NDOR Research Project Number SPR-PL-1(35)P511
Transportation Research Studies

FINAL REPORT

NEBRASKA
INTELLIGENT TRANSPORTATION SYSTEMS
STATEWIDE STRATEGIC PLAN

Sponsored by the

Nebraska Department of Roads

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U.S. Department of Transportation

Federal Highway Administration

December 1998

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. FHWA-NE-99-P511	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Nebraska Intelligent Transportation Systems (ITS) Plan		5. Report Date December 1998 6. Performing Organization Code
7. Author(s) Patrick T. McCoy, Sharon L. Gaber, John A. Gaber, William D. Tobin		8. Performing Organization Report No. SPR-PL-1(35)P511
9. Performing Organization Name and Address Department of Civil Engineering University of Nebraska-Lincoln Lincoln, Nebraska 68588-0531		10. Work Unit No. 11. Contract or Grant No. SPR-PL-1(35)P511
12. Sponsoring Agency Name and Address Nebraska Department of Roads PO Box 94759 Lincoln, Nebraska 68509-4759		13. Type of Report and Period Covered Final Report 14. Sponsoring Agency Code

15. Supplementary Notes

Prepared in cooperation with the U.S. Department of Transportation, Federal Highway Administration

16. Abstract

Nebraska Statewide ITS Plan highlights the State's transportation needs, goals and objectives and how transportation systems can be improved using ITS technologies and management strategies. The strategic plan provides a background of ITS, the mission and vision of ITS planning in Nebraska, key stakeholders, lead agencies, research methodologies used and a detailed description of the ITS planning process.

The strategic plan also includes 108 short-, medium- and long-range ITS projects and their costs. The costs of each project was measured against its benefits for closer analysis and recommendation. A summarized statewide system architecture is drafted to show the relationship of selected projects to a traffic management center.

17. Keyword Intelligent Transportation Systems (ITS) Plan	18. Distribution Statement		
19. Security Classification (of this report) Unclassified	Security Classification (of this page)	21. No. of Pages	22. Price

Form DOT F 1700.7 (8-72)

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1.0 EXECUTIVE SUMMARY

1.1 Introduction

Intelligent Transportation Systems (ITS) is the application of advanced sensors, computers, electronics, telecommunications and management strategies, in an integrated manner, to increase the safety and efficiency of the surface transportation system. ITS includes applications of these technologies in the areas of traffic control, traveler information, public transportation and incident management. Potential benefits of ITS are more efficient uses of the transportation infrastructure and energy resources including significant improvements in safety, mobility, accessibility and productivity. The objective of the study was to develop a strategic plan for the deployment of ITS technologies in Nebraska. The study was initiated in November 1997 and completed in December 1998.

1.2 Project Background

The development of the ITS Plan was a collection of planning processes in that it involved consideration of the plans of many other agencies and jurisdictions concerned with transportation in Nebraska. The goals, objectives, needs and priorities of the other plans were considered to ensure continuity with other agencies and to avoid duplicating similar projects. The *RATIONAL PLANNING MODEL (1)* was used to guide the ITS planning process statewide. The Critical Program Areas (CPAs) served as a management technique to help break down the rural ITS planning process into more manageable tasks to provide a clearer focus on specific issues and problems statewide.

The following CPAs served as the foundation for the ITS statewide planning process:

- Traveler Safety and Security
- Emergency Services
- Tourism and Traveler Information Services
- Infrastructure Operations and Maintenance
- Fleet Operations and Maintenance
- Public Traveler and Public Mobility Services
- Commercial Vehicle Operations
- Communications

An ITS steering committee was formed to monitor and guide the ITS planning process for the State of Nebraska. Steering committee members represented the Nebraska Department of Roads, Department of Administrative Services (Division of Communications), Department of Economic Development (Division of Tourism), Nebraska State Patrol, Federal Highway Administration, Health and Human Services System and the Department of Motor Vehicles. The purpose of the ITS Steering Committee was to provide guidance regarding the future of ITS deployment in Nebraska. Other tasks performed by the steering committee included participating in CPA focus group meetings, providing additional key contacts, supplying needed documents, recommending ITS projects and strategies, and creating ITS awareness with the organizations.

1.3 Methodology and Results

The ITS study team used a variety of research techniques to develop an ITS statewide plan. Techniques utilized included focus groups, interviews, surveys and content analysis of secondary data source. The results of these research techniques established a basis for which goals and objectives were determined and projects later developed.

1.4 Goals and Objectives

The ITS study team established goals and objectives by reviewing the materials acquired and comments made while using various research techniques throughout the planning process. Goals and objectives were based on the needs assessment and priorities listed in various statewide plans and/or voiced by key stakeholders. A comprehensive list of goals and objectives can be found in Section 6.0.

1.5 ITS Plan

The ITS Plan includes 108 projects for implementation in Nebraska over the next 20 years. Collectively, these projects are expected to provide benefits on the order of $482 million at a total estimated cost of $320 million, yielding an overall benefit-cost ratio of 1.5. The plan defines three deployment scenarios for the implementation of ITS projects: (1) short-range, within the next 5 years; (2) medium-range, within 5 to 10 years; and (3) long-range, within 10 to 20 years. The projects are organized by CPAs and summarized in Table 1.1, which shows the number, total cost, and total benefits of the projects in each CPA. A detailed description of the projects is presented in Appendix C. A discussion of the costs and benefits can be found in Appendices A and B, respectively.

The benefit-cost analysis was conducted to provide a basis for comparing the economic value of the projects in the plan. The analysis included only projects for which reasonable estimates of their benefits could be made and expressed in monetary terms. Consequently, feasibility studies, design projects, operational tests, and deployment support programs were not included in the analysis. Several short-range projects are prerequisites to subsequent medium- and long-range projects that may provide substantial monetary benefits in the future.

Depending on the nature of the project, the benefits used in the benefit-cost analysis included: (1) road user operational and accident cost savings; (2) economic impacts; (3) public health; and/or (4) cost savings to the public sector. Although projects may provide benefits in all of these categories, only one or two of these types of benefits were considered.

CPAs with the highest overall benefit-cost ratios (B/C) are: Tourism and Traveler Information Services (B/C of 5.8), Commercial Vehicle Operations (B/C of 5.0), and Traveler Safety and Security (B/C of 4.5). The only CPAs with overall B/Cs less than 1.0 are Public Traveler Services and Public Mobility Services (B/C of 0.3) and Communications (B/C of 0.2). However, it is very likely that the projects in these CPAs may provide significant benefits that are not readily expressed in monetary terms which can be identified in the short-range projects in these CPAs.

Table 1.1 Summary of ITS Projects

Critical Program Area	Item	Project Deployment Scenario			Total for 20-year Period
		Short-Range 2000-2005	Medium-Range 2005-2010	Long-Range 2010-2020	
Traveler Safety & Security	No. of Projects	7	6	5	**18**
	Cost ($)	3,700,000	3,900,000	11,000,000	**22,000,000**
	Benefits ($)	40,000,000	26,000,000	15,000,000	**100,000,000**
	B/C Ratio	11.0	6.8	1.4	**4.5**
Emergency Services	No. of Projects	6	6	4	**16**
	Cost ($)	2,200,000	23,000,000	41,000,000	**66,000,000**
	Benefits ($)	N/A	38,000,000	114,000,000	**152,000,000**
	B/C Ratio	N/A	1.7	2.8	**2.3**
Tourism & Traveler Information	No. of Projects	6	5	4	**15**
	Cost ($)	1,400,000	1,800,000	2,700,000	**5,900,000**
	Benefits ($)	5,100,000	16,000,000	13,000,000	**34,000,000**
	B/C Ratio	3.6	8.9	4.8	**5.8**
Public Traveler & Mobility Services	No. of Projects	3	2	2	**7**
	Cost ($)	170,000	35,000	2,400,000	**2,600,000**
	Benefits ($)	N/A	N/A	850,000	**850,000**
	B/C Ratio	N/A	N/A	0.4	**0.3**
Infrastructure Operations & Maintenance	No. of Projects	5	7	6	**18**
	Cost ($)	890,000	6,400,000	15,000,000	**22,000,000**
	Benefits ($)	N/A	31,000,000	49,000,000	**80,000,000**
	B/C Ratio	N/A	4.8	3.2	**3.6**
Fleet Operations & Maintenance	No. of Projects	2	2	2	**6**
	Cost ($)	230,000	680,000	1,600,000	**2,500,000**
	Benefits ($)	N/A	3,300,000	6,900,000	**10,000,000**
	B/C Ratio	N/A	4.9	4.3	**4.0**
Commercial Vehicle Operations	No. of Projects	7	7	6	**20**
	Cost ($)	2,500,000	4,900,000	5,700,000	**13,000,000**
	Benefits ($)	9,400,000	28,000,000	27,000,000	**64,000,000**
	B/C Ratio	3.8	5.7	4.7	**5.0**
Communications	No. of Projects	3	3	2	**8**
	Cost ($)	650,000	185,000,000	120,000	**186,000,0000**
	Benefits ($)	N/A	41,000,000	150,000	**41,000,000**
	B/C Ratio	N/A	0.2	1.3	**0.2**
TOTAL	**No. of Projects**	**39**	**38**	**31**	**108**
	Cost ($)	**12,000,000**	**226,000,000**	**79,000,000**	**320,000,000**
	Benefits ($)	**54,000,000**	**183,000,000**	**226,000,000**	**482,000,000**
	B/C Ratio	**4.5**	**0.8**	**2.8**	**1.5**

1.6 Implementation

Implementation of the ITS Plan will require the involvement and cooperation of several state agencies and private sector groups. It is essential, for successful implementation of the plan, to include these stakeholders in the initial phases of the deployment of ITS projects that may impact them. Therefore, it is recommended that an ITS Implementation Committee be formed to monitor and guide the implementation of the ITS Plan. The Committee would ensure that the deployment of ITS projects is coordinated with the plans and programs of all key stakeholders and does not needlessly conflict with them or fail to recognize opportunities to avoid duplication of effort. Specific duties of the Committee would include:

1. Initiation and oversight of the following forums are recommended in the ITS Plan:

- Emergency Medical Services (EMS) Communications Forum
- Traveler Information and Tourism Information Forum
- Rural Transit Forum
- CVO Forum
- Communications Forum

2. Establish priorities of ITS project implementation

3. Identify funding sources and lead agencies for the implementation of ITS projects

4. Update the ITS Plan on a regular basis

The membership of the Committee should include representation from the following:

- NDOR ITS Coordinator
- NDOR Maintenance Division
- NDOR Transportation Planning Division
- NDOR Traffic Engineering Division
- Nebraska State Patrol Motor Carrier Enforcement
- Nebraska State Patrol Traffic Enforcement
- Health and Human Services EMS Program
- Department of Economic Development Travel and Tourism Division
- Department of Administrative Services Communications Division
- Department of Environmental Quality Hazardous Materials Transportation
- Department of Motor Vehicles Motor Carrier Services
- Nebraska Motor Carriers Association
- Railroad Companies
- Federal Highway Administration, Nebraska Division

2.0 INTRODUCTION

The Nebraska Intelligent Transportation Systems (ITS) Statewide Strategic Plan was produced for the Nebraska Department of Roads (NDOR), to serve as a tool to guide future deployment of ITS technologies and management systems in Nebraska. The Nebraska ITS Plan is a culmination of data and research strategies addressing statewide surface transportation problems, needs, goals and objectives stated by key stakeholders and concerned citizens alike. Input from key stakeholders and citizens was recorded and compared to available ITS technologies and management systems nationwide. This enabled the study team to determine how ITS could be deployed to address the needs and opportunities identified in the planning process. The end result of this analysis was the identification of 108 short-, medium- and long-range projects recommended for statewide implementation within the next 20 years.

The Nebraska ITS Planning Study was conducted by the University of Nebraska - Lincoln (UNL) study team for NDOR. The NDOR ITS Coordinator acted as project manager and liaison to other NDOR divisions to ensure access to information needed in the planning process. The Assistant ITS Coordinator assisted by providing additional research materials, data and professional ITS contacts. The UNL study team was comprised of Patrick T. McCoy, Professor, Department of Civil Engineering; Sharon L. Gaber, Associate Professor, Department of Community and Regional Planning; John A. Gaber, Assistant Professor, Department of Community and Regional Planning and; William D. Tobin, Graduate Research Assistant, Department of Community and Regional Planning.

A Steering Committee was formed to provide oversight and guidance to the research team during the study. The Committee monitored the progress of the study and focused on the primary issues pertinent to the development of the Plan. Members of the Committee were:

- Stephen D. Andersen, Strategic Planning Manager, Planning Division, NDOR
- Joe Botsford, Project Leader, Nebraska Department of Motor Vehicles
- Milo Cress, ITS Engineer, Federal Highway Administration
- Andrew F. Cunningham, Local Liaison Division, NDOR
- Brenda L. Decker, Acting Director, Nebraska Division of Communications
- Ron Kontos, Permits Manager, Intermodal Transportation Division, NDOR
- David Miller, Director, Division of Travel and Tourism, Department of Economic Development
- R. James Pearson, ITS Coordinator, Intermodal Transportation Division, NDOR
- Randall D. Peters, Traffic Engineer, Traffic Engineering Division, NDOR

- Dalyce F. Ronnau, Assistant Maintenance Engineer, Maintenance Division, NDOR
- Dan J. Rosenthal, Public Transportation Engineer, Intermodal Transportation Division, NDOR
- David P. Schor, Medical Advisor, Nebraska Health and Human Services System
- Major Bryan J. Tuma, Nebraska State Patrol

2.1 Nebraska ITS Vision

The ITS Steering Committee agreed to the following vision statement to guide the planning process: "An overall higher quality of life for residents and travelers by way of safer, more secure, available and efficient movement of people and goods across Nebraska through a multi-jurisdictional accord applying advanced Intelligent Transportation Systems."

