent methods for remote, secure, electronic payment of license and credentialing fees.

Likewise, State government agencies were anticipated to benefit through

- Reduced labor costs and more efficient deployment of enforcement resources
- Increased data quality and availability, including near-instant access to current data in the office and the field; better enforcement of registration, licensing, weight, size, and tax regulations; and improved methods for identifying and correcting errors and omissions in State databases
- Better access to State credentialing resources for carriers based in remote locations, and more efficient approaches to customer service and quality, with the reduction or avoidance of lengthy queues in State agency offices
- Closer coordination with State motor carrier associations, which helps both the State and the industry in the design, testing, deployment, and carrier outreach aspects of CVISN deployment
- Opportunities to improve the quality of State data by purging duplicate, outdated, or erroneous records in the course of deploying CVISN database resources
- Interoperable data sharing systems among jurisdictions and between States and individual motor carrier companies
- Development of an interagency CVISN oversight committee that assigns responsibilities, delineates jurisdiction, and codifies decisions to build consensus among teams where staff turnover is a factor.

Recommendations for Federal and State support of CVISN deployment included the following:

- Maintain an active contact list of States and individuals who were instrumental in early adoption of CVISN technologies

- Foster communication among States at various stages of deployment
- Provide market outreach to carriers and State associations, to make them aware of new CVISN technologies and potential benefits
- Set up mechanisms for current, accurate information to be sent from roadside inspections to the motor carrier companies affected
- Improve the quality and reliability of historical safety data, on which good inspection selection and electronic screening decisions depend
- Involve motor carriers in the CVISN deployment process, and maintain their input through the life of the project
- Educate motor carriers as to the purposes and goals of CVISN deployment, and to dispel any misinformation or misperceptions that may arise.

Many of the same benefits and recommendations emerged from the economic analysis of CVISN from the perspective of large motor carrier companies (FHWA 2007), which indicates significant, near-immediate financial benefits to carriers from taking part in electronic credentials administration, primarily through the ability to put new trucks into service more quickly. The economic analysis also shows substantial benefits to carriers from enrolling their trucks in electronic screening programs or partnerships, through reduced costs of operation brought about by keeping their trucks moving instead of stopping so often for routine weigh station checks.

The 2007 analysis found that motor carriers experienced negligible startup (\$275 per carrier) and annual recurrent (\$125) costs associated with electronic credentialing. The most significant benefit of electronic credentialing considered is the time value of increased fleet utilization, or the ability to expedite the process for placing trucks into service. This analysis indicated that electronic credentialing allows motor carriers to place new trucks into service an average of 3.5 days sooner than would have otherwise been possible under paper-based systems, at an average savings to motor carriers of \$371 per truck. The cost savings associated with increased fleet utilization are based on the finance charges accruing on vehicles as they await credentials. For the mean value case that was modeled over a 10-year period, this fleet utilization benefit translated into an average of \$349,787 in annual cost savings per carrier.

The second most significant benefit associated with electronic credentialing is the labor savings per transaction, which was estimated at \$4.13 per transaction (10 to 12 minutes per transaction). Benefits associated with reduced materials and postage costs of \$1 per transaction have also been identified. When the full range of benefits are considered, total net benefits per company were estimated at \$3.6 million over a 10-year analysis time horizon (average annual net benefits of \$360.5 thousand), resulting in an overall ROI ratio of 2,971:1 and a payback period of less than one month. The level of cost savings and resultant benefits associated with increased fleet utilization are expected differ from company to company, with smaller companies likely to realize the greatest benefits on a per-truck basis.

The 2007 analysis also shows that motor carriers incur very few up-front costs associated with the transponder acquisition, redistribution of transponders to vehicles, and driver training when entering electronic screening partnerships and programs. On a recurrent basis, most motor carriers incurred monthly costs ranging from \$7 to \$14 per transponder, based on the number of trucks enrolled in the electronic screening program and the negotiated rate. Time savings per bypass in this study are estimated at 3 to 5 minutes, and average motor carrier operating costs are valued at \$2.16 per minute. Thus, cost savings associated with electronic screening are valued in this study at \$8.68 per bypass. The annual net benefit per transponder-equipped truck was estimated at \$1,169. Net benefits to motor carriers range from \$3.2 to \$219.4 million per company over the 10-year study time horizon with all but one of the ROI ratios ranging from 6.1:1 to 15.9:1 and with payback periods of less than one year.

For the motor carrier industry, these findings suggest that wider adoption of CVISN technologies would yield significant returns on relatively modest investments. Other business factors affecting adoption of CVISN technologies may also come into play, including the need for education and outreach to the industry, so that more carriers know about the CVISN technologies (and the benefits) available to them in the States where they operate.

Many motor carrier companies operate on very narrow profit margins. Some may tend to focus on the cost side of the technology deployment equation, not recognizing the value of the future benefits of technology to their particular operation, for example, the time that can be saved through electronic credentialing and screening, and the monetary value of this time savings. Also, most investments in new technology will be viewed with skepticism, but as more and more carriers deploy technologies such as CVISN electronic credentialing in their terminals and offices and electronic screening transponders in their tractors on the road, the word-of-mouth diffusion of positive experiences with CVISN—and how CVISN affects companies' business—can be expected to continue. This summary report and the two business cases on which it is based are intended to contribute to this kind of information sharing and exchange of knowledge.

Another implication of this research is that the awareness of CVISN and the derivation of benefits from CVISN appear to predominate among the larger motor carrier companies. The industry and government may explore approaches to extending the overall design of the CVISN program to include features that are more adapted to the medium- and smaller-sized carrier companies, who may, for example, credential only 10 or 100 power units per year, and so have a much different administrative burden than the large or giant motor carriers.

The Federal and State government role in fostering the deployment of CVISN among motor carrier companies of all sizes should continue, through cost-sharing grants, research funding, and the facilitation of technology transfer. One of the hallmarks of CVISN deployment from its earliest days has been the readiness of States to collaborate through forums and channels established by FMCSA and other agencies of the USDOT. Traditionally, States have been very willing to speak up about problems and barriers they face in deploying advanced hardware and software. They have also actively shared new ideas and solutions they have learned or tried.

FMCSA can go a long way in disseminating accurate information about the scope and purpose of CVISN initiatives. This would increase the awareness of the motor carrier industry as to the

limits of CVISN and promote realistic expectations of what carriers stand to gain by participating in CVISN. FMCSA can also work to dispel any misperceptions through continuous outreach and communication, the documentation of actual carrier experiences, and the collection and publication of valid data from the field to add to the knowledge that carriers need to make deployment and operations decisions.

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