KITS

kansas intelligent transportation systems

DEPARTMENT OF TRANSPORTATION · KANSAS ·

TRANSYSTEMS CORPORATION

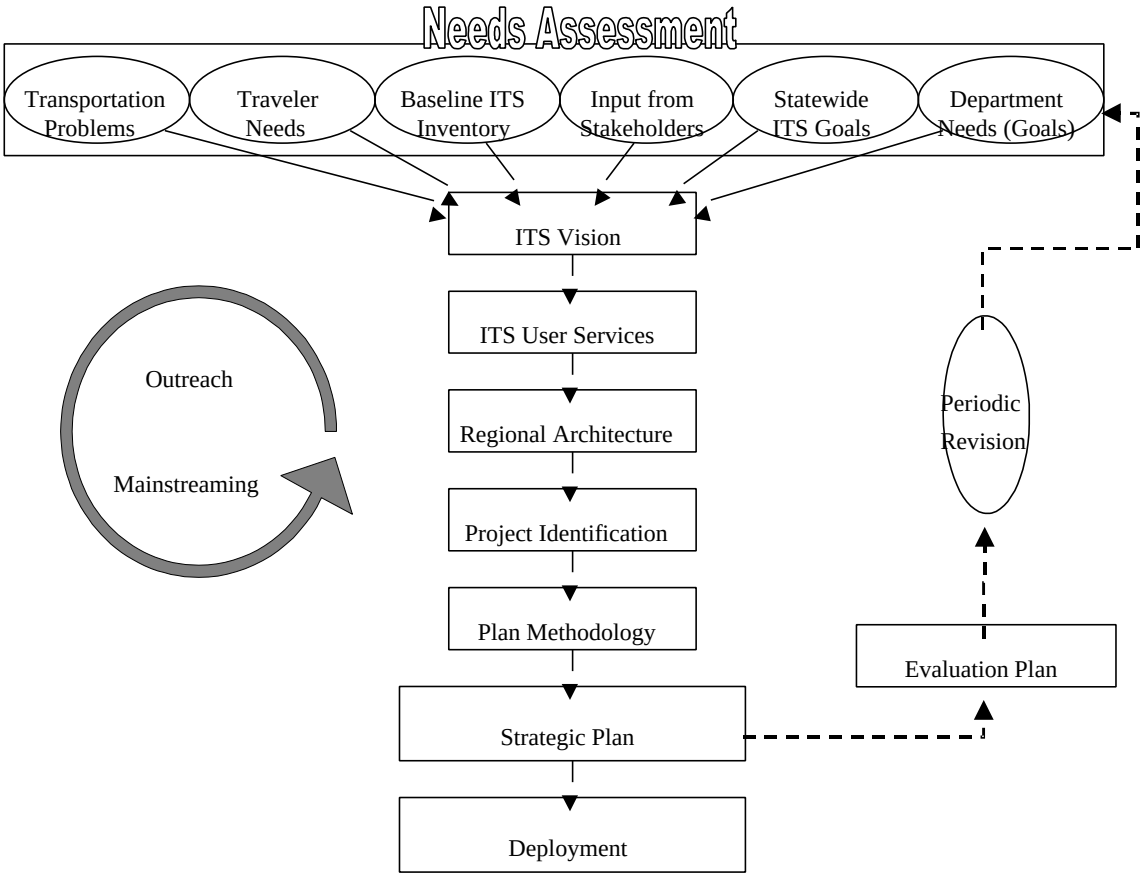
Kansas Statewide ITS Plan

INTRODUCTION

The Kansas Statewide ITS Plan is a strategic plan to deploy Intelligent Transportation System (ITS) technologies throughout the state. Currently, the Kansas Department of Transportation (KDOT) has several ITS initiatives and technologies at various stages of deployment. The next step was to develop a coordinated strategic plan to integrate these existing technologies with new deployments to avoid duplication of efforts and to use existing and future infrastructure wisely. This plan assesses the needs of Kansas for ITS and develops both short-term and long-term strategies for addressing those needs. Further, the Statewide ITS Plan defines the direction KDOT will want to take, identifies ITS projects and develops a strategy for integrating and mainstreaming ITS into the KDOT structure. Ultimately, this plan will establish the blueprint for a successful statewide ITS system.

Figure 1 shows a flow chart of the process that was used to develop the Statewide ITS Plan for Kansas. The detailed results of this process are documented in the full version of the Kansas Statewide ITS Plan. The full version of the plan includes four sections: Baseline Condition Report, Analysis of ITS Elements, Plan Methodology and Strategic Deployment Plan. This document presents a summary of the full plan.

Figure 1: Kansas Statewide ITS Plan



BASELINE

In Kansas, rural areas account for 97% of the total road mileage, 54% of the vehicle-miles traveled, and 78% of the total number of fatal accidents in Kansas. Due to the high percentage of fatal accidents in rural areas, it is imperative that efforts be made to improve safety in the rural environment. ITS can help in those efforts. Rural ITS encompasses seven critical program areas:

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

These program areas are the basis for the federal rural ITS program. They were used to develop similar program areas for KDOT. The completed Baseline Condition Report illustrates the existing foundation of ITS in rural and urban areas of Kansas. Completing this needs assessment was the first step in preparing a Statewide ITS Plan for Kansas. The statewide ITS goals resulting from the Baseline were the basis for developing a regional architecture and strategic deployment plan for ITS in Kansas.

The baseline conditions were derived from a number of sources, including a review of existing documentation, ITS Awareness Seminars at the six KDOT district offices, interviews and meetings with KDOT personnel, and analysis of existing survey information. This input was used to define goals and a vision for a statewide ITS system in Kansas.

Kansas ITS Awareness Seminars

Two rounds of ITS Awareness Seminars were held in each KDOT district and at headquarters. Attendees included:

- KDOT personnel,
- city and county public works officials,
- transit and paratransit providers,
- EMS/law enforcement, and
- farming and business interests.