2.2 Nebraska ITS Mission

The ITS Steering Committee adopted the following mission statement to guide the planning process: "To advance the development and application of Intelligent Transportation Systems across Nebraska which will increase highway safety, mobility, and economic health and community development while preserving the natural environment."

The projects included in the ITS Statewide Strategic Plan and an illustration of a statewide ITS systems architecture for the deployment of the projects are described in Section 3. The planning process used to develop the Plan is documented in Section 4. The methods and results of the needs assessment which served as the basis for the development of the Plan are presented in Section 5, and the goals and objectives derived from the needs assessment are summarized in Section 6. Recommendations for implementing the Plan are presented in Section 7. More detailed information regarding the contents of the Plan is presented in the appendices. Appendices A and B describe the assumptions made in estimating the costs and benefits for the benefit-cost analysis. Appendix C provides detailed descriptions of the projects. Appendices D, E, F, G, H, and I provided detailed information supporting the description of the needs assessment in Section 5. A description of the ITS user services referenced in the formulation of the Plan is presented in Appendix J. The relationship between ITS goals and objectives is presented in Section 6 and illustrated in Appendix K. Finally, Appendix L is a glossary of terms relevant to the discussions of ITS in this report.

3.0 STRATEGIC PLAN

3.1 Projects

The ITS needs assessment, along with the Nebraska Department of Roads' Long-Range Strategic Plan and the National ITS Architecture, resulted in the development of 108 short-, medium- and long-range projects for Nebraska. The needs assessment consisted of interviews, a focus group meeting, surveys and document review and research. Appendix C describes the projects in further detail including: applicable user services, project costs, benefits, funding sources public/private partnerships, institutional considerations, leading agencies and project status.

The deployment scenarios were developed for three time frames: short-range, medium- range and long-range. The phasing allows implementing projects/forums, over time, as technologies advance and funding becomes available.

- **Short-Range Project Deployment Scenario-** Projects and forums which can begin immediately and be implemented within 5 years. The short-range projects also provide infrastructure or foundation for other future projects.

- **Medium-Range Project Deployment Scenario-** Projects and forums to be implemented within 5 to 10 years into the future.

- **Long-Range Project Deployment Scenario-** Projects and forums to be implemented beyond 10 years into the future.

The following projects are organized in eight Critical Program Areas (CPA) of rural ITS, which are described in Section 4:

- Traveler Safety and Security
- Emergency Services
- Tourism and Traveler Information
- Public Traveler Services and Public Mobility Services
- Infrastructure Operations and Maintenance
- Fleet Operations and Maintenance
- Commercial Vehicle Operations
- Communications

3.2 Short-Term Project Deployment Scenario

The objectives of the short-range projects are to apply proven, practical and cost-effective ITS technologies to help solve current problems and demonstrate their effectiveness while building on existing applications which have shown success. Forums are also introduced to enhance intragroup, as well as, intergroup communications and guide projects in the appropriate directions. Within the short-range deployment scenario, the focus will be primarily on operational tests for priority corridors and establishment of forums. Table 3.1 lists and briefly describes the recommended short-range projects for statewide ITS implementation.

Table 3.1 Short-Term Project Deployment Scenario

Project	Description
Critical Program Area 1 - Traveler Safety and Security	
S1.1 Statewide Railroad Corridor Study	Continue to identify and prioritize railroad-highway grade crossing safety needs statewide and identify ITS applications for improving railroad-highway grade crossing safety.
S1.2 School Bus/Railroad Crossing Safety Warning System Operational Test	Conduct operational test of safety warning system at a school district in need to alert school bus drivers to the presence of approaching trains at railroad-highway grade crossings involving approximately 7 school buses. Project includes design, implementation, and evaluation. Success of this operational test will lead to implementation in high volume railroad corridors throughout the state. Develop warrants for installation.
S1.3 Private Railroad Crossing Operational Test	Design and implement an operational test to evaluate the cost-effectiveness of in-vehicle safety warning systems at private railroad grade crossings. Establish warrants for installation.
S1.4 Railroad Crossing Notification System Pilot Study	Conduct pilot project to demonstrate the feasibility and cost-effectiveness of an automated system to notify local emergency dispatch centers to the presence of trains at railroad grade crossings. Project includes the initiation and evaluation of railroad crossings planned by the City of Lincoln, NDOR, and Burlington Northern Railroad.
S1.5 Variable Message Signs (VMS) - Phase I	Design and install permanent VMS on I-80, between Lincoln and Omaha, to alert travelers of real time road, weather, incident and event information. Evaluate system effectiveness and develop guidelines for expansion of system.
S1.6 Surveillance - Phase I	Install video cameras in key locations on I-80 between Lincoln and Omaha to support incident management and traveler information system.
S1.7 Motorist Assistance - Phase I	Extend motorist assist program on I-80 from the Platte River to Lincoln. Program serves to aid motorists in need of emergency assistance, increase safety and reduce number of abandoned vehicles.
Critical Program Area 2 - Emergency Services	
S2.1 Interoperable Radio Communications System Phase I	Conduct a study to determine system requirements, existing system configurations and system architecture for more effective and efficient methods of radio communication between emergency responders and public agencies. Submit results to Legislature in FY 2000.
S2.2 EMS Communications System - Phase I	Work collaboratively with the Statewide Communications Task Force, Trauma System Advisory Board and other EMS organizations to determine system requirements, existing system configurations. Coordinate EMS communications, incident data to minimize communication barriers and improve procedures for incident management.
S2.3 Coordinate-Based Addressing System - Phase I	Conduct study to determine system requirements and existing GIS databases to serve coordinate-based local addressing system. Focus on Scotts Bluff county for evaluation of current coordinate-based address system there. Develop transition plan and include costs. Project serves to facilitate Mayday system (M2.6), en-route navigation systems support and Project's M4.1, L4.1, M6.1, L6.1, M8.2, L8.2.

Table 3.1 Short-Term Project Deployment Scenario (Continued)

Project	Description
S2.4 EMS Communications Forum - Phase I	Establish EMS Communications group to hold regular meetings with EMS professionals/volunteers and law enforcement officials to discuss emergency communication methods with other jurisdictions, develop common 911 protocols for communication and transport. Continue monitoring and collaborating with Statewide Communication Task Force and Trauma System Advisory Board. Investigate statewide interoperable computer aided dispatch (CAD) systems to facilitate emergency response. Develop new procedures for incident reporting to NDOR and NSP. Produce public service announcements discussing the benefits of multi-jurisdictional emergency response cooperation. Activities in Phase I will focus on organizing and initiating group and agenda, formulating and implementing emergency dispatch training program, as well as, develop time line for task completion.
S2.5 Mayday Systems Phase I	Define system requirements utilizing automatic vehicle location (AVL) technologies to improve emergency response times by knowing location of vehicles in distress to allow quicker response times. Evaluate existing, privately-owned and operated, Mayday systems to determine efficiency and user acceptance.
S2.6 Improve 911 Dispatch	Implement and evaluate improved 911 Emergency Medical Dispatch (EMD) standards and training for 911 dispatchers statewide. Design regionalized 911 system communications architecture for operational test.
Critical Program Area 3 - Tourism & Traveler Information Services	
S3.1 Highway Advisory Radio (HAR) - Phase I	Determine need and install HAR units serving the higher volume roadways on I-80 between Lincoln and Omaha to improve reception quality of traveler information. Communication links, voice message recordings, system design, associated signing, and implementation are included. Evaluate performance and develop guidelines for system expansion.
S3.2 Kiosks - Phase I	Design and implement kiosks to provide traffic information at major activity centers throughout state. Phase I includes design and installation of graphical displays, communication links, and database, as well as, system integration between NSP's Weatherline system and NDOR's internet web site.
S3.3 Internet Site	Design and implement a computer-based traffic information system for statewide public access. Project includes the design and installation of graphical displays and communication links integrating information from NDOR kiosks. Develop time line for implementation and updating.
S3.4 Tourist Information Warehouse - Phase I	Analyze system requirements and existing networks containing tourist information. Design system architecture to include costs. Include rest area kiosks, truck stop kiosks, airports, bus and train stations, car rental agencies and other major attractions in system design.
S3.5 Feasibility Study for Statewide 211/511 Traveler Information Telephone System.	Analyze and evaluate 211/511 communication system needs, requirements and existing networks containing tourist information access. Identify information service providers. Design detailed system architecture to include costs.

Table 3.1 Short-Range Project Deployment Scenario (Continued)

Project	Description
S3.6 Traveler & Tourism Information Forum Phase I	Establish Traveler & Tourism Information group to meet with Department of Economic Development representatives and various multi-modal transportation system providers. Group serves to cross barriers and work out details for expanding kiosk network and/or connecting tourism information warehouse, as well as, conducting commerce from kiosks with various public and private agencies. Forum will also review systems capable of conducting commerce in state owned rights of way and applicable restrictions. Phase I activities will focus on organizing group, initiating group meetings and developing a time line for task completions.
Critical Program Area 4 - Public Traveler Services & Public Mobility Services	
S4.1 Kearney/Buffalo County Transit Coordination Pilot Project	Design and implement a pilot project to evaluate Computer Aided Dispatch (CAD) to facilitate coordination of services provided by the transportation service providers in Kearney and Buffalo County.
S4.2 Beatrice Transit Tracking Study	Design and implement a pilot project to evaluate the effectiveness of automatic vehicle location (AVL) technologies for improving efficiency of rural transit service.
S4.3 Rural Transit Forum Phase I	Establish a rural transit group, consisting of public agencies and private stakeholders to meet regularly and work collectively to improve transit coordination statewide. Group facilitates minimizing legal barriers to rural transit coordination while improving transit for welfare-to-work participants and youth-at-risk. Analyze statewide infrastructure for AVL, CAD and smart card payment system needs and requirements and address technology and institutional needs to other committees (e.g. GIS Committee, NITC, etc). Phase I activities will focus on organizing group, initiating group meetings and developing a time line for task completions.
Critical Program Area 5 - Infrastructure Operations & Maintenance	
S5.1 Statewide Traffic Management Center (TMC) - Feasibility Study	Perform feasibility study to determine the need for a statewide traffic management center. Assemble key stakeholders to discuss costs, benefits, legal issues and institutional barriers. Perform benefit/cost analysis for TMC. Consider applications for virtual TMC system or regionalized system for initial operational test and evaluation.
S5.2 Statewide Maintenance Management System - Phase I	Define requirements and existing maintenance systems to determine how to develop maintenance management systems to improve statewide maintenance inventory and fleet vehicle tracking systems to lower costs, increase mobility, enhance safety and customer service. Develop system architecture to facilitate the organization of pavement, traffic signals, work zones, bridge, sign and safety systems and inventory systems, as well as, an integrated means of accessing each system and sensors remotely from TMC. Develop detailed transition plan to include costs.
S5.3 Weather Stations - Phase I	Determine system requirements and need for additional weather stations statewide. Develop system architecture with remote access from TMC. Develop detailed plan for implementation to include costs.
S5.4 Incident Management System - Phase I	Activities in Phase I will focus on organizing and assembling incident management forum, developing a statewide intergovernmental transition plan for incident management coordinated by TMC. Continue to install gates on I-80 to redirect traffic flow under emergency conditions.

Table 3.1 Short-Range Project Deployment Scenario (Continued)

Project	Description
S5.5 Smart Work Zones - Operational Test	Conduct smart work zone operational test for the purposes to evaluate advanced traveler information systems, variable speed limit signs and radar detection systems. System serves to improve traffic safety and the work zone environment for on-site employees.
Critical Program Area 6 - Fleet Operations & Maintenance	
S6.1 Automatic Vehicle Location (AVL) System-Operational Test	Define system requirements and infrastructure support to establish AVL system to benefit fleet maintenance vehicles and reduce costs in one NDOR district. Develop transition plan with hardware/software support needs and include costs. Conduct operational test on snow plows and Nebraska State Patrol vehicles in one NDOR district utilizing AVL systems. Evaluate system performance for possible expansion.
S6.2 Oversize/Overweight (OS/OW) Routing Tools-Phase I	Analyze private consultant study once completed (May 1999) to determine the following: Define system requirements and evaluate existing OS/OW routing procedures to maximize the efficiency of fleet vehicle mobility and minimize road and bridge stress and wear. Develop transition plan to include costs for system integration with TMC for real time tracking. Conduct operational routing test. Evaluate system performance for possible expansion.
Critical Program Area 7 - Commercial Vehicle Operations (CVO)	
S7.1 CVO Information Warehouse Network - Phase I	Define system requirements and existing support systems to establish electronic permitting process with real time border state information and requirements index. Include information on infrastructure capacity limitations and routing systems for oversize/overweight and seasonal/harvesting transport to save CVO operators time and money while increasing highway safety. Include system architecture for issuing permits for and tracking of the movement of hazardous materials permitting. Develop transition plan to include costs. Identify leading information service provider.
S7.2 CVO Warehouse Access Improvement System - Phase I	Define system requirements and infrastructure support for improved access to CVO information warehouse. Develop system architecture and system integration of CVO information warehouse with Project S3.1, Project S3.2, toll free telephone system, pagers, internet and truck stop and rest area kiosks. Develop transition plan with costs.
S7.3 Weigh-In-Motion (WIM) Improvement - Phase I	Evaluate current Eastbound WIM station near North Platte. Expand WIM sites to include Westbound I-80 near North Platte and Eastbound and Westbound I-80 near Waverly to increase the efficiency and safety of highway transport. Evaluate WIM sites on I-80 for overall cost effectiveness and performance.
S7.4 Electronic Hazardous Materials Permitting System - Phase I	Define system requirements and existing system of issuing hazardous materials permits. Develop system architecture and software to include integration of CVO warehouse to improve overall highway safety and monitoring. Develop transition plan with costs.
S7.5 Hazardous Materials Tracking/Routing System Phase I	Design tracking system to utilize AVL technologies and routing software to effectively control and monitor the safe transport of hazardous materials statewide. Develop transition plans to coincide with Project S6.1 and Project S6.2. Develop hazardous materials vehicle inventory system utilizing computer software routing tools to report departure, expected route of travel and time of arrival at destination. Evaluate system performance.