Each seminar was concluded with a question and answer session during which participants were encouraged to share their thoughts on ITS in general, to discuss applications specific to their work, and to help the project team develop an effective statewide plan. The discussions at the seminars were focused on:

- weather related applications of ITS and sharing of this information,
- where severe snowstorms are most likely to cause travel related problems,
- ITS applications that could help meet the challenge of getting travelers off the road before they are in danger or in areas where accommodations are inadequate, by providing real-time weather information,
- presenting the technology in terms of its capability to improve safety and efficiency, and
- technologies for maintenance personnel including automated vehicle location and road weather information systems.

Interviews with KDOT Personnel

Interviews were held with key personnel from the following KDOT Bureaus: Design, Traffic Engineering, Planning, Construction and Maintenance, Program Management, Computer Services, and the KDOT Metro Engineers in both Wichita and in Kansas City. The purpose of these interviews centered on three objectives:

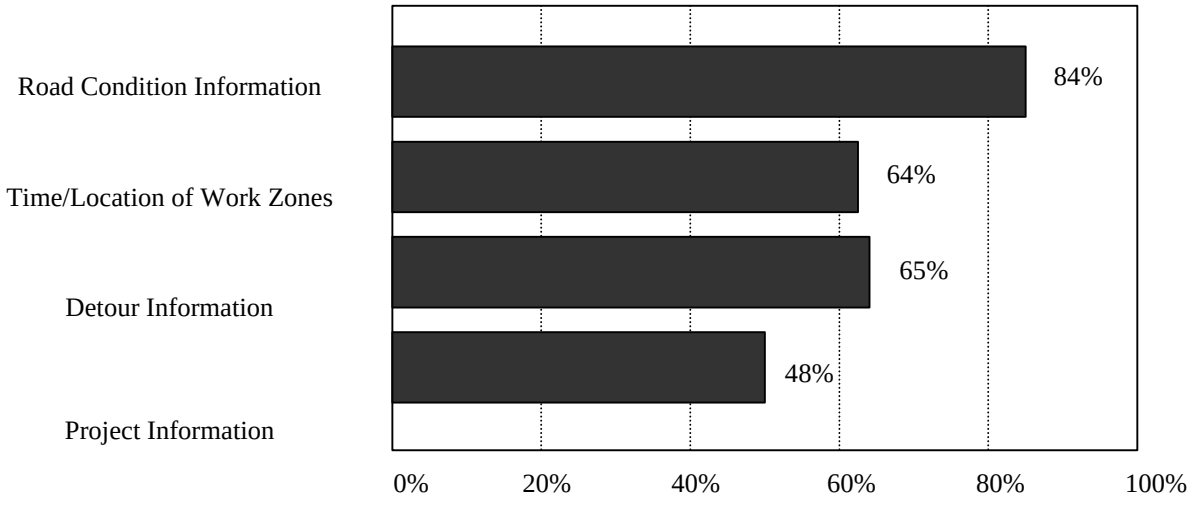
1. Learn what the bureau does and where it sees ITS fitting into the way it does business.
2. Find out its level of understanding about ITS.
3. Learn what ITS projects each bureau currently has and what potential projects exist in the short, medium, and long term.

Analysis of Survey Information

The consumer's response to KDOT was evaluated most notably in the area of traveler information. The chart in figure 2 shows some of the results from a survey conducted for KDOT related to consumer priorities for traveler information.

Figure 2: Information KDOT Should Supply to the Public

By Percentage of Respondents (total exceeds 100% because respondents were allowed to mention more than one type of information)



Statewide ITS Goals

A focus area of the Statewide ITS Plan is rural applications. Also, in order to have a successful Statewide ITS Plan, this plan must be structured around goals for the statewide ITS system. These goals will complement KDOT's primary goal of increasing safety, security, mobility, and efficiency. From analysis of the baseline conditions, the five major statewide ITS goals are to:

- Mainstream ITS into standard KDOT business procedures,
- Integrate existing ITS programs into the KDOT system,
- Continue to educate KDOT and the Kansas public on ITS alternatives and benefits,
- Identify potential ITS projects and funding sources, especially for rural areas, and
- Prioritize ITS project areas.

ITS Vision for Kansas

The Kansas ITS Vision was developed based in part on the results of the Baseline Condition Report. The vision defines what the statewide ITS system will look like in 20 years. The vision states that Kansas ITS will be an open, integrated and cost effective system that ensures safer, more secure and efficient movement of people and goods across Kansas through the use of advanced technologies and management strategies. This vision will guide the Kansas ITS planning process for the next 20 years.

PROJECT DEVELOPMENT

Projects involving ITS in Kansas will start with an ITS Project Sheet and will be stored in an Access database, called the Kansas ITS (KITS) Project Database. This database provides easy sorting and querying capabilities and can be used to track the status of all Kansas projects involving ITS. It will be maintained and updated as new projects are identified or existing ones are modified. The project sheets will play an important role in assessing each project's conformance with the statewide ITS architecture.

ITS Architecture

An ITS architecture provides the framework of a system outlining how the individual components, whether an element or an agency, communicate together and work with the other components of a transportation system. The purpose of developing a Kansas Statewide ITS architecture is to define the coordination of ITS applications in Kansas and their fit within KDOT organizational structure and physical infrastructure.

Standards

Developing an ITS architecture provides a sound basis for identifying where ITS standards are needed. The USDOT has undertaken a large effort to facilitate

development of standards for communication between different ITS components. A number of standards have already been completed that will enable users to purchase ITS products and services from a range of competitive providers. ITS standards allow for system integration and interoperability.

STATE TO STATE COORDINATION

A key issue that should be considered in the development of the Kansas Statewide ITS Plan is the value of cooperation with other states. Significant benefits can be achieved by forming multi-state alliances for the deployment and operation of ITS. Consistency and integration across state lines is critical for some applications, particularly commercial vehicle applications and advanced traveler information systems (ATIS).