Table 3.1 Short-Range Project Deployment Scenario (Continued)

Project	Description
S7.6 CVO Forum - Phase I	Establish CVO group to meet regularly consisting of public and private key stakeholders and guide development of an efficient and effective CVO information warehouse network. Other functions of this group include: formulating partnerships, overseeing and recommending improvements for the development of broadcasting CVO information warehouse information statewide, monitoring and recommending improvements to statewide WIM and automated pre-clearance screening systems, monitoring CVO information service providers and making recommendations on border state information improvement, as well as, hazardous materials permitting and tracking needs.
S7.7 Automated Pre-Clearance Screening System - Phase I (Electronic Screening)	Define system requirements and system architecture for automated pre-clearance screening station for safety and permits credentialing of CVO vehicles at North Plate I-80 Eastbound. Define system requirements and develop system architecture to coincide with WIM sites for more efficient statewide deployment of automated pre-clearance screening to enhance safety for travelers and reduce the travel time for CVO operators. Evaluate performance at safety inspection site.
Critical Program Area 8 - Communications	
S8.1 Communications Master Plan	Develop communications master plan to support the implementation of the statewide ITS plan.
S8.2 GIS Strategic Plan	Define GIS system requirements and evaluate existing infrastructure to expedite a statewide computerized road map database to facilitate AVL, transportation management systems and other related ITS applications. Develop intergovernmental transition plan to include costs. Develop system architecture to accommodate statewide access.
S8.3 Communications Forum Phase I	Establish communications group consisting of public and private stakeholders to monitor ITS related communications infrastructure development and opportunities for public/private partnerships. Group acts as liaison to GIS Steering Committee and Nebraska Information Technology Committee on ITS related issues.

3.3 Medium-Range Project Deployment Scenario

The medium-range project deployment scenario will build upon, as well as continue the short-range projects. In the medium-range project deployment scenario, the phased implementation of the statewide traffic management center, and a guidance on how all other projects connect to its open-ended architecture, will be the most critical element.

Table 3.2 shows a summary of the recommended projects for the Medium-Range Deployment Scenario. Similar to the short-term scenario projects, detailed information relative to each project is included in Appendix C.

Table 3.2 Medium-Range Project Deployment Scenario

Project	Description
Critical Program Area 1 - Traveler Safety and Security	
M1.1 School Bus/Railroad Crossing Safety Warning System Deployment	Implement school bus/railroad-highway grade crossing in-vehicle signing project for school districts located near high volume railroad corridors throughout state where installation is warranted.
M1.2 Private Railroad Crossing Warning Systems Deployment	Deploy safety warning systems at approximately 10 private railroad-highway grade crossings where installation is warranted based on findings of Project S1.3.
M1.3 Railroad Crossing Notification System Deployment - Phase I	Establish and evaluate regional network of railroad-highway grade crossing sensor equipment warning 911 emergency dispatchers to the presence of trains based on pilot study S1.4. Evaluate system performance and develop guidelines for deployment statewide.
M1.4 Variable Message Signs (VMS) Phase II	Design and implement expansion of VMS system to include additional VMS installations at approximately 10 priority locations with area-wide real-time message generation capabilities provided by Traffic Management Center (TMC).
M1.5 Surveillance - Phase II	Install additional video cameras at approximately 10 congested locations on I-80. Establish central control of video cameras by TMC.
M1.6 Motorist Assistance - Phase II	Continue activities from Phase I. Phase II will focus on expanding motorist assistance along I-80 from Lincoln to Grand Island, if needed. Determine need for motorist assistance programs along other major highways statewide.
Critical Program Area 2 - Emergency Services	
M2.1 Interoperable Radio Communications System - Phase II	Implement radio communications hardware based on enabling legislation and the recommendations from Project S2.1. Evaluate interoperable radio communication system for performance and establish guidelines for deployment and maintenance.
M2.2 EMS Communications System Phase II	Establish operational test based on Project S2.2 to regionalize several 911 centers in one area and measure performance levels for coordinated emergency response and transport. Evaluate EMS communications system integration and develop guidelines for expansion and project continuation.
M2.3 Coordinate-Based Addressing System - Phase II	Implement coordinate-based address system for NDOR Engineering District Number 5 to test cost effectiveness, efficiency and user acceptance. Evaluate system performance and develop guidelines for regional or statewide implementation.
M2.4 EMS Communications Forum - Phase II	Continue activities from Phase I. Phase II activities to focus on working out institutional and technical barriers to statewide emergency communications and evaluating established communication guidelines.
M2.5 Mayday Systems - Phase II	Improve communications infrastructure and 911 capabilities to support Mayday systems statewide. Link Mayday systems to statewide TMC.
M2.6 911 Dispatch Network - Phase I	Deploy and evaluate multi-county network of regionalized 911 dispatch centers for system performance.

Table 3.2 Medium-Range Project Deployment Scenario (Continued)

Project	Description
Critical Program Area 3 - Tourism & Traveler Information Services	
M3.1 Highway Advisory Radio (HAR) - Phase II	Design and implement expansion of HAR system on I-80 based on results of Project S3.2.
M3.2 Kiosks - Phase II	Expand kiosks to include additional locations. Enhance kiosk capabilities implemented in Phase I to include two-way communications, interactive information access and internet access with e-mail capabilities.
M3.3 Tourist Information Warehouse Phase II	Deploy tourist information warehouse utilizing compiled tourism information databases, computer servers and software accessible via internet.
M3.4 Video Log Data Production Study	Determine video log system requirements and existing inventories of video log data and equipment statewide. Explore internet and VHS tape release options of video taped attractions and scenic highways throughout Nebraska. Design detailed system requirements for production, manufacturing, marketing and sales of video log data that will be made available to the public.
M3.5 Traveler & Tourism Information Forum - Phase II	Continue with Phase I activities. Phase II activities will focus on system expansion and unresolved institutional and technical barriers. Group will need to work with Communications Forum to integrate HAR, Kiosks and Tourism Information Warehouse into TMC to build real time highway closure information system.
Critical Program Area 4 - Public Traveler Services & Public Mobility Services	
M4.1 Statewide Transit Coordination	Develop plan for statewide coordination of rural transit based on results of Project S4.1 and Project S4.2.
M4.2 Rural Transit Forum Phase II	Continue activities in Phase I. Phase II activities will focus on technology applications to benefit welfare-to-work participants and youth-at- risk. Review and recommend improvements to statewide transit coordination plan. Begin integration of rural transit systems with TMC.
Critical Program Area 5 - Infrastructure Operations & Maintenance	
M5.1 Statewide Traffic Management Center (TMC) - Phase I	Define system requirements for input/output, database and interface functions at TMC. Analyze location, space and resources, operation and funding requirements. Design system architecture to include integration of NDOR, NSP and statewide EMS communications system, rural transit systems, incident management, GPS base station and traffic data collection sites and sensors. Develop detailed transition plan to include costs.
M5.2 Statewide Maintenance Management System - Phase II	Delegate operational tests for each system listed in Project S5.2 to individual NDOR districts. Evaluate operational tests for system performance and cost effectiveness.
M5.3 Weather Stations - Phase II	Implement additional weather stations statewide that are capable of TMC remote access. Evaluate system performance.

Table 3.2 Medium-Range Project Deployment Scenario (Continued)

Project	Description
M5.4 Automated Safety Enforcement Phase I	Conduct system requirements study and analyze areas where safety enforcement technologies may be needed to increase overall highway safety and reduce law enforcement operational costs. Develop detailed transition plan to include interface capabilities with Criminal Justice Information Systems (CJIS) and automatic ticketing systems.
M5.5 Incident Management System Phase II	Continue with activities in Phase I. Phase II activities will focus on institutional barriers surrounding incident management, establishing incident response teams in participating areas and developing reporting procedures and guidelines to TMC.
M5.6 Smart Work Zone Implementation	Deploy smart work zone systems in I-80 corridor and other needed areas throughout the state based on Operational Test S5.5. Link systems with TMC. Evaluate system performance.
M5.7 Traffic Signal Coordination Phase I	Determine system requirements and existing statewide traffic control coordination systems. Design system architecture for integrated and adaptive statewide traffic signal optimization system accessible that is controlled by TMC. Deploy coordinated traffic signal systems in highly congested areas near I-80 on and off ramps. Evaluate traffic control system adaptability to traffic flow conditions and system performance.
Critical Program Area 6 - Fleet Operations & Maintenance	
M6.1 Automatic Vehicle Location (AVL) Systems - Phase II	Expand AVL system project to snow plows and Nebraska State Patrol vehicles in additional engineering district based on results of Project S6.1. Evaluate system performance and effectiveness.
M6.2 Oversize/Overweight (OS/OW) Routing Tools - Phase II	Deploy statewide computerized OS/OW vehicle routing system with internet broadcasting capabilities based on operational test. Expand computerized base maps to include county roads (see Project M8.2). Evaluate system performance.
Critical Program Area 7 - Commercial Vehicle Operations (CVO)	
M7.1 CVO Information Warehouse Network - Phase II	Develop CVO information warehouse database to include permitting, infrastructure specifications on road, bridges and border state information and requirements. Evaluate system performance.
M7.2 CVO Warehouse Access Improvement System - Phase II	Deploy CVO information warehouse network on internet. Evaluate system performance statewide.
M7.3 Weigh-In-Motion (WIM) Improvement - Phase II	Deploy approximately five additional WIM sites in areas that demonstrate a need. Develop remote access and operations architecture between WIM sites and TMC. Evaluate WIM sites at weigh stations and elsewhere for system performance.
M7.4 Automated Pre-Clearance Screening System - Phase II	Expand automated pre-clearance screening sites to coincide with WIM site deployment to reduce costs and increase safety. Evaluate system performance.

Project	Description
M7.5 Electronic Hazardous Materials Permitting System - Phase I	Conduct operational tests utilizing internet. Evaluate performance of operational tests based on Project S7.4.
M7.6 Hazardous Materials Tracking/Routing System Phase II	Expand Phase I to include operational tests for customized GIS mapping software. Purpose of project is to analyze effectiveness and accuracy of tracking hazardous material transporters equipped with GPS transmitters remotely by TMC. Evaluate system performance.
M7.7 CVO Forum - Phase II	Continue activities from Phase I. Activities in Phase II will focus on marketing available CVO information available on internet, integrating WIM/automated pre-clearance sites with TMC and expanding CVO information warehouse to include additional states' CVO credentialing and permitting requirements.
Critical Program Area 8 - Communications	
M8.1 Communications Master Plan	Implement communications master plan developed in project S8.1.
M8.2 GIS Statewide Road Map Network - Phase I	Continue to build GIS database to a network of approximately 100,000 miles of roads to support sign and bridge inventory systems, pavement and safety management systems, as well as, railroad grade crossing inventory systems. Integrate network for central processing at TMC. Evaluate system performance.
M8.3 Communications Forum - Phase II	Continue activities in Phase I. Activities in Phase II will focus on the implementation of the communications master plan. Continue working on institutional barriers, networking issues and software issues, as well as, GIS standards and communications integration with local governments and statewide TMC.

3.4 Long-Range Project Deployment Scenario

Long-range ITS projects can build on earlier short- and medium-range project scenarios. Deployment of long-range projects will be based on successful operational tests, evaluations and available funding. Table 3.3 shows a summary of the recommended projects for the long-range deployment scenario based on citizen input and document research. Detailed information regarding these long-range projects can be found in Appendix C.

Table 3.3 Long-Range Project Deployment Scenario

Project	Description
Critical Program Area 1 - Traveler Safety and Security	
L1.1 Private Railroad Crossing Warning Systems Deployment	Deploy safety warning systems at an additional 10 private railroad-highway grade crossings where installation is warranted, based on findings from Projects S1.3 and M1.2.
L1.2 Emergency Service Railroad Crossing Notification System Deployment	Deploy statewide network of railroad-highway grade crossing sensor equipment linked to TMC warning 911 emergency dispatchers to the presence of trains, according to guidelines developed in Project M1.3.
L1.3 Variable Message Signs (VMS) Phase III	Design and implement expansion of VMS system to include additional VMS installations at approximately 20 priority locations with area-wide real-time message generation capabilities monitored by TMC.
L1.4 Surveillance - Phase III	Install additional video cameras at approximately 20 locations to extend surveillance on rural interstate and high volume highways.
L1.5 Motorist Assistance - Phase III	Continue activities from Phase I and Phase II. Phase III will focus on expanding program statewide and monitored by TMC.
Critical Program Area 2 - Emergency Services	
L2.1 Interoperable Radio Communications System	Expand statewide interoperable radio communication system based on findings and recommendations from Phase II (M2.1) to include commercial and non-vital uses where applicable.
L2.2 EMS Communications System	Expand EMS communications system statewide based on operational test performed in Project M2.2. Link Statewide EMS Communication System to statewide TMC, to improve EMS coordination and incident management.
L2.3 Coordinate-Based Addressing System - Phase III	Implement coordinate-based address system in additional NDOR districts, or statewide, based on Phase II evaluation performed in Project M2.3.
L2.4 EMS Communications Forum - Phase III	Continue activities from Phase I and Phase II. Activities in Phase III will focus on improving EMS communications equipment acquisition and integrating EMS dispatch network with TMC pending operational test evaluation.
Critical Program Area 3 - Tourism & Traveler Information Services	
L3.1 Highway Advisory Radio (HAR) - Phase III	Expand to include additional HAR with area-wide real-time message capabilities and pager reception capabilities.
L3.2 Kiosks - Phase III	Expand kiosks to include additional locations. Enhance system to facilitate interactive user features. Evaluate system performance and user acceptance.
L3.3 Tourist Information Warehouse Phase III	Expand tourism information warehouse to include real time event reporting with built-in reservation, ticket ordering and smart card payment capabilities at rest stop and truck stop kiosks.