Commercial Vehicle Operations	Kansas agencies responsible for enforcing commercial vehicle operations (CVO) must be able to communicate with similar agencies from other states to enable nationwide access to credentials and safety information for administration and enforcement functions. It is important for neighboring states to use compatible ITS/CVO systems, which is being accomplished by a national initiative, Commercial Vehicle Information Systems and Networks (CVISN).
Advanced Traveler Information Systems	Traveler information regarding road and weather conditions is an ITS service that can benefit from state to state coordination. Another information sharing activity would be having a link on the KDOT traveler information web site to the Colorado DOT traveler information web site (and vice versa) to allow easy access to multi-state traveler information.
Traffic Management System in Kansas City	Kansas City is a major metropolitan area that includes areas on both sides of the Missouri-Kansas state border. Currently, there is a bi-state partnership between Kansas and Missouri to develop a shared Traffic Management System (TMS) called Scout. The Traffic Operations Center (TOC) building will be located in Lee's Summit, Missouri, and will be operated and maintained by MoDOT personnel. It will be used to monitor and manage traffic conditions on freeways in both Missouri and Kansas. Ongoing cooperation and information sharing between Kansas and Missouri are keys to the success of this project.
ITS Heartland	ITS Heartland is a regional chapter of ITS America that is made up of the states Kansas, Missouri, Iowa and Nebraska. The purpose of this organization is to increase interregional coordination between the member states on ITS-related projects and research. This includes conducting pooled fund studies, sharing ITS data, and ensuring interoperability between ITS systems.

KANSAS ITS PROGRAM AREAS

Since many of the Kansas ITS projects are similar in nature and scope, it makes sense to group "like" projects into program areas so that they can be analyzed together and recommendations developed. The program areas were created to encourage a more integrated approach to ITS deployment in Kansas.

Five program areas were used to analyze Kansas ITS projects.

- Priority Corridors
- CVO
- Maintenance
- Traffic Operations
- Rural Safety and Mobility

Some of the potential issues addressed in these program areas include:

1. Interagency coordination,
2. System architecture,
3. Telecommunications needs,
4. Operating cost analysis,
5. Benefit/cost analysis, and
6. Opportunities for public/private partnerships.

Priority Corridors Program Area

This program area includes rural ITS projects that are being deployed on a specific corridor. One priority corridor in Kansas is the I-70 corridor, and some of the ITS applications that are being considered for this corridor include advanced traveler information systems (ATIS), weigh-in-motion (WIM), and fiber optic communications.

Interagency coordination	The agencies involved in the priority corridor program include: KDOT, KHP, Kansas Dept. of Commerce and Housing (Tourism Division), Kansas Turnpike Authority (KTA), local transportation agencies, emergency service providers, National Weather Service (NWS), television and radio stations, and other state agencies. Agencies such as KDOT, KTA, KHP, NWS and Kansas Department of Commerce and Housing would gather traveler and tourism information and send it to a Statewide Traffic Operations Center where it can be processed. KDOT could then process the data at the Center and send it on to the traveling public and other agencies.
System architecture	Developing a good ITS architecture can eliminate redundant, stand-alone systems and provide a more integrated system. The development of a central ATIS Center as part of the Statewide Operations Center is one of the potential ITS projects being considered in the Kansas ITS Statewide Plan.
Telecommunications needs	A variety of telecommunications resources will be required to connect the Kansas ATIS Center to information sources, information users, and dissemination devices. These telecommunications resources may include optical fiber, leased telephone lines, 800 MHz and microwave radio, cellular/PCS, WAN/LAN, or satellite systems.
Operating cost analysis	Currently, the ATIS elements being planned along corridors contain stand-alone systems. By integrating these systems, several cost advantages can be gained that would minimize the operating costs of such a system. Costs of maintaining the communication infrastructure can be shared among the various projects comprising the various priority corridors. This cost sharing serves to lower the incremental cost for each additional component as it is added to the system.
Benefit/cost analysis	The magnitude of benefits for the types of projects being considered under this program area varies greatly depending on many deployment factors. These factors include the location of components, quantity of components deployed, how the components will be used, and the characteristics of travel on the transportation facilities. Many of the projects planned, such as VMS and HAR deployments, provide the greatest level of benefits when deployed on facilities with non-recurring congestion and weather related closures. The benefits resulting from the Priority Corridors deployments would vary depending on the market sector using the capabilities of the system.
Public/private opportunities	One of the main reasons for seeking a partnership with the private sector is that ITS demands large financial investments (which can be eased by private investment) but it depends on access to state-owned or controlled transportation infrastructure. The Priority Corridor program area provides many opportunities for public/private partnerships. For example, KDOT could contract with a private entity that would provide value added traveler information such as touch-tone telephone services, Internet web sites and kiosks. KDOT would still be in charge of providing the basic traveler information services of VMS and HAR, which will be available to everybody.

Commercial Vehicle Operations (CVO) Program Area

This program includes the ITS/CVO projects being deployed in Kansas. The state is currently developing an ITS/CVO Business plan that will define an architecture for CVO/ITS as part of the Commercial Vehicle Information Systems and Networks (CVISN) project sponsored by FHWA.

Interagency coordination	The CVO Program requires a great deal of interagency coordination within Kansas. The primary agencies outside of KDOT are the Department of Revenue (KDOR), the Kansas Highway Patrol (KHP), the Kansas Corporation Commission (KCC) and the Kansas Motor Carriers Association (KMCA). These groups, together with KDOT, make up the CVO Executive Working Group for Kansas.
System architecture	The system architecture for the CVO program is anticipated to contain new deployments to the administrative center, roadside, and vehicle systems that will allow improved CVO processes. These improvements potentially include electronic credentialling, electronic data transfer, electronic roadside screening, and improved data record access.
Telecommunications needs	To be determined in the Kansas CVO Business Plan
Operating cost analysis	The CVO program area will incur significant deployment costs. However, the ongoing costs required to operate and maintain the systems will be offset by the reduction in processes that must now be performed manually.

Benefit/cost analysis	ITS projects deployed to improve commercial vehicle operations have been estimated as having some of the greatest promised returns on investment of any ITS improvement type. By improving CVO compliance processes, the speed at which goods may be delivered can be increased while improving the safety of those movements. ITS/CVO deployments produce various benefits for different market sectors including motor carriers, government regulatory agencies, and the traveling public.
Public private opportunities	The involvement of private sector carriers in the commercial vehicle arena provides many tangible opportunities for forging public/private partnerships. The involvement of the private sector in this program area is critical to the success of any ITS/CVO deployments. It is critical that the public sector and the carrier industry work together to not only minimize the costs of the deployment, but also coordinate the processes to maximize the utility of the system.