Table 3.3 Long-Range Project Deployment Scenario (Continued)

Project	Description
L3.4 Traveler & Tourism Information Forum - Phase III	Continue with activities in Phase I and Phase II. Phase III activities will focus on system expansion and enhancement of technologies to support information delivery to near real time levels and system integration with TMC.
Critical Program Area 4 - Public Traveler Services & Public Mobility Services	
L4.1 Statewide Transit Coordination Phase II	Implement statewide transit coordination plan developed in Project M4.1.
L4.2 Rural Transit Forum - Phase III	Continue activities in Phase I and Phase II. Phase III activities will focus on integrating emerging technology applications into improved rural transit operations and transit coordination. Continue working on institutional barriers to coordination, CAD and AVL system integration with statewide TMC.
Critical Program Area 5 - Infrastructure Operations & Maintenance	
L5.1 Statewide Traffic Management Center (TMC) - Phase II	Construct statewide traffic management center. Begin systems implementation and integration. Conduct preliminary operational systems deployment. Evaluate systems performance. Implement statewide TMC operations in conjunction with emergency and incident management center(s) and Nebraska State Patrol dispatch.
L5.2 Statewide Maintenance Management System - Phase III	Deploy regional and statewide maintenance management systems based on operational tests conducted during Phase II (M5.2). Focus deployment on networking systems to allow districts and TMC to access and share information and make informed management decisions.
L5.3 Automated Safety Enforcement	Conduct operational tests of safety enforcement technologies in areas identified in Project M5.4. Evaluate operational tests.
L5.4 Incident Management System - Phase III	Continue with activities noted in Phase I and Phase II. Activities in Phase III will focus on incident management systems integration with TMC.
L5.5 Smart Work Zone Implementation - Phase II	Deploy smart work zone systems statewide in areas needed. Continue linking work zone systems with statewide TMC for remote evaluations.
L5.6 Traffic Signal Coordination Phase II	Deploy adaptive signal control systems and ramp metering systems in areas near I-80 and other major attractions based on Project M5.7. Link traffic signal control systems to TMC. Evaluate system performance.
Critical Program Area 6 - Fleet Operations & Maintenance	
L6.1 Automatic Vehicle Location (AVL) System - Phase III	Expand AVL system to snow plows and Nebraska State Patrol vehicles statewide for real time tracking by TMC. Evaluate system effectiveness and performance.
L6.2 Oversize/Overweight (OS/OW) Routing Tools - Phase III	Expand statewide computerized routing system to include real time infrastructure detail including border state CVO information. Evaluate system performance.

Table 3.3 Long-Range Project Deployment Scenario (Continued)

Project	Description
Critical Program Area 7 - Commercial Vehicle Operations (CVO)	
L7.1 CVO Information Warehouse Network - Phase III	Expand CVO information warehouse to include real time infrastructure data collection and integration with TMC, as well as, networking with other states' CVO credentialing and permitting sites. Evaluate system data collection and integration performance.
L7.2 CVO Warehouse Access Improvement System - Phase III	Expand methods statewide for real time information delivery to include HAR, truck stop and rest area kiosks, pagers, dedicated television channels, toll free telephone hotlines and high-speed internet access.
L7.3 Weigh-In-Motion (WIM) Improvement - Phase III	Expand WIM sites statewide where needed and integrate system access and control with TMC. Evaluate system performance.
L7.4 Electronic Hazardous Materials Permitting System - Phase II	Integrate hazardous materials permitting system with CVO information warehouse network and TMC. Evaluate system performance.
L7.5 Hazardous Materials Tracking System - Phase III	Integrate hazardous materials tracking software and GPS base station with CVO information warehouse network and TMC. Establish hazardous materials monitoring and toll-free telephone system with TMC. Evaluate system performance.
L7.6 CVO Forum - Phase III	Continue activities from Phase I and Phase II. Activities in Phase III will focus on integrating hazardous materials tracking and permitting systems with CVO information warehouse network. Regionalize or centralize CVO highway safety, monitoring and enforcement networks and operations with statewide TMC.
Critical Program Area 8 - Communications	
L8.1 GIS Statewide Road Map Network - Phase II	Continue with activities in Phase I. Phase II to focus on integrating GIS network with TMC.
L8.2 Communications Forum - Phase III	Continue activities listed in Phase I and Phase II. Activities in Phase III will focus on sharing data and information, identifying other emerging communications technologies and integrating systems with TMC.

3.5 Statewide ITS Architecture

The proposed Nebraska ITS Architecture provides an illustration of the types of systems and potential transport media supporting and connecting many of the technical elements of the 108 ITS projects in the Plan (See Figure 3.1). The Proposed Nebraska ITS Architecture supports the application of available technologies and facilitates the achievement of the goals and objectives defined in the planning process. Highlights from this proposed system architecture include:

Statewide Traffic Management Center. A statewide traffic management center (TMC), or a "virtual" TMC, has the capability of monitoring and managing a multitude of transportation systems. These statewide transportation systems include: traffic surveillance, incidents, weather, road conditions, signal timing, commercial vehicle activity, work zones, construction, information management, data collection and dissemination, public service functions such as broadcasting tourist information and facilitating transportation research. The proposed statewide TMC could utilize a dedicated I-80 fiber optic line and other transport media to monitor I-80 traffic conditions and traffic conditions on other highways statewide. The basic principle of a TMC is to bring together essential transportation systems and public agency employees into one facility (or virtual facility) to collectively make informed decisions regarding the movements of traffic statewide. System design and role of the TMC will depend largely on the feasibility study performed in Project S5.1.

Note: Inputs and Outputs for Figure 3.1 all lead to one proposed TMC facility. Arrows crossing over and into the TMC's boundary in Figure 3.1 represent specific links to certain areas within the TMC.

Automatic Vehicle Location (AVL) System. An AVL system could facilitate rural transit route guidance, tracking and transit coordination. In addition to rural transit, AVL systems could assist maintenance vehicles, ambulances, fire trucks, Mayday systems, school buses, police vehicles and hazardous material transporters. AVL can track fleet location and fleet movement having the potential for enabling pre-trip route guidance for more efficient, less time consuming operations.

Traveler and Tourist Information System. A means of distributing the information acquired by the TMC to the public can be accomplished by a means of delivering the information through a web site, local media, pagers or electronic mail. A traveler and tourist information system has been included as a means of utilizing data for more than just real time traffic analysis. Data collected by the TMC could be marketed and sold to commercial and private road users which could off set initial costs. A traveler and tourist information system outlined in this system architecture uses a combination of the Department of Economic Development's information database and TMC's information database giving travelers multiple information choices from additional transport media.

Dedicated Fiber Optic Line. Dedicated fiber spanning Nebraska along I-80 may be a solution for exchanging real-time information rapidly between the TMC and the end users. A fiber optic line could facilitate the deployment of surveillance cameras, loop detectors, ramp metering, WIM scales, weather stations, variable message signs, railroad crossing notification systems and many other public and private agency services. Today, nearly 10,000 miles of fiber optic cable spans Nebraska for use by utility and telecommunications companies *(2)*.

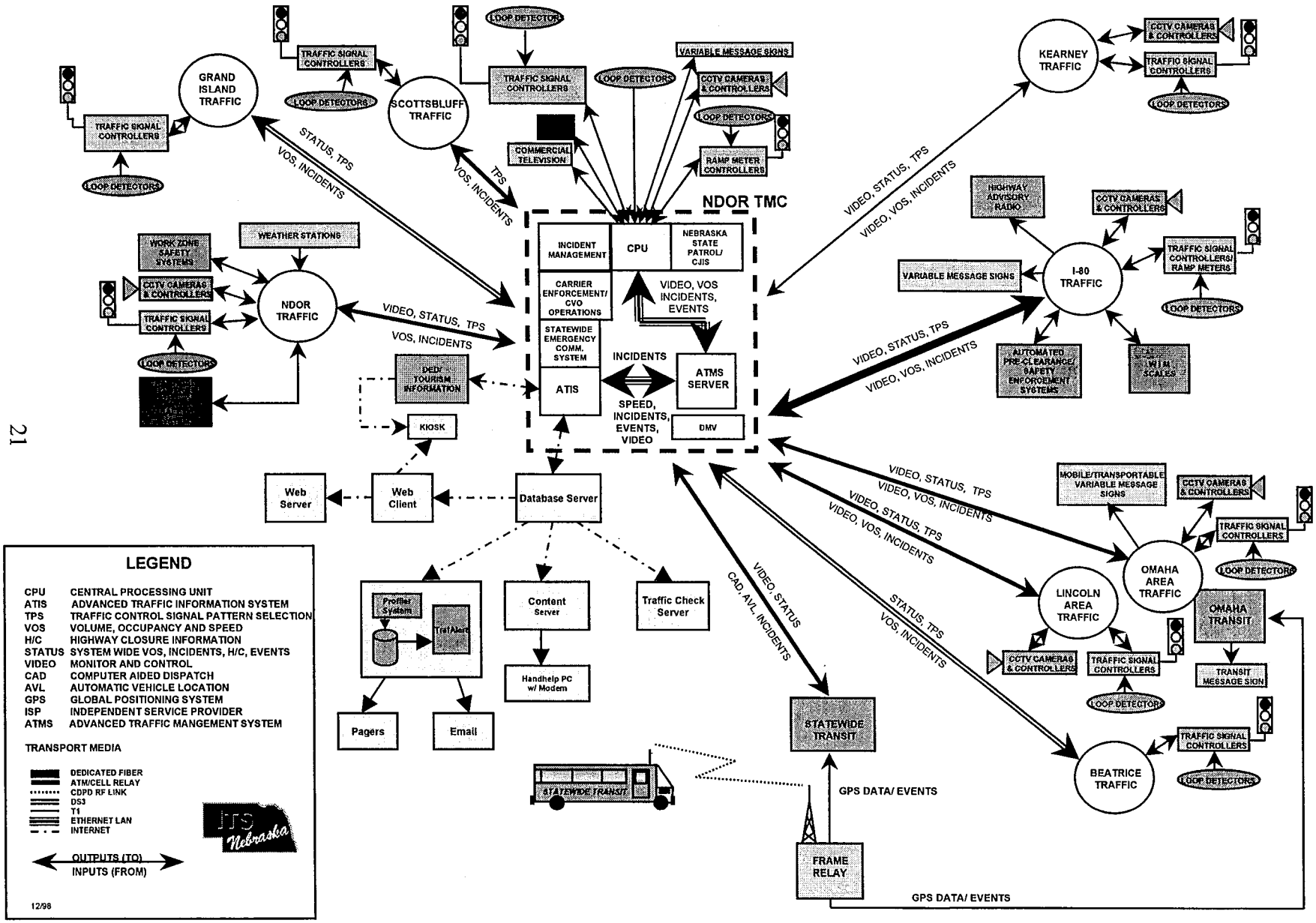


Figure 3.1 Proposed Statewide Systems Architecture

3.6 Funding Sources

The ITS study team has identified two types of funding sources that could be utilized to support the deployment of ITS statewide: (1) traditional transportation funding sources typically come from local, regional, state or federal agencies originating from tax levies for the purposes of transportation improvements and maintenance and; (2) non-traditional transportation funding sources typically coming from origins other than transportation tax levies and outside the NDOR state budget.

3.6.1 Traditional Funding Sources

Traditional transportation infrastructure funding sources for ITS projects are identified below:

Federal

- Surface Transportation Program (STP)
- National Highway Systems (NHS)
- Congestion Mitigation and Air Quality Improvement Program (CMAQ)
- Intelligent Vehicle Highway Systems Act (IVHS)
- Highway Bridge Replacement and Rehabilitation Program
- Scenic Byways Program
- Congestion Pilot Pricing Projects
- Federal Transit Authority (FTA) Funds
- Department of Health and Human Services
- Department of Agriculture
- Office of Rural Development
- Environmental Protection Agency

State (Interagency Partnerships)

- State Patrol
- Health and Human Services System
- Department of Economic Development
- Department of Administrative Services
- Department of Motor Vehicles
- Nebraska Department of Roads

Regional/Local

- Metropolitan/Regional Planning Organizations
- City Governments

3.6.2 Non-Traditional Funding Sources

Non-traditional transportation funding sources for future ITS project deployment in Nebraska are identified below:

Public/Private Partnerships

Other Funding Sources/Methods

- Capital Campaigns
- Foundations
- Fund-raising
- Grant Writing

The characteristics of ITS and the available sources for funding ITS projects in Nebraska requires both traditional and non-traditional funding sources. The recent passage of Transportation Equity Act (TEA-21) extended the life of the Intermodal Surface Transportation Efficiency Act and ensures future federal spending on ITS projects nationwide. However, this amount will not account for the total cost for all ITS projects recently developed for the state of Nebraska. Federal funding sources usually pay one-half or less for only a few ITS projects. Exploration of non-traditional funding sources such as partnership formulation, grant seeking/writing and other creative funding methods will be needed to ensure ITS project deployment and project sustainability.