Maintenance Program Area

The maintenance program area includes ITS-related projects that fall under the domain of the KDOT Bureau of Construction and Maintenance. Examples of these projects include road/weather information systems (RWIS), the road condition reporting system (RCRS), installation of automatic vehicle location (AVL) and mobile data terminals (MDT) in maintenance vehicles and automated anti-icing systems for bridges.

Interagency coordination	The majority of information collected and disseminated with these types of maintenance projects will be used internally by the Bureau of Construction and Maintenance. There may be advantages to coordinating with, and sharing information with other agencies responsible for roadway maintenance. Other agencies responsible for public safety, such as KHP, could also use the information generated by the maintenance systems.
System architecture	Since the National Architecture has not yet defined subsystems for Maintenance Vehicles or Maintenance Centers, these subsystems have to be added. RWIS, RCRS, and AVL are all elements of the Maintenance Center Subsystem. This subsystem receives road condition information from the maintenance vehicle, emergency vehicle and roadway subsystems. The personal information access, remote traveler support, traffic management and emergency management subsystems all use the road condition information.
Telecommunications needs	The following telecommunication methods will be tailored to meet the telecommunications needs of the Maintenance Program area. These include Optical Fiber, Telephone Lines, 800 MHz Radio, Cellular and Satellite, WAN/LAN, and the integration of RWIS, RCRS, and AVL.
Operating cost analysis	Operating costs for the identified maintenance projects will consist primarily of equipment replacement/upkeep and training for maintenance vehicle operators. No additional staff should be required to operate the planned systems. The evaluation of technologies may require some staff time during the initial phases of the projects. The modest operating costs for these projects should be partially offset by the cost efficiencies provided by the automated collection of road maintenance data.
Benefit/cost analysis	The benefits from projects under the Maintenance program area typically accrue to those agencies deploying the projects. These benefits result from more efficient management of resources and labor, and the elimination of redundant processes. Benefits are also experienced by highway users and include improved roadway safety and travel conditions brought about by improved maintenance.
Public private opportunities	Few short-term opportunities exist to forge public/private partnerships with the maintenance projects. Legal and institutional issues block the potential to directly provide the collected data to the traveling public. However, the opportunity to share the collected data with an information service provider remains a narrow possibility. Potential long-term opportunities include equipping private vehicles with the data collection sensors to act as probe vehicles.

Traffic Operations Program Area

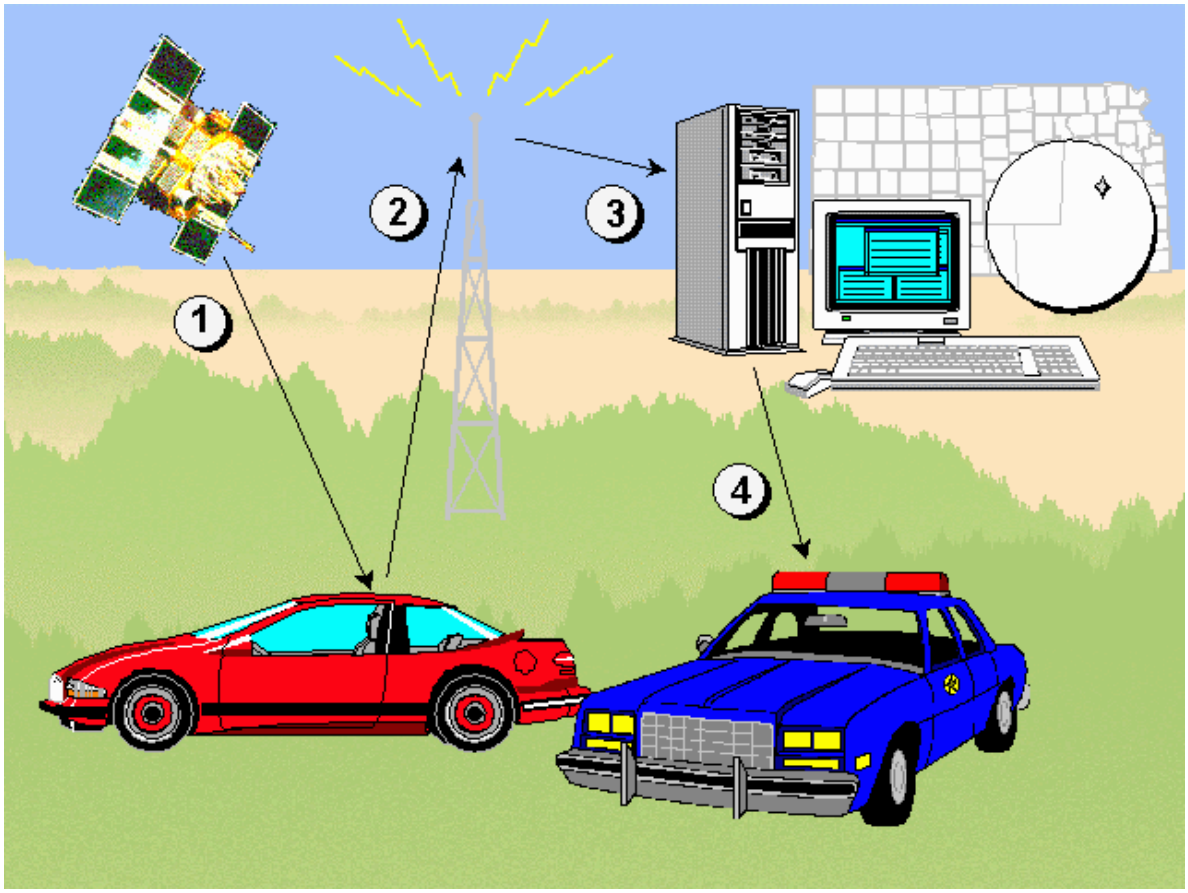
This program area primarily refers to projects aimed at improving traffic operations in metropolitan areas. Examples include the design of the Wichita Traffic Operations Center (TOC) and the Kansas City Scout Project. This area also includes the planning and design of a statewide operations center that would link the metropolitan TOCs and house a statewide TOC and regional traveler information center.