4.0 PROJECT BACKGROUND

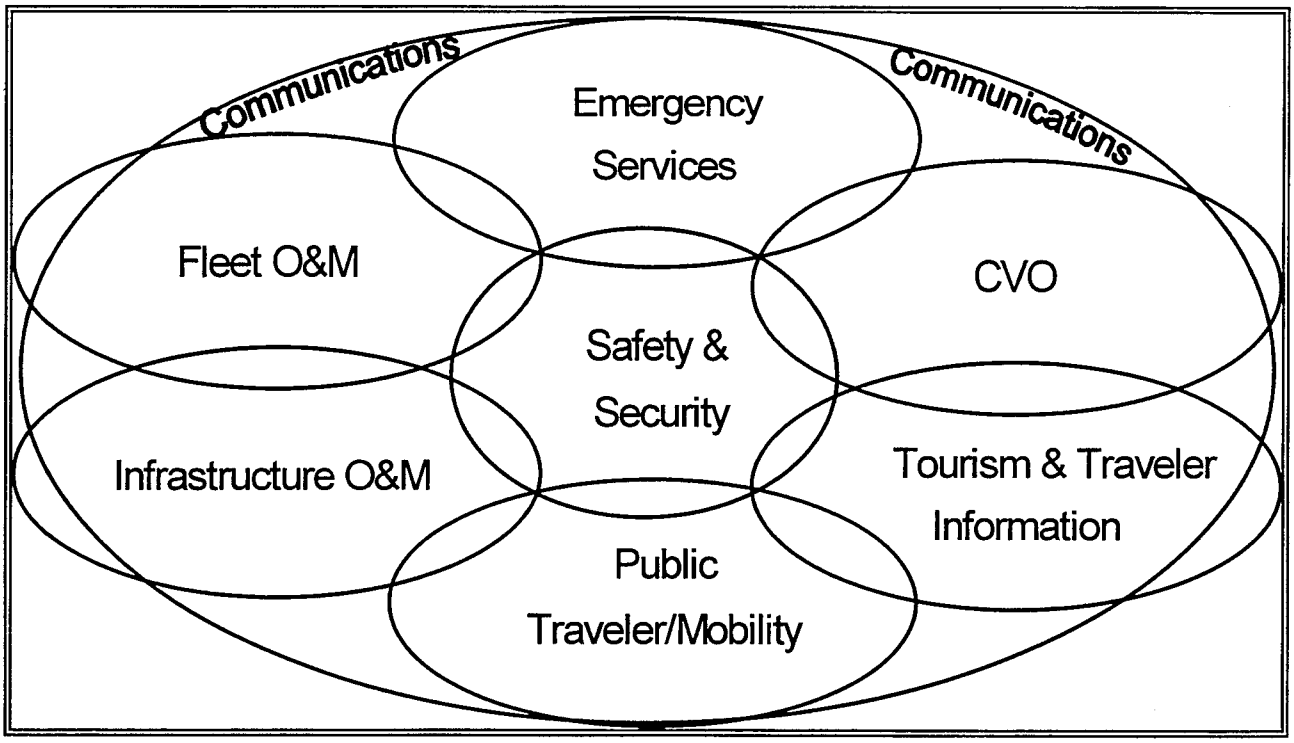
Rapid changes in technology and the emergence of the information age are having profound impacts on our society. Choices related to when, where and why one travels are affected by technology. Yet, society relies on the surface transportation system and seems to take for granted that it will enable one to travel in a timely and predictable manner wherever and whenever one chooses to go. Use of the surface transportation system is greater than ever, and growth in travel and changes in travel patterns point to the need to improve management and operations of the existing system. The application of technologies in the transportation sector offers the potential to substantially improve operations and management, which is the foremost challenge to transportation decision-makers today.

With the passage of the Intermodal Surface Transportation Efficiency Act of December 1991 (ISTEA), Congress established a new era for transportation, calling for more efficient and safe use of existing highway and transit infrastructure and emphasizing intermodalism-the seamless integration of multiple transportation modes. Intelligent Transportation Systems (formally known as Intelligent Vehicle-Highway Systems) evolved from this act prescribing the widespread implementation of intelligent transportation systems to enhance the capacity, efficiency and safety of the Federal-aid highway system. Additionally, ITS can serve as an alternative to additional physical capacity of the Federal-aid highway system. Recently, the Transportation Equity Act (TEA 21) passed by Congress and signed by President Bill Clinton, further supports and funds the ideological principles of ISTEA and intelligent transportation systems planning.

On April 30, 1998, the first Nebraska ITS Steering Committee meeting was held at the Nebraska Department of Roads in Lincoln. Committee members discussed their role in this statewide ITS planning process and volunteered to serve within certain critical program areas (CPAs) that best matched their professional experiences. The CPAs are shown in Figure 4.1. The ITS Steering Committee members assigned to each CPA is shown in Table 4.1. Due to the complex nature and interconnectedness of all eight CPAs, several steering committee members volunteered to offer their professional expertise to more than one CPA.

Since the first ITS Steering Committee meeting, three additional meetings were held. At the second meeting, the committee reviewed the results of the needs assessment and established ITS goals and objectives which guided the identification of alternative projects to address the needs and opportunities for the deployment of ITS in Nebraska. At the third meeting, the committee reviewed the alternative projects and selected those to be included in the strategic plan. The fourth and final committee meeting consisted of strategic plan presentation and recommendations for further action.

Figure 4.1 Critical Program Area Model Modified for Nebraska



Critical Program Areas

1. Traveler Safety and Security
2. Emergency Services
3. Tourism and Traveler Information Services
4. Public Traveler Services and Public Mobility Services
5. Infrastructure Operations and Maintenance
6. Fleet Operations and Maintenance
7. Commercial Vehicle Operations
8. Communications

Table 4.1: ITS Steering Committee Members and CPAs

EMERGENCY SERVICES: MAJOR BRYAN TUMA, State Patrol DR. DAVID SCHOR, Health & Human Services STEVE ANDERSEN, Department of Roads DALYCE RONNAU, Department of Roads	**FLEET OPERATIONS & MAINTENANCE:** RON KONTOS, Department of Roads DAN ROSENTHAL, Department of Roads MAJOR BRYAN TUMA, State Patrol DALYCE RONNAU, Department of Roads STEVE ANDERSEN, Department of Roads
SAFETY & SECURITY: RANDALL PETERS, Department of Roads MAJOR BRYAN TUMA, State Patrol DALYCE RONNAU, Department of Roads STEVE ANDERSEN, Department of Roads DAN ROSENTHAL, Department of Roads	**TOURISM & TRAVELER INFORMATION:** MAJOR BRYAN TUMA, State Patrol DAVE MILLER, Department of Tourism DALYCE RONNAU, Department of Roads STEVE ANDERSEN, Department of Roads DAN ROSENTHAL, Department of Roads
COMMERCIAL VEHICLE OPERATIONS (CVO): JOE BOTSFORD, Department of Motor Vehicles MAJOR BRYAN TUMA, State Patrol STEVE ANDERSEN, Department of Roads RANDALL PETERS, Department of Roads RON KONTOS, Department of Roads	**INFRASTRUCTURE OPERATIONS & MAINTENANCE:** MAJOR BRYAN TUMA, State Patrol DALYCE RONNAU, Department of Roads STEVE ANDERSEN, Department of Roads RANDALL PETERS, Department of Roads RON KONTOS, Department of Roads
PUBLIC MOBILITY: STEVE ANDERSEN, Department of Roads DR. DAVID SCHOR, Health & Human Services DAN ROSENTHAL, Department of Roads	**COMMUNICATIONS:** BILL MILLER, Division of Communications MAJOR BRYAN TUMA, State Patrol DALYCE RONNAU, Department of Roads STEVE ANDERSEN, Department of Roads

4.1 Planning Process

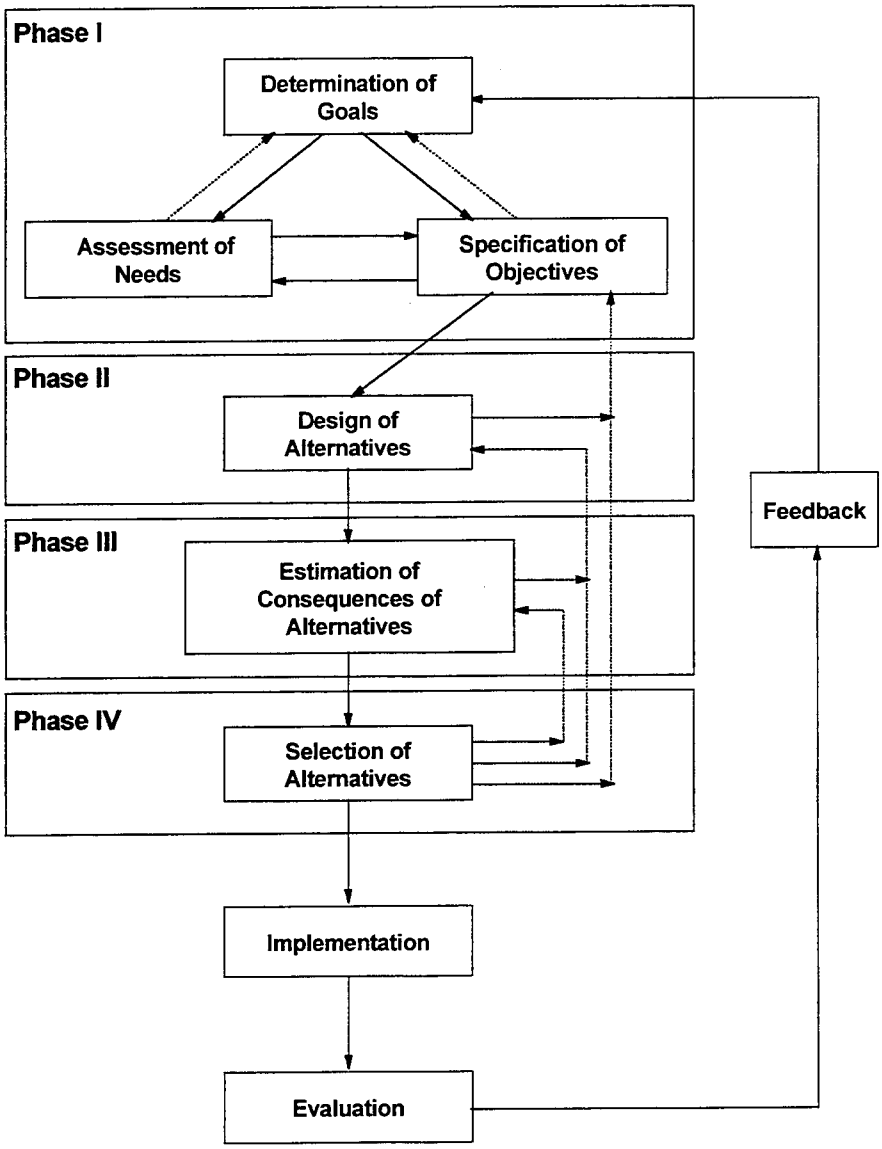
The Nebraska ITS planning process used was a process that involved the incorporation of the needs, priorities, goals and objectives of other plans that are relevant to the deployment of ITS in Nebraska. The ITS study team relied heavily upon other Nebraska statewide plans to better grasp the problems and issues that may affect ITS. One of the first tasks of the study team was to gather as many statewide comprehensive plans as possible, to determine if any ITS planning was currently planned. Plans acquired for this plan can be found in Appendix D.

The Nebraska ITS study team selected the Rational Planning Model to serve as the basis for the ITS planning process. The Rational Planning Model is shown in Figure 4.2. The ITS study team believes the traditional transportation planning process is still important and relevant to the overall objectives of ITS planning in Nebraska and should be considered and compared regularly. Due to the complexity and diversity of numerous programs, committees, standards and political barriers throughout Nebraska, the study team decided to use the Rational Planning Model providing a more generalized approach to the ITS planning process.

Each phase within the planning process contained specific tasks for the ITS study team to undertake. The first phase of the planning approach consisted of a needs assessment to determine the goals and objectives of ITS in Nebraska. A series of interviews, a focus group, several surveys, several meetings and extensive review of existing documents enabled the ITS study team to establish ITS goals and objectives for Nebraska. This was the most important phase of the planning process as it became the precursor for defining the project descriptions needed to satisfy the goals and objectives. The needs assessment yielded the following primary concerns:

- Safety issues related to railroad crossings.
- Hazards associated with long emergency response times to reach troubled motorists in isolated areas.
- Hazards related to inclement weather/road closures.
- Need for increased driver awareness about potentially dangerous conditions and tourist attractions/points of interest.
- Need for improved fleet management and incident management.
- Need for coordinated rural transit.
- Hazards associated with snow plows sharing highways with passenger vehicles.
- Safety issues concerning vehicles passing through work zones.
- Concern over CVO oversized/overweight restrictions.
- Concern over hazardous materials routing, tracking and permitting.
- Need for CVO electronic permitting system.
- Need for increased multi-jurisdictional communications among transportation agencies.
- Need for increased efficiency for CVO at weigh stations.
- Need for border state CVO information at truck stops.
- Need for information about road/traffic conditions before departing on trip.
- Safety concerns for school buses crossing railroad tracks.
- Need for interoperable radio communications among state and local governments

Figure 4.2 Nebraska ITS Planning Process/Rational Planning Process



Source: Meyer, pp. 39

The second phase of the ITS planning process consisted of designing alternative projects. This process was undertaken by analyzing the ITS technologies and management systems deployed in other regions, states and countries, as well as, the National ITS Architecture developed by the Federal Highway Administration. Extensive investigations and document reviews were needed to formulate feasible projects that can assist Nebraska achieve statewide ITS goals and objectives. Significant consideration was given to costs, user acceptance, proven project success, cultures and environments. Additionally, feedback was sought from key stakeholders regarding ITS proposed project concepts.

The third phase of the planning process involved estimating the consequences of the alternative ITS projects. In this phase, projects were analyzed based on their costs, benefits and benefit ratios. Project costs were annualized for three different periods of time in the future representing the next 5 years (short-range), 5 to 10 years (medium-range) and 10 to 20 years (long-range).

The fourth and final planning phase conducted by the ITS Study Team was the selection of project alternatives for future action. In this phase, ITS projects were presented to the ITS Steering Committee for review, revision and comments. Nonessential projects were eliminated. Other projects were streamlined, added, modified or clarified. In this step of the planning process, projects were reviewed and certified by the ITS Steering Committee for future consideration and/or implementation.

The remaining actions of the ITS planning process will be under the direction of NDOR and other key stakeholders. These final actions of the planning process not performed by the ITS study team consist of (1) project implementation, (2) project evaluation and (3) feedback. ITS projects will be implemented based on available funding, project costs and project benefits. Once the projects have been implemented, they should be evaluated based on how well they support the goals and objectives initially developed. Feedback from ITS project managers, key stakeholders and concerned citizens will determine future project parameters, modified implementation strategies and/or project termination.