Interagency coordination	Traffic Operations Centers (TOC) require a great deal of interagency coordination. Large metropolitan areas such as Kansas City and Wichita are currently planning the deployment of TOCs, which will monitor incidents and manage the flow of traffic on freeways. These systems will require coordination between KDOT, KTA, local transportation agencies, KHP, emergency services, transit agencies, and the local media.
System architecture	This architecture is very similar to the Priority Corridor Architecture except that it is more focused on the traffic operations and less on road and weather conditions. The key subsystems in this program area are the traffic management subsystem and the statewide traffic operations center. The other subsystems in the architecture represent the systems that will convert the operations data to traveler information.
Telecommunications needs	The following telecommunication methods will be tailored to meet the telecommunications needs of the Operations Program area. These include Optical Fiber, Telephone Lines, Cellular and Satellite, and WAN/LAN. The availability of the optical fiber backbone is crucial for this program area since its bandwidth will be needed for transmitting video images across the state.
Operating cost analysis	Traffic operations projects require substantial expenditures for deployment and operation. The characteristics of these projects can result in the on-going operating costs greatly exceeding the capital deployment costs of the projects. These projects require significant dedication of staff and training. These projects can incur significant costs for the maintenance and operation of various components, such as communication links.

Benefit/cost analysis	The operations improvements that will result from the deployment of TOCs in Wichita and the Kansas City metropolitan area offer the potential for significant benefits. Similar deployments in various cities have been evaluated and provide relevant examples of the types and level of benefits that can be anticipated from these types of deployments. By providing the basic infrastructure needed to operate many potential future ITS deployments, the TOC project deployments should be able to reduce the incremental costs of adding new components. It is likely that the system expansion will result in greater benefits at lower incremental costs, raising the benefit/cost ratio over time.
Public private opportunities	TOCs serve several interrelated functions, one of which is to disseminate information collected from various systems (e.g., traffic detectors, RCRS, and RWIS) to drivers both before they begin their trip and while they are en route. Partnerships with the media could offer an effective means of disseminating this information at little or no cost to KDOT.

Rural Safety and Mobility Program Area

This program area includes all safety-related projects affecting the rural traveler, as well as rural transit. Examples include projects related to automatic collision notification (ACN), or Mayday Systems, work zone applications, rural transit applications, at-grade rail crossings and the Intelligent Vehicle Initiative (IVI). Characteristics of projects in this program area are very diverse. In the following table, ACN is used as an example of a predominantly rural application.

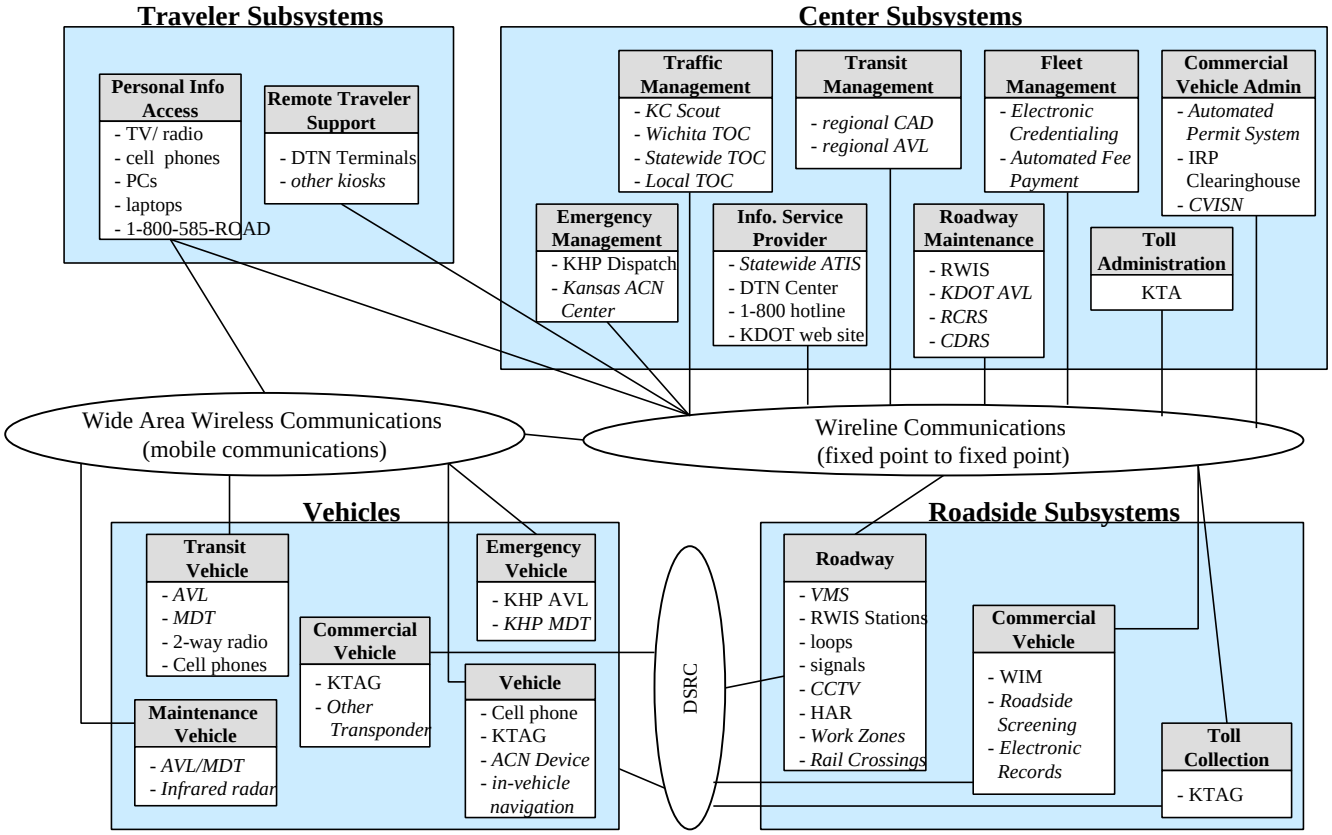


Interagency coordination	Predominantly rural projects require significant effort to be expended in the coordination of multiple agencies and jurisdictions. In the case of ACN, there are two primary areas where the operation of the system depends on the coordination between agencies. These areas are between the ACN Center and the responding agency(s) and between responding agency(s) and trauma centers.
System architecture	The system architecture for an ACN system currently includes three entities and two communication paths. An in-vehicle device contacts a national service provider over a wireless telephone link, most commonly analog cellular. The national service provider then interprets the location of the vehicle, determines the appropriate response agency, and contacts that agency directly, communicating all crash information verbally over a landline call.
Telecommunications needs	The following telecommunication methods will be tailored to meet the telecommunications needs of the Rural Safety and Mobility Program area. These include: Optical Fiber, Telephone Lines, 800 MHz Radio, Cellular and Satellite, and WAN/LAN. The 800 MHz radio, cellular and satellite communications are all critical links to the ACN system.
Operating cost analysis	Currently, ACN calls are handled through the existing emergency response facilities. Thus, there is no increase in the incremental operating costs. The establishment of a statewide ACN center would require certain operating costs, including the maintenance of computer hardware and software, ongoing training for operators, and possibly additional staffing.
Benefit/cost analysis	The primary benefit from ACN is reduced emergency response times when accidents occur. The reduced response time allows lives to be saved and the severity of some injuries to be reduced. The extent of the benefits depends on market penetration of the in-vehicle devices, the coverage of the service, and baseline notification time required to initiate an emergency response.
Public private opportunities	Public-private opportunities fall into two categories. The first is directly related to the establishment of a statewide ACN center. The second area that presents excellent opportunities for public-private partnerships is that of providing wireless communications services to remote areas, increasing ACN coverage.

KANSAS STATEWIDE ITS ARCHITECTURE

The role of the statewide architecture is to tie each of these program areas together and provide a framework for ensuring an interoperable statewide ITS system. The long-term ITS architecture includes existing and future ITS implementations and is consistent with the National ITS Architecture. Aside from the subsystems and agencies that are a part of the Kansas Statewide ITS Architecture, there are also a number of external interfaces. External interfaces are related systems and agencies that interface with the Kansas ITS system. Examples of these include other states, local agencies, media, emergency personnel, rail operators and metropolitan planning organizations. Figure 3 shows a high level depiction of the Kansas ITS Architecture.

Figure 3: Kansas Statewide ITS Architecture



INTEGRATING AND MAINSTEAMING ITS INTO KDOT

One of the keys to having a successful ITS program in Kansas is integrating or mainstreaming ITS into the KDOT business process. In order for this to happen, funding, contracting, planning, design, operations and maintenance of ITS needs to be a consideration in all bureaus of KDOT.

Institutional Barriers

Mainstreaming ITS into other projects will require working with what some might consider institutional barriers within KDOT. One institutional barrier could be that ITS is new and not a traditional part of day to day business in KDOT. KDOT design projects follow strict guidelines laid out in manuals and standards that have been used for many years. Currently within KDOT, ITS standards do not exist and many of their elements have not yet been defined. Designers need to be encouraged to include ITS as a part of their plans if mainstreaming is to happen.

In order to achieve the mainstreaming of ITS into KDOT, key recommendations were outlined, and they include:

- Checklists should be developed for projects and bureaus to help identify potential ITS elements in KDOT projects. These checklists should be implemented on every project during the discovery phase or scoping.

- Establish informal working groups for interagency coordination. The working groups should be comprised of representatives from each of the agencies involved. An example of a current working group in Kansas is the CVO Executive Working Group, which is comprised of KDOT, KDOR, KCC, KHP and KMCA.

- The ITS Unit should contact other states to solicit ITS standards and detail sheets if they are available.

- KDOT bureaus should designate an ITS "champion" to help facilitate the mainstreaming of ITS into their work area.

- Identify those ITS projects that have a high potential for providing substantial benefits or projects with a high-level of visibility to the traveling public. Encourage the rapid deployment of these types of projects. Promote the advantages of these projects through internal and external publicity campaigns, press releases, etc.

Integrating Rural and Urban ITS Programs

Another consideration for mainstreaming ITS in Kansas is the integration of rural and urban ITS programs. These two areas of ITS are often treated separately with the urban focus being on reducing traffic congestion and the rural focus on increasing safety. One strategy for integrating the two program areas is to establish informal working groups to facilitate coordination between the two programs. Another strategy for integrating urban and rural ITS program areas is to develop a statewide operations center.

PLAN METHODOLOGY

A methodology has been developed to assist the KDOT ITS Unit in the identification, tracking, ranking and prioritization of ITS projects. ITS projects will come from a number of sources including: the KDOT Bureau of Design, other KDOT Bureaus, KDOT Districts, research, local agencies, and public/private partnerships. A formal procedure has been established to help mainstream ITS into the KDOT design process. The most significant change to the traditional design process is the addition of an ITS Checklist. The ITS checklist will be introduced during the Discovery Phase of the project. This Checklist will be developed by the ITS Unit and will contain criteria that when met would indicate an opportunity for ITS to be added to the project. For example, if a project is located on a priority corridor or in a high accident location, then ITS should be considered for that project.

Other bureaus within KDOT develop their projects differently. It is difficult to define a formal procedure for integrating ITS into the day to day business of these bureaus. Accomplishing this can be done in a number of ways:

1. By educating KDOT to get them thinking about ITS and its benefits.
2. Starting with a few proof of concept projects exploring the benefits of particular ITS applications (e.g. AVL).

Universities, other research institutions, local agencies, and the private sector may come up with ideas for new ITS projects. It is important that the ITS Unit be proactive in soliciting ideas for ITS projects through the use of the project form.

STRATEGIC DEPLOYMENT PLAN

This Strategic Deployment Plan presents both a phasing plan for the ITS projects and recommended strategies for successful ITS deployment. The different types of strategies developed for the ITS Unit include funding strategies, implementation strategies and management strategies.

Funding Strategies

As with any crosscutting program, the funding for ITS projects must come from a wide variety of sources:

- Existing funding sources (KDOT funding category)
- ITS Set-Aside Funds (KDOT funding category)
- Research Funds (Federal and State)
- Other Funding Strategies

Implementation Strategies

ITS deployment requires strategies under the following headings:

- Scheduling projects

  - Schedule projects with critical elements first
  - Identify related projects and factor them into the schedule
  - Take advantage of stepwise deployment whenever practical
  - Carefully analyze each new project against existing and proposed projects.

- Evaluating Projects

  - Always evaluate new technologies
  - Plan for the project evaluations in parallel with the overall project development
  - Use evaluations as an awareness tool

- Integrating ITS into the Design Process

  - Integrate ITS checklists into the design process
  - Continue to update the mainstreaming process
  - Develop design standards and detail sheets for roadside ITS elements as they are being incorporated into design projects

- Increasing ITS Awareness

  - Develop a continuing process of education for KDOT personnel
  - Involve the media with publicly visible projects
  - Obtain buy-in from the ITS Steering Committee on important decisions relating to ITS

- Using the ITS Architecture

  - Evaluate how future projects fit into the Statewide ITS Architecture
  - Establish a schedule for periodically reviewing and updating the ITS Architecture
  - Conform to ITS communications standards

- Investigating Telecommunication Infrastructure

  - Make efficient use of the fiber optic resources
  - Make efficient use of the 800 MHz radio network
  - Interconnect the fiber network with the microwave network where feasible
  - Expand the optical fiber backbone throughout Kansas
  - Create a telecommunications unit within KDOT

- Increasing Partnerships

  - Take necessary steps to ensure successful public/private partnerships
  - Clearly define the roles and responsibilities of each partner

- Defining Special Considerations for Safety-Oriented Applications

  - Midwest Smart Work Zone Deployment Initiative

ITS Unit Management Strategies

Guidance in the continued success of the ITS Unit could include strategies to address issues concerning the continued operation and maintenance of the ITS program. The primary function of these strategies is to help KDOT realize its goals of increasing the scope of ITS applications, increasing the level of benefits resulting from existing ITS deployments, and facilitating the continued updating of the Statewide ITS Strategic Plan

and ITS Architecture. The following recommendations represent the suggested management strategies for the KDOT ITS Unit.

- Establish a process for maintaining the project database.
- Continue the role of the ITS Steering Committee.
- Identify and develop design standards for commonly deployed elements.
- Consider hiring additional staff trained to operate, administer, manage, and provide the ITS field devices or the optical fiber backbone.
- Provide training for staff who will be involved with ITS deployment and operation.
- Evaluate ITS deployments and disseminate findings.
- Increase public agency awareness of ITS projects through outreach campaigns.
- Periodically review proposed ITS projects to identify potential cost sharing opportunities and minimize unnecessary system redundancies.
- Periodically update the Statewide ITS Architecture and the Statewide ITS Plan.
- Periodically review proposed ITS projects to identify potential data sharing opportunities.
- Encourage interagency, intra-agency and interstate coordination.
- Develop guidelines for agencies and individuals considering ITS deployments in Kansas.

Project Phasing Plan

The Strategic Deployment Plan categorizes all the projects and tries to capture at a moment in time the status of the projects according to two measures:

1. If it is a short, medium, or long term project.
2. If it is a high, medium or low priority project

The objective of the Phasing Plan is to consistently evaluate the current projects in the KITS Database with these measures. Tables 1, 2 and 3 show the near-, medium- and long-term ITS projects that have been identified for Kansas so far.

Table 1: Near-term Deployment Projects (1 to 5 years)

Program Area	KITS #	Project Name	Priority
Priority Corridor	1501-0	VMS on I-70 near Goodland	High
	1501-1	VMS on I-70 near Salina	High
	1501-2	HAR on I-70 west of Goodland and east of Salina	Medium
	1502-0	Kiosk-Based Traveler Information System, Phase I	High
	1502-1	Kiosk-Based Traveler Information System, Phase II	High
	1502-2	Kiosk-Based Traveler Information System, Phase III	Medium
CVO	3001-0	Electronic Credentialing (Renewal Processing) for KDOR	High
	3003-0	IRP Clearinghouse Participation	High
	3004-0	Electronic Screening Site Evaluations	High
	3005-0	Electronic Heavy Vehicle Use Tax (HVUT) Reporting	Medium
	3010-0	Document Scanning	Low
	3015-0	Integrated Access to CVO Information/Resources	High
Maintenance	1100-0	Install AVL and MDTs in KDOT winter maintenance fleet, Phase I, District 6	Medium
	1100-1	Expand AVL and MDT Statewide	Medium
	1102-0	Install AVL in KDOT paint trucks	Medium
	1103-0	Install Infrared Radar on Snowplows in a test District	Done
	1200-0	Integration of Weather Sensors on Maintenance Vehicles with RWIS, Phase I	Medium
	1201-0	Pagers for KDOT crews working near railroads	High
	1202-0	Automated Anti- / De-icing System on Bridge in Garden City	High
	4004-0	Conversion of 800 MHz radio system from conventional to trunked	Medium
	4005-0	Implementation of a mobile data channel	Medium
Traffic Operations	2101-0	Wichita Advanced Traffic Management System (ATMS)	High
	2102-0	Ramp Metering on US-54 (Kellogg Blvd.)	Medium
	2103-0	NASCAR ITS	High
	2801-0	Planning Study for Railroad Crossing on Johnson Drive	High
	2801-1	Deploy ITS at Railroad Crossing on Johnson Drive	Medium
	1500-0	Statewide Operations Center, Phase I	High
Rural Safety And Mobility	1001-0	Statewide Mayday System Development Plan	High
	1001-1	Statewide Mayday/ACN Response System	Medium
	1001-2	Mayday/ACN Service Provider Registration System	Medium
	1504-0	Deploy VMS or CCTV at trouble spots throughout Kansas	Medium
	4006-0	Statewide Cellular Coverage Map	High
	1400-0	Implement an AVL/MDT system for transit in North Central Kansas (NCK)	Medium
	1400-1	Implement a Computer Aided Dispatch System in NCK	Medium
	1401-0	Implement an AVL/MDT system for transit in Reno County	Medium
	1401-1	Implement a Computer Aided Dispatch System in Reno County	Medium
Other	4001-0	Last mile connection to District Offices	High
	4002-0	Last mile connection to the Area Offices	High
	4003-0	Barter KDOT's right-of-way to wireless service providers	Low
	4007-0	GIS database of KDOT telecommunications infrastructure	High