4.2 Critical Program Areas

The Nebraska ITS study team held meetings with known statewide experts and stakeholders regarding the eight Critical Program Areas (CPAs). Below is a list of the eight CPAs explored by the ITS study team. In addition to these meetings on CPAs, the study team collected and reviewed documents to facilitate their search for needs, priorities, goals and objectives relating to the eight CPAs. The complete list of these documents can be found in Appendix D.

4.2.1 Traveler Safety and Security

The meetings for the Safety and Security, and Infrastructure Operation and Maintenance were combined into one group meeting. The ITS study team determined that the overlap between Steering Committee Members facilitated a single meeting format and would involve similar discussions and the same key stakeholders.

While discussing Safety and Security issues, participating members agreed that the two most important topics in Nebraska are railroad crossings and road information. Discussions regarding railroad crossings focused on assessing and mitigating risks at grade crossings. The primary focus during the road information conversation was on weather and road conditions, and how the use of ITS technology at

rest stops and on the radio are two ways to better inform travelers. For each of these two topics, members identified stakeholders with whom the ITS study team should meet to follow-up and discuss their plans, goals, objectives, and needs relative to ITS.

4.2.2 Infrastructure Operation and Maintenance

After completing the discussion of Safety and Security issues, the group then turned their attention to topics related to Infrastructure Operation and Maintenance. Here, the group identified seven issues that are important to Nebraska: (1) traffic signals; (2) pavement management system; (3) bridge management system; (4) safety management system; (5) GIS; (6) road weather information and; (7) work zone traffic control. For each topic, members of the group identified stakeholders for the ITS study team to follow-up with additional comments and suggestions.

It was determined by the ITS study team that the most cost-effective way of contacting statewide transportation officials regarding statewide infrastructure operations and maintenance issues was through a survey. A survey instrument was then developed with the assistance of the University of Nebraska - Lincoln Technical Transfer Center. The survey was sent to Nebraska highway superintendents, public works and city/county officials. A total of 695 surveys were mailed in July 1998 (See a copy of the survey in Appendix G) with 140 surveys returned. Results of the survey can be found in Appendix H.

4.2.3 Fleet Operations and Maintenance

It was determined, by the members participating in the Fleet Operations and Maintenance CPA meeting, that more information was needed on how ITS can facilitate NDOR maintenance vehicle fleets to operate more efficiently. It was identified in the meeting that there are several different organizations in the state that operate varying sized fleets which have very little in common except that they are fleets. For example, the operation of the University of Nebraska fleet is fairly unique in comparison to the State Patrol and urban transit systems like StarTran of Lincoln. Several questions found in the maintenance survey (Appendix G) addressed fleet operations and maintenance issues as well as the CVO focus group (Appendix F). The fleet operational and maintenance needs determined by surveys and the CVO focus group are reflected in the ITS projects developed for them.

4.2.4 Emergency Services

Early in the Nebraska ITS planning process, members of the study team conducted a survey of 490 fire chiefs throughout Nebraska. This survey yielded responses that indicated that ITS is unknown to most of the emergency service providers in Nebraska. Additionally, a lack of resources prohibits fire departments from upgrading their equipment. The survey also suggests that if fire departments had additional funds, they would be interested in ITS technologies that could quicken emergency response times in their jurisdictions. The majority of fire chiefs responding indicated that there is no need to coordinate emergency communications under one regional or statewide system. Survey results can be found in Appendix I.

Participants in the Emergency Services CPA meeting identified three emergency medical service (EMS) issues as they relate to ITS: (1) common communications system among emergency responders; (2) coordination among 911 centers; and, (3) incident management on the interstate and state highway

system. It was agreed by the attendees of the meeting that a focus group meeting would be helpful in order to adequately identify the necessary plans, goals, and needs among EMS stakeholders. This was followed by identifying statewide stakeholders who should attend the focus group meeting. However, it will not be possible to conduct the focus group meeting due to the time constraint of the project. Instead, interviews with key stakeholders will be conducted.

4.2.5 Tourism and Traveler Information Services

Members participating in the Tourism and Traveler Information meeting felt that the Nebraska Division of Travel and Tourism should be the primary source of information regarding this particular critical program area. A representative of the Division of Travel and Tourism agreed to make their needs assessment information available to the ITS strategic planning research team. Key issues that should be addressed in the ITS plan include: (1) restrictions on conducting commerce on federal right-of-way as related to the use of smart cards; (2) system architecture for traveler information management; and, (3) coordination of ITS infrastructure deployment among state agencies. Members at the meeting also talked about the merits of rental car agencies using ITS technology as a way to improve traveler information and Nebraska tourism. Stakeholders that need to be contacted by the ITS study team were also identified.

4.2.6 Public Traveler Services/Public Mobility

Participants in this meeting agreed that the most significant need for public mobility is better coordination between different local/regional transportation providers. The public mobility problem in Nebraska is not due to the lack of vehicles. Rather, it is the lack of coordination between different state, local, nonprofit, public, private transit operators to better utilize vehicles they currently have. Some members expressed their desire that the NDOR provide more technical transportation planning expertise to allow regional organizations to coordinate services among themselves. Members of the group suggested that an ITS scanning tour and peer-to-peer exchange could enhance ITS awareness among local Nebraska transportation service providers as well as help improve the coordination of regional transportation services. Through discussions with the Department of Health and Human Services System and private transportation providers across the state, it was determined that an ITS demonstration project in Kearney and Beatrice could be favorable locations for beginning the process of coordinating local and regional transportation services.

4.2.7 Commercial Vehicle Operations (CVO)

Members participating in the CVO meeting agreed that more work is needed on the part of the ITS study team to flush-out the important issues on this critical program area. Participants felt that a focus group was necessary in order to obtain the necessary information to adequately understand the CVO critical program area in Nebraska. They identified seven groups of stakeholders that should be invited to the focus group. The seven stakeholder groups identified are: (1) permitting, (2) shippers, (3) motor carriers, (4) drivers, (5) truck stops, (6) government (state and federal), and, (7) motor carriers safety council.

The CVO focus group met in June 1998 at the University of Nebraska-Lincoln City Campus. Approximately 40 participants attending this meeting represented various commercial carrier backgrounds including agriculture, petroleum, truck stops, State Patrol, State Fire Marshal, interstate

and local commercial carriers. The participants shared the following major concerns and needs: (1) Reliable traveler information, (2) Intermodal communications for seasonal transport, (3) Emergency response, (4) Safety, (5) Standards and (6) Border state information availability. Most concerns are related to the specific environments in which the carriers operate. Projects developed for the CVO CPA are a result of the needs assessment from this focus group, the Nebraska CVO Business Plan and the Nebraska Long-Range Transportation Plan.

4.2.8 Communications

Communications is not one of the identified seven critical program areas identified by the Federal Highway Administration and the ITS National Architecture. It is, however, identified as an institutional layer encompassing all CPAs. The ITS study team collectively agrees that "Communications" should be recognized as both a CPA and an institutional layer for the purposes of the ITS planning process. The ITS study team agreed that communications is extremely important in Nebraska as it relates to ITS; therefore, they addressed it as a critical program area for the sake of the planning and research process. Members participating in the communication's CPA meeting identified six topics which need further attention within the ITS plan: (1) two-way radio; (2) telephone (wireless and land line); (3) internet and kiosks; (4) GPS and GIS; (5) cable television; and, (6) radio. For each topic the group identified necessary key communications agencies with whom the ITS research team should meet with and discuss communication plans, goals, objectives, and needs in Nebraska. A list of user services for communications and other CPAs can be found in Appendix J.

Communications agencies contacted and deemed important by the ITS study team to the ITS planning process in Nebraska include:

- Nebraska Information Technology Commission
- Cox Communications
- Cablevision
- Burlington Northern Santa Fe Railroad
- Department of Administrative Services Division of Communications, Division Radio Communications
- Aliant Communications/Aliant Cellular
- Cellular One
- Nebraska Broadcasters Association
- Nebraska Educational Telecommunications
- Nebraska Information Network
- Omaha Public Power District
- Nebraska Public Power District
- Union Pacific Railroad
- Nebraska Emergency Management Agency

5.0 METHODOLOGY AND RESULTS

5.1 Research Process

The development of the ITS plan was based on the information obtained from CPA focus groups, ITS Steering Committee meetings, surveys, interviews, and content analysis. Eight CPA meetings were held to address problems, issues and challenges facing the state and how ITS can resolve these problems. Additionally, key stakeholders and participants generated strategies, methods and additional contacts to provide further information pertinent to specific CPAs. However, before the CPA meetings were held, a thorough review of acquired ITS plans and related documents from other areas of the United States was performed. This task provided ideas about potential projects to consider in Nebraska. A list of documents acquired and reviewed can be found in Appendix D.

The ITS Study Team concluded that the eighth CPA, "Communications," should be included as a critical program area because of its critical relationship to all other CPAs and its technical complexity. The Communications CPA can also be identified as a dominant *layer* of the ITS Architecture connecting all other CPAs. An example of this interconnectedness is illustrated in the Proposed Statewide System Architecture found in Figure 3.1.

Before that planning process was selected and meetings scheduled, an approach as to how the plan would evolve into a comprehensive document needed to be identified. The study team came to the conclusion that there were two different methods of breaking the research and planning process down into smaller, more "manageable parts." The first choice utilizes the National ITS Architecture and the established user services to address problems, issues, goals and objectives. This approach involves a series of focus groups, surveys and interviews with targeted participants to identify the issues, problems and concerns while considering all user services. This method was too cumbersome because several of the user service bundles have little application for rural Nebraska. Moreover, certain user service bundles did not match the expertise and/or interest of some key participants. Use of this method would have risked the loss of interest of some stakeholders which may have resulted in their lack of participation in the ITS planning process.

A method of using CPAs as manageable research subcategories proved to be more useful for the Nebraska ITS study team. The CPA management technique allowed the ITS study team to focus on individual CPAs, thereby, providing a better focus on a particular portion of ITS. Once the decision was made to divide the needs assessment into eight CPAs; it was easier to determine who could best serve as a key stakeholder and/or ITS Steering Committee member and what their specific role would be. Once the key stakeholders and ITS Steering Committee members were identified and selected for each CPA, meetings were easily organized. Hence, fewer stakeholders were needed at any one CPA meeting and those who attended had a high level of interest in the topics discussed providing significant input to the ITS plan. The disadvantage of the CPA management technique is the lack of collaboration among stakeholders of different CPAs. However, this deficiency was avoided with the ITS Steering Committee meeting regularly representing all eight CPAs. This allowed for further collaboration on overlapping issues and concerns.

5.2 CVO Focus Group

A CVO focus group meeting was conducted in June 1998, to supplement the CVO/ITS Business Plan developed a year earlier. The purpose of the CVO focus group meeting was to gather a diverse population of both private and public CVO key representatives from all parts of the state to discuss the issues, problems and opportunities of ITS. The CVO focus group meeting first began with the entire group meeting in together to hear comments from the ITS State Coordinator and ITS Principal Investigator. After that, the entire group was split into two smaller groups. Group A represented intra-state representatives. Group B consisted of agriculture and ranching representatives. Each group identified their specific problems and needs based on their experiences. These needs and problems were recorded and compared to the original CVO/ITS Business Plan to determine if any revisions were needed for the ITS Statewide Plan. The CVO focus groups then met jointly and discussed their problems and needs in a collective manner and compared each group's problems and needs. A detailed description of the CVO focus group can be found in Appendix F.

5.3 EMS Survey

In March 1998, the ITS study team mailed 490 surveys to fire chiefs, ambulance drivers and rescue squads throughout Nebraska. The purpose of this survey was to determine the existing conditions of emergency response training, familiarity of ITS applied to EMS and sufficient resources to respond to emergencies. Additionally, respondents were asked to provide additional comments to the last open-ended question regarding any concerns they may have with emergency response within their jurisdiction that were not addressed within the survey. The total number of responses to this survey was 198 or approximately 40 percent. The most significant aspect of this survey was that most respondents support technologies to increase the emergency response times within their jurisdiction. This suggests that many rural EMS providers may be interested in experimenting with innovative means of responding to incidents. Another significant finding was people's belief that training would not account (or be feasible) for quicker emergency response times. People indicated that their EMS teams are volunteers who have little or no free time to train for emergencies. Other significant findings include lack of funding for the acquisition of additional equipment or EMS technologies. Funding could prove to be the largest barrier for those EMS departments willing to make changes in how they respond to incidents within their jurisdiction. A more detailed description of the EMS results and response data can be found in Appendix I.

5.4 Street/Highway Operations and Maintenance Survey

In July 1998, the ITS study team mailed 690 surveys to mayors, county commissioners, maintenance superintendents, public works officials and other key stakeholders statewide. The total number of survey responses was 149, or 21 percent. The survey focused on three divisions of street/highway operations and maintenance. The three divisions targeted were street/highway maintenance, bridge maintenance and traffic safety. The purpose of this survey was to determine what kinds of technology and information local governments currently have or need. The survey was structured to probe the technological needs, types of information cities and counties keep on record, information accuracy, software used and if coordination exists with other maintenance jurisdictions throughout the state. The survey provided useful information to assist the ITS study team determine the types of ITS projects that would serve maintenance departments statewide. For example, many survey responses expressed a need for GIS software and sign/pavement improvement systems. The ITS study team designed ITS projects

to accommodate most of the needs indicated by the survey participants. A detailed description of the maintenance survey and survey results can be found in Appendices G and H.

5.5 Interviews and Contacts

Interviews and contacts with over 150 transportation and ITS officials were performed throughout the ITS planning process by the ITS study team. ITS officials, ITS equipment vendors and both private and public transportation officials were consulted and interviewed to determine the resources needed, successful ITS projects deployed elsewhere and other additional contacts for in-depth technical information. Interviews were extremely helpful in the planning process. For example, an interview with Paul Pisano, Federal Highway Administration (FHWA), yielded information about a rural public transit project in northern Florida and Ottumwa, Iowa that became models for two projects included in this plan (Project S4.1 and Project S4.2). The interviews often led to new ideas and different perspectives on ITS, which shaped the way information was later assembled and interpreted. The interview process was generally a positive task in the ITS planning process, as many ITS officials were enthusiastic and willing to share their knowledge and experiences. Interviews and/or contacts facilitated the identification of applicable ITS technologies. Moreover, people contacted often discussed problems and situations with ITS unique to their experiences and not usually found in publications. Electronic mailing capabilities supplied by the World Wide Web often proved to be the most reliable and favorable means of initiating any and all contact regardless of distance. Contacting ITS officials in the future for further ITS planning and deployment purposes using the electronic mailing system is highly recommended. A list of people interviewed and/or contacted can be found in Appendix E.