Table 2: Medium-term Deployment Projects (6 to 10 years)

Program Area	KITS #	Project Name	Priority
Priority Corridor	1502-3	Kiosk-Based Traveler Information System, Phase IV	Medium
	1503-0	Traveler/Tourism Information Web Site	High
CVO	3012-0	Streamline Property Tax and Insurance Verifications	Medium
	3014-0	Integrated Access to CVO Information/ Resources	Medium
Maintenance	1101-0	Snow Route Design Optimization Software	Medium
	1200-1	Integration of Weather Sensors on Maintenance Vehicles with RWIS (Phase II)	Medium
Traffic Operations	1500-1	Statewide Operations Center, Phase II	Medium
Other	1505-0	Agricultural Harvesting and Migration Information Services	Low

Table 3: Long-term Deployment Projects (more than 10 years)

Program Area	KITS #	Project Name	Priority
Rural Safety and Mobility	2300-0	Installing Cameras on the Inside of Rural Transit Vehicles	Low
Other	2104-0	Implementing Condition-based Variable Speed Limit Signs	Low

Table 1 summarizes the near-term projects segmented by the different program areas. Most of the near-term projects have been assigned either high or medium priority with only two exceptions. Tables 2 and 3 present the medium- and long-term projects, respectively. No medium and long-term projects were assigned a high priority, which would indicate the deployment horizons are consistent with their assigned priority. The KITS database and Appendix G of the Kansas Statewide ITS Plan include individual project sheets for each of the projects listed. These project sheets provide more detailed descriptions of the given projects.

CONCLUSION

The Kansas Statewide ITS Plan is intended to be a guidance document. Its role is to assist the ITS Unit in their management of the ITS Program in Kansas and to help them mainstream ITS into KDOT business. The success of the Statewide Plan depends on receiving quality input from stakeholders and the traveling public on the role ITS should play in Kansas. Furthermore, the Kansas Statewide ITS Plan is a living document. It will need to be updated on a regular basis as new projects are identified, funded and deployed. The Kansas Statewide Architecture will also need to be updated regularly as new projects are brought into the Plan. Finally, as KDOT policy changes, some of the strategies in the Plan will need to be revised to reflect those changes.

Kansas Statewide ITS Plan
Executive Summary

The Kansas Statewide ITS Plan is a strategic plan to deploy Intelligent Transportation System (ITS) technologies throughout the state. The Plan reviews existing ITS deployments in rural and urban areas of Kansas and uses this foundation to determine future needs and integration requirements for ITS in Kansas. Further, the Statewide ITS Plan defines the direction KDOT will want to take, identifies ITS projects and develops a strategy for integrating and mainstreaming ITS into the KDOT structure. Ultimately, this plan will establish the blueprint for a successful statewide ITS system.

The Kansas Statewide ITS Plan is comprised of four parts: Baseline Condition Report, Analysis of ITS Elements, Plan Methodology and Strategic Deployment Plan. The baseline conditions were derived from a number of sources, including a review of existing documentation, ITS Awareness Seminars at the six KDOT district offices, interviews and meetings with KDOT personnel, and analysis of existing survey information. This input was used to define goals and a vision for a statewide ITS system in Kansas.

The vision for what the Kansas Statewide ITS system will look like in the future guides the ITS planning process. In this vision, the system will be an open, integrated and cost effective system that ensures safer, more secure and efficient movement of people and goods across Kansas through the use of advanced technologies and management strategies.

Using input from the KDOT ITS Steering Committee, Districts and Bureaus, over 50 ITS projects were identified for Kansas. The following program areas were defined for the purpose of grouping these projects:

- Priority Corridors
- Commercial Vehicle Operations (CVO)
- Maintenance
- Traffic Operations
- Rural Safety and Mobility

Some of the potential issues addressed in these program areas include:

1. Interagency coordination,
2. System architecture,
3. Telecommunications needs,
4. Operating cost analysis,
5. Benefit/cost analysis, and
6. Opportunities for public/private partnerships.

An ITS Set-Aside Funding Program was created in 1999 in order to meet the funding needs of ITS/technology related projects in Kansas that may not be able to secure funding through normal funding mechanisms. The program is managed by the ITS Unit in the

KDOT Bureau of Transportation Planning. Projects defined in the statewide plan are eligible for this funding program.

An ITS architecture provides the framework of a system outlining how the individual components, whether an element or an agency, communicate together and work with the other components of a transportation system. A Kansas Statewide ITS architecture was developed to define the coordination of ITS applications in Kansas and their fit within KDOT organizational structure and physical infrastructure.

One of the keys to having a successful ITS program in Kansas is integrating or mainstreaming ITS into the KDOT business process. In order for this to happen, funding, contracting, planning, design, operations and maintenance of ITS needs to be a consideration in all bureaus of KDOT. A formal procedure has been established to help mainstream ITS into the KDOT design process. The most significant change to the traditional design process is the addition of an ITS Checklist. This Checklist will be developed by the ITS Unit and will contain criteria that when met would indicate an opportunity for ITS to be added to the project.

The Strategic Deployment Plan presents both a phasing plan for the ITS projects and recommended strategies for successful ITS deployment. The different types of strategies developed for the ITS Unit include funding strategies, implementation strategies and management strategies.

The phasing plan separates projects into Near-, Medium-, or Long-term deployment horizons. These designations are defined below:

- Near-term 1 to 5 year deployment schedules
- Medium-term 6 to 10 year deployment schedules
- Long-term more than 10 year deployment schedules

Additionally, as part of the ITS Statewide Planning effort, each project was assigned a deployment priority of either High, Medium or Low. The purpose of this prioritization was to ensure that the deployment timelines given in the project sheets are consistent with their respective project priorities.

In conclusion, the Kansas Statewide ITS Plan is intended to be a guidance document. Its role is to assist the ITS Unit in their management of the ITS Program in Kansas and to help them mainstream ITS into KDOT business. The success of the Statewide Plan depends on receiving quality input from stakeholders and the traveling public on the role ITS should play in Kansas. Furthermore, the Kansas Statewide ITS Plan is a living document. It will need to be updated on a regular basis as new projects are identified, funded and deployed. The Kansas Statewide Architecture