5.6 Document Review

Documents were collected and reviewed throughout the research and planning process. Documents reviewed consist of various comprehensive statewide plans, state policy manuals, ITS plans from other states, newsletters, magazines and Federal Highway Administration (FHWA) documents. FHWA provided the most comprehensive and updated ITS information for the ITS study team. Literature supplied by FHWA gave the ITS study team detailed information about other ITS projects and plans in other states and a National ITS Architecture to assist in shaping the Nebraska ITS Statewide Plan. FHWA proved to be the most helpful by supplying needed materials and software rapidly at little or no cost. A list of FHWA and other documents acquired can be found in Appendix D.

6.0 GOALS AND OBJECTIVES

6.1 Identification of Goals and Objectives

Goals and objectives for the ITS statewide plan were developed based on the needs and priorities stated by key stakeholders and documented in comprehensive statewide plans. The ITS study team reviewed documents relating to each CPA to determine the goals and objectives of ITS. Once the goals and objectives were identified, the task of designing ITS alternatives facilitated the means of following through with the wants and needs of Nebraska residents. The identification of goals and objectives led to the development of the ITS projects included in the plan. Below are the needs, priorities, goals and objectives identified for each CPA from Table 6.1 to Table 6.8.

Table 6.1 Traveler Safety and Security Goals and Objectives

Source	Needs
1) *Traveler Safety & Security Meeting*, 5/26/98	1) Railroad grade crossing warning 2) Road information
2) *Survey*, sent to 695 Highway Superintendents; Public Works Directors; City/ County officials	1) GIS 2) Pavement management technologies 3) Sign inventory improvements

Priorities
1) Railroad grade crossing warning
2) Road information

Goals and Objectives

GOAL 1- IMPROVE RAILROAD GRADE CROSSING WARNING
- Objective 1- Work with railroad companies to get their input
- Objective 2- Equip school buses with warning devices
- Objective 3- Provide incentives to communities to improve warning systems

GOAL 2- IMPROVE TRAVELER ROAD INFORMATION
- Objective 1- Provide (real time) updated Internet accessible road information
- Objective 2- Provide (real time) updated information at variable message signs on state roads

Table 6.2 Emergency Services Goals and Objectives

Source	Needs
1) *Nebraska Rural Health Plan for the Critical Access Hospital Program*, 1998	1) Shortage of appropriately trained (EMS) volunteers able to respond when needed (p.3) 2) Regarding development of five rural health networks, "these linkages will be enhanced by the implementation of improved systems of emergency and non-emergency transportation, as well as telecommunication systems linking the communities" (p.12) 3) The conversion to critical access hospitals will force the community to evaluate their present communication systems and emergency and non-emergency transportation systems (p.12) 4) Network agreement will also provide mechanisms for emergency and non-emergency transportation systems and communications systems. Access improved by investing and better coordinating emergency and non-emergency transportation systems (p.21)
2) *State of Nebraska Emergency Operations Plan*, 1993	1) For Division of Communications, receipt of Governor's proclamation of a disaster emergency, support disaster response by realignment of state communications resources and/or coordination of other communication services as required (p.14) 2) Provide basic telephone voice switched service for key response agencies. These services are subject to subsequent reimbursement by the using entity (p.14) 3) Division of Emergency Medical Services, Department of Health- Identify licensed ambulance services which could be mobilized to provide operations to disaster victims (p.18) 4) Department of Roads- Provide communications to support response and recovery operations (p.21) 5) Nebraska State Patrol- Provide mobile communications center for Field Command Post, as required (p.22)
3) *Nebraska Department of Health, Health Systems Planning and Development*	1) Problem Statement- "Without coordinated protocols of actions concerning communications, transport and transfer; medical direction will continue to be chaotic and may result in long term disability or loss of life. Protocols shall include: (p.69) * Access to the system (911) * Immediate response to notification of incident * Pre-scene operations to include level of response * On scene operations and treatment. The Medical Incident Command System is strongly encouraged. * Transport protocols from scene to nearest appropriate facility and interfacility transport, if necessary * Data collection to include statistical compilation with an interface to the Statewide Trauma Registry.

Table 6.2 Emergency Services Goals and Objectives (continued)

Source	Needs
	2) Problem Statement- "Currently there are no statewide provisions for coordinated, appropriate access or dispatch for emergency services..." (p.71). Each Trauma Region will have an Emergency Central Dispatch structured according to the recommendations of the DOT... The dispatch shall have reliable communication link to all EMS responders and transport destinations throughout the State. *It is recognized that several of the telephone systems in the State of Nebraska are not yet capable of supporting 911, so efforts must be made to improve these systems (p.71) 3) Reason for not transporting, NARIS Report, "Unable to Locate" (Figure 19)
4) *Final Report, Evaluation of the State EMS Program,* 1994 (Appendix in *Statewide Trauma System*)	1) "Seamless transfer of patients between different agencies and levels of care not evident" (p.19) 2) "Explore development of innovative response systems for rural communities" (p.22)
5) Draft State Emergency Response Team Standard Operating Procedures and Hazardous Materials Safety	NONE
6) *Survey of Nebraska Fire Chiefs* Tobin, 1998	1) Appendix D- "Statewide communication system" "Need better communications between agencies" "Required 800 MHZ system" "Enhanced 911 service hand-held radios and access to air ambulance service" "Enhanced cell phones to locate where call is coming"
7) *ITS Emergency Services Mtg.*, May 1998	1) Need common communications systems among emergency responders, coordination among 911 centers, and incident management on interstate and state highway system

Priorities
1) Statewide radio communications system
2) 911 system
3) Patient transport and transfer system
4) Incident management

Goals and Objectives

GOAL 1- IMPROVE STATEWIDE RADIO COMMUNICATIONS FOR EMERGENCY SERVICES
- Objective 1- Establish state guidelines for radio communication hardware
- Objective 2- Implement statewide seamless communications system for State Patrol and NDOR
- Objective 3- Educate and encourage local emergency services and law enforcement
- Objective 4- Establish training for sharing information and working together

GOAL 2- IMPROVE AVAILABILITY OF, AND ACCESS TO, 911 SYSTEMS STATEWIDE
- Objective 1- Encourage and facilitate under served and unserved counties to develop 911 capabilities
- Objective 2- Develop statewide 911 protocols
- Objective 3- Encourage enhanced 911 to facilitate locating emergencies
- Objective 4- Develop Emergency Central Dispatch coordinated with NDOR, Nebraska State Patrol (NSP) and trauma regions

GOAL 3- IMPROVE PATIENT TRANSPORT AND TRANSFER CAPABILITIES IN EMERGENCY SITUATIONS
- Objective 1- Develop guidelines for emergency patient transportation
- Objective 2- Coordinate communication between NSP, trauma regions and EMS to improve patient transport protocols

GOAL 4- IMPROVE INTERSTATE, HIGHWAY, AND STATE ROAD INCIDENT MANAGEMENT AND INCIDENT REPORTING
- Objective 1- Develop new procedures for standard reporting with NDOR, NSP, and NDOR District Engineers
- Objective 2- Develop centralized reporting system
- Objective 3- Use central reporting system to report to FHWA

Table 6.3 Tourism and Traveler Information Services Goals and Objectives

Source	Needs
1) *Tourism & Traveler CPA Meeting*, 5/20/98	1) Restrictions on conducting commerce on federal right-of-way as related to use of smart cards 2) System architecture for traveler information management 3) Coordination of ITS infrastructure deployment among state agencies
2) Top 25 Requested Services at Nebraska Rest Areas, 1996 Dept. of Tourism	1) Vending machines 2) Mileage/directional information 3) Nebraska maps 4) Lodging/ reservations 5) State park and campground information 6) More telephones 7) Road/ weather reports 8) Restaurant information 9) Postcards 10) State park permits 11) Restrooms 12) Stamps/ mail box 13) Coffee 14) Colorado map 15) General information 16) Nebraska motel coupon book 17) Other state maps 18) Car service/emergency service 19) Fishing permits 20) Newspapers 21) Money change machines 22) Nebraska tapes 23) Nebraska pins/gifts 24) City maps 25) Casinos
3) Nebraska 1996 Tourism Industry Development Plan	1) Computerized Tourism Information (p. 294)
4) Scottsbluff National Monument General Management Plan	1) Develop new shuttle system with interpretive message (p.25)
5) Missouri/ Niobrara/ Verdigre Creek EIS 1997	NONE

Priorities

1) Traveler/ tourism information mileage, directional information, road/weather conditions, restaurant information, state park/campground information
2) Commerce with smart cards, lodging/ reservations, fishing permits, etc.
3) Coordinate ITS infrastructure among state agencies tourists with data on mileage, directions, road conditions, weather conditions, restaurants, state parks, campgrounds

Goals and Objectives

GOAL 1- IMPROVE ACCESSIBILITY TO TRAVELER/ TOURISM INFORMATION
- Objective 1- Establish "tourist information warehouse" which can be accessed by travelers/tourists with data on mileage, directions, road conditions, restaurants, state parks, campgrounds
- Objective 2- Make tourist information warehouse accessible from rest area kiosks
- Objective 3- Work with traveler transportation services (airports, railroads, bus companies, rental car agencies) to provide access to tourist information warehouse

GOAL 2- ASSESS FEASIBILITY OF CONDUCTING "COMMERCE" ON RIGHT-OF-WAYS USING SMART CARDS
- Objective 1- Determine legality and applicable restrictions
- Objective 2- Identify system for conducting "commerce"
- Objective 3- Implement system

GOAL 3- IMPROVE COMMUNICATION AND COORDINATION REGARDING ITS AND ITS INFRASTRUCTURE AMONG STATE AGENCIES
- Objective 1- NDOR and Nebraska Department of Economic Development (NDED) should discuss ITS needs and infrastructure collectively
- Objective 2- NDOR and NDED should each appoint an ex-officio member to sit on the other agency's ITS committee

Table 6.4 Public Traveler Services/Public Mobility Services Goals and Objectives

Source	Needs
1) *Nebraska Human Services Needs Assessment*, for DSS, 1996, by Gaber & Gaber	1) Transit/ transportation identified as a primary need in the following areas: *Central Nebraska Community Services *Northwest Community Action *Mid-Nebraska Community Services *Panhandle Community Services
2) *Identifying Transit Needs and Opportunities in Mid-Sized Nebraska Cities*, MATC/ NDOR, Gaber et al.	1) Coordination among agencies 2) Community transit plan 3) Service changes or additions
3) *Public Mobility Meeting*, 7/16/98	1) Coordination 2) Possible uses of smart cards, ride matching, and schedule coordination
Priorities	
1) Coordination	2) Improve transit operations

Goals and Objectives

GOAL 1- INCREASE COORDINATION AMONG TRANSIT PROVIDERS IN RURAL COMMUNITIES
- Objective 1- Provide incentives to encourage coordination
- Objective 2- NDOR facilitate minimizing legal barriers to coordination
- Objective 3- Work with FHWA to access peer-to-peer consulting
- Objective 4- Implement ITS demonstration coordination projects in Kearney and Beatrice

GOAL 2- IMPROVE PROVISION OF TRANSIT SERVICES IN RURAL COMMUNITIES
- Objective 1- Use technology to better schedule service
- Objective 2- Increase awareness by marketing rural mass transit systems to larger population

Table 6.5 Infrastructure Operations and Maintenance Goals and Objectives

Source	Needs	
1) Infrastructure Oper. & Maint. *CPA Meeting*, 5/26/98	1) Develop improved management systems for pavement; bridges; safety; signs 2) Work zone safety improvements	
2) *Survey* sent to 695 highway superintendents; public works directors; city/county officials, Tobin/Walgrave, 1998	1) Pavement management system improvements 2) GIS/other computer software applications 3) Sign inventory systems	4) Improve safety 5) Better traffic control 6) More efficient/ computerized workplace
Priorities		
1) Safety 2) Pavement improvement systems	3) GIS 4) Sign inventory improvements	5) Workplace efficiency improvements

Goals and Objectives

GOAL 1- IMPROVE MAINTENANCE MANAGEMENT SYSTEMS STATEWIDE
- Objective 1- Use technologies to enhance maintenance system performance and safety.
- Objective 2- Utilize TMC to centralize maintenance infrastructure database shared by all NDOR department districts.
- Objective 3- Train management on software applications to improve workplace efficiency.
- Objective 4- Encourage coordination and resource sharing between neighboring jurisdictions.

Table 6.6 Feet Operations and Maintenance Goals and Objectives

Source

1) *Fleet Operations & Maintenance CPA Meeting, 1998*

Needs

1) Prioritize maintenance & snow removal efforts
2) Tracking of fleet vehicles
3) Oversized vehicle routing
4) Railroad grade crossing warning systems for school buses

Priorities

1) Tracking of fleet vehicles
2) Incident management
3) Prioritization/re-assignment for maintenance and snow removal efforts

Goals and Objectives

GOAL 1- IMPROVE ABILITY TO LOCATE AND TRACK FLEET VEHICLES

Objective 1- Implement GPS in priority NDOR fleet maintenance vehicles

Objective 2- Facilitate and encourage cities and counties to implement GPS for coordinated fleet vehicle tracking

GOAL 2- IMPLEMENT MECHANISMS FOR PRIORITIZATION/ RE-ASSIGNMENT FOR FLEET MAINTENANCE VEHICLES

Objective 1- Identify software for emergency prioritization of fleet vehicles

Objective 2- Assure vehicles are equipped with communications devices to allow re-assignment

Table 6.7 Commercial Vehicle Operations (CVO) Goals and Objectives

Source	Needs
1) *CVO Steering Committee Meeting*, 5/19/98	1) By-pass scales 2) Tracking
2) *Nebraska ITS/CVO Business Plan*, Dec. 1997	1) Technology applications (p. 6): a) Commercial vehicle electronic clearance b) Automated roadside safety inspection c) Commercial vehicle administrative process d) Hazardous Materials Incident response e) Freight mobility 2) CVO issues (p.10): a) Global economic changes pressure motor carriers to reduce costs, improve delivery time, and enhance customer service b) Enforcement activities cannot completely assure highway safety or regulatory compliance c) Complex and redundant regulatory procedures raise the cost of doing business for agencies and carriers d) Highway safety concerns when commercial vehicles are backed up at State Weigh Scale facilities e) Government agencies need to share data concerning IFTA, IRP, safety, registration and Driver Licensing 3) Problems (pp. 16-19): a) Lack of access to real-time data on motor carrier driver and vehicle safety status b) Complex, inadequate and redundant administrative systems c) Inefficient clearance of commercial vehicles at weigh stations and borders d) Lack of access to government agencies for real-time data on road congestion and weather or business transactions designed to help carriers in their operations
3) CVO Focus Group, 6/23/98	1) Seasonal transport 2) Information warehouse 3) Safety 4) Intermodal communication 5) Routing 6) Infrastructure (including local) 7) HazMat 8) Borders 9) Permits 10) Information access points

Priorities

1) Lack of information about vehicle safety; motor carrier drivers; permits; weather; traffic; routing
2) Seasonal transport
3) By-pass scales/ vehicle clearance
4) Hazardous materials response
5) Communication/dialogue for planning (trucking companies, agencies, communities)

Goals and Objectives

GOAL 1- IMPROVE ACCESSIBILITY TO EXISTING DATA
- Objective 1- Establish "information warehouse" which can be accessed by CVO to house data on vehicle safety, weather conditions, permits, border state regulations, routing
- Objective 2- Make "information warehouse" accessible from vehicles
- Objective 3- Make "information warehouse" accessible from truck stop kiosks

GOAL 2- IMPROVE CONDITIONS FOR SEASONAL TRANSPORT
- Objective 1- Improve ease/speed of granting or issuing seasonal permits, overweight and/or oversize vehicle permits
- Objective 2- Improve information about border state regulations for seasonal transport
- Objective 3- Improve information about infrastructure's capacity (bridges and roads) to accommodate seasonal transport
- Objective 4- Improve access to routing information for seasonal transport

GOAL 3- IMPROVE EFFICIENCY OF VEHICLE CLEARANCE AT WEIGH STATIONS AND SAFETY INSPECTIONS
- Objective 1- Increase number of weigh-in-motion stations across I-80 in Nebraska
- Objective 2- Increase number of automated safety inspection sites across I-80 in Nebraska

GOAL 4- IMPROVE HAZARDOUS MATERIALS INCIDENT RESPONSE
- Objective 1- Improve hazardous materials permitting
- Objective 2- Improve hazardous materials tracking

GOAL 5- IMPROVE INFORMATION EXCHANGE/ DIALOGUE FOR PLANNING (TRUCKING COMPANIES, STATE AGENCIES, RAILROADS, COMMUNITIES)
- Objective 1- NDOR supplement web pages to notify counties/ communities of road closures, hazards, etc.
- Objective 2- Railroads work with NDOR and communities to notify of rail closings/shutdown, in order to plan for alternative road transport

Table 6.8 Communications Goals and Objectives

Source	Needs
1) Mike Jeffres, Communications, *Personal Interview, 1998*	1) Statewide radio system to enforcement (Digital 800 MHz)
2) Jim Brown, State Surveyor's Office, *Personal Interview*, 1998	1) Improved GIS standards
3) Policy, Administrative and Operations Management of a State-Wide Commun. System for State of Nebraska and NPPD, 1996, RAM Commun. Consultants	1) Trunked radio system (p.2)
4) *Current Radio Systems and Needs Summary*, 1996, RAM Comm.	1) Radio coverage (p.7) 2) Interoperability (p.7) 3) Channel capacity (p.7) 4) Voice security (p.7)
5) *State of Nebraska Criminal Justice Information System*, 1997	1) "The state lacks standards for technology, data, and/or procedures" 2) "Information is not shared among state systems" (p.II-4) 3) "The state has lacked a commonly shared vision of the future of information technology for criminal justice (p. II-4) 4) Goal 1- Increase user access (p.IV-2) 5) Goal 2- Improve data quality (p.IV-2) 6) Goal 3- Improve data completeness (p.IV-3) 7) Goal 4- Maximize system efficiency (p.IV-3) 8) "Develop a statewide radio/ voice/ data network integration plan for criminal justice agencies that will meet current and future statewide communication requirements" (p.IV-6) 9) "System integration"- interface (p.IV-6)
6) *Successful Telecommuting Programs in the Public and Private Sectors: A Report to Congress* (1997)	1) Needs for telecommuters include: home computers; links to the office computer; second phone line; and Fax machine and pagers (p.35)

Priorities
1) Statewide seamless radio communications system
2) GIS statewide

Goals and Objectives

GOAL 1- IMPROVE STATEWIDE RADIO COMMUNICATIONS FOR EMERGENCY SERVICES
- Objective 1- Establish state guidelines for radio communication hardware
- Objective 2- Implement statewide seamless communications system for State Patrol and NDOR
- Objective 3- Educate and encourage local emergency services and law enforcement
- Objective 4- Establish training for sharing information and working together

GOAL 2- IMPROVE STATEWIDE GIS USE AND ACCESS FOR ITS
- Objective 1- Create information warehouse for statewide access
- Objective 2- Digitize all Nebraska roads and highways and make them accessible to public

6.2 Relationship of Goals and Objectives to ITS Projects

Goals and objectives in Table 6.1 through Table 6.8 resulted from the needs assessment conducted by the ITS study team. Goals and objectives were then used to develop ITS projects for the state A chart was produced to illustrate the relationship of all goals and objectives with the projects that were developed. All goals and objectives stated above were met at least once. Moreover, the importance of the eighth CPA, Communications, is noteworthy as it facilitates the achievement of most goals and objectives in all CPAs. The relationship between goals and objectives and ITS projects can be found in Appendix K.

7.0 IMPLEMENTATION

7.1 ITS Implementation Committee

Implementation of the ITS Plan will require the involvement and cooperation of several state agencies and private sector groups. It is essential for successful implementation of the plan to include these stakeholders in the initial phases of the deployment of the ITS projects that may impact them. Therefore, it is recommended that an ITS Implementation Committee be formed to monitor and guide the implementation of the ITS Plan. The Committee would ensure the deployment of ITS projects is coordinated with the plans and programs of all stakeholders and does not needlessly conflict them or fail to recognize opportunities to avoid unnecessary duplication of effort. Specific duties of the Committee would include:

- Initiation and oversight of the following forums that were recommended in the ITS Plan:
  - EMS Communications Forum
  - Traveler and Tourism Information Forum
  - Rural Transit Forum
  - CVO Forum
  - Communications Forum
- Establish priorities for ITS project implementation
- Identify funding sources and lead agencies for the implementation of ITS projects
- Promotion of public/private partnerships appropriate for the implementation of ITS projects
- Update the ITS Plan on a regular, continuing basis

The membership of the Committee should include representation by the following agencies:

- NDOR Maintenance Division
- NDOR Transportation Planning Division
- NDOR Traffic Engineering Division
- Nebraska State Patrol Traffic Enforcement
- Nebraska State Patrol Motor Carrier Enforcement
- Health and Human Services System EMS Program
- Department of Economic Development Travel and Tourism Division
- Department of Administrative Services Communications Division
- Department of Environmental Quality Hazardous Materials Transportation
- Department of Motor Vehicles Motor Carrier Services
- Nebraska Motor Carriers Association
- Railroad Companies
- Federal Highway Administration

7.2 Existing ITS Compatible Committees in Nebraska

The Nebraska ITS study team has identified several committees outside the NDOR that serve to assist Nebraska public and private organizations achieve goals and objectives similar to the intent of the Nebraska ITS planning and deployment study. The following is a list of committees and organizations which the ITS study team has identified as influential towards ITS planning and deployment.

Nebraska Information and Technology Commission (NITC). This Commission, appointed by the Governor, serves to monitor, influence and coordinate Nebraska's existing and future information network and technology systems in both public and private environments. More specifically, this Commission sets policies to create an environment and infrastructure that will meet the needs of the users in the most efficient and effective manner possible. This Commission will focus on realizing and creating the most value from public and private investment in information technology. ITS needs to be introduced and considered in the minds of these NITC Commissioners so that the seamless transition of ITS in Nebraska can be accomplished.

Nebraska Information Resources Cabinet (IRC). This IRC Cabinet consists of technical advisors to NITC. This Cabinet established guidelines and policies in acceptable use, cellular telephone, electronic publishing, networking and electronic mailing standards. ITS needs to be introduced and considered by members of this Cabinet since cellular telephone usage is a critical component of the rural ITS infrastructure.

The Nebraska Geographic Information Systems (GIS) Steering Committee. The GIS Steering Committee consists of fifteen representatives from assorted public and private Nebraska state agencies including the Nebraska Department of Roads. The purpose of the GIS Steering Committee is to 1) actively coordinate the development, maintenance, and distribution of priority statewide digital geospatial databases 2) promote and facilitate local government land record modernization and GIS development and 3) strengthen the GIS Education Subcommittee and its overall educational program activities. Nebraska ITS is fundamentally tied to an effective GIS systems database and needs to be introduced and considered by GIS Steering Committee members for future applications.

Nebraska Radio Communications Task Force. The Radio Communications Task Force's purpose is to study and develop recommendations for implementing a statewide radio communications infrastructure, for consolidation of resources and technologies, and for the necessary strategies to implement such an infrastructure. Goals of this task force include: defining the needs of state and local government radio users, establish feasible funding strategies and establish technical standards to meet the defined needs of radio users. Nebraska ITS needs to be introduced to, and considered by, the Radio Task Force so that their decision- and policy-making agenda can be coordinated with the ITS plan.

Nebraska Intergovernmental Data Communications Advisory Council (NIDCAC). Among others, the purpose of the NIDCAC is to: 1) Increase awareness of the importance of information sharing 2) Spearhead multi-jurisdictional efforts to collect, exchange, and use information 3) Work for standards to make it easier to share data among state and local governments 4) Simplify data sharing among subdivisions and agencies by providing planning and implementation. ITS in Nebraska works on the principal of sharing information and resources throughout Nebraska at all government levels. Nebraska ITS planners need to monitor and work closely with the NIDCAC to ensure ITS is considered in its role and mission.

Nebraska Commission on Local Government Innovation & Restructuring. The purpose of this Commission is to: 1) Educate citizens and public officials on the importance of government innovation and efficiency, ways to overcome barriers to innovation and ways to implement changes 2) Recommend any necessary statute and policy changes to encourage innovation and efficiency 3) Improve the quality and efficiency of government at all levels. ITS is highly innovated and has specific barriers that need to be crossed. Nebraska ITS planners should meet with members of this Commission to discuss how ITS fits into their goals and objectives and if they could assist with ITS in Nebraska.

7.3 Constraints to the Implementation of ITS in Nebraska

The Nebraska ITS study team found several distinct nontechnical constraints and institutional barriers within ITS and the ITS planning process.

Nontechnical constraints found in the Nebraska ITS planning process were evident early in this study. The staffing and educational needs of transportation agencies and the development of design (architecture) and performance standards seem to be the most pressing nontechnical issues confronting Nebraska ITS stakeholders. A survey conducted in early March 1998, by the ITS study team found that many emergency medical specialists and fire fighters expressed their concern about their inability to find the resources and time to learn about new technologies and systems that, in effect, make up ITS.

The lack of standards with radio communications, computer interfacing, AVL technologies and GIS pose great challenges to ITS planners. The lack of standards needs to be addressed as early as possible among all state and local ITS related agencies. Without standards in critical technologies, the risk of private firms holding back from researching, developing products and strategies, and participating with state and local governments increases. There is an overwhelming sense of eagerness from both private and public sectors for the development of standards in various information technology types which they believe will enable the deployment of consistent, non-interfering and reliable systems on local and on a statewide level. The NITC, the IRC, the Nebraska Radio Task Force and the GIS Steering Committees are working on these issues at this time.

Another issue brought up early in this planning process was a lack of funding for ITS in Nebraska. Government agencies and private-sector firms together can achieve what neither alone can do. Successful projects demonstrate that by sharing the risks both parties share the rewards: the public sector achieves its transportation management objectives and the private sector obtains a return on their investment. Public/Private partnerships should be investigated and/or utilized for all ITS projects.

From public/private partnerships came the issue of liability as a potential barrier. Some people expressed concern that variable message signs (VMS) may raise possible product liability or tort issues. It is thought that if such issues arise, it could slow the advancement of ITS in Nebraska. To date, there has been no significant litigation, and there is no evidence that fear of liability has deterred industry involvement. Nebraska ITS planners found that as these ITS technologies are developed, concomitant studies should be performed to investigate the legal risks they may pose; the resulting legal-risk management options should then be explored. Then, a careful decision should be made as to risk and feasibility of the technology or system and whether it should be used.

Another nontechnical constraint posed by people contacted in this ITS planning process is the privacy issue when discussing the use of surveillance cameras and sensing equipment. The privacy issue concerns expressed by the public about ITS technologies are similar to those expressed at the advent of automatic teller machines (ATMs). However, the majority of people in Nebraska seem willing to weigh the benefits of such technologies against a slight loss to privacy. To date, there have been no serious constitutional or statutory challenges to the use of ITS technologies on the grounds of invasion of privacy.

8.0 REFERENCES

1. *Mayer, Robert R. (1985),* Policy and Program Planning-A Developmental Perspective, pp. 39.

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3. *Nebraska Information Network Organization Brochure (1998).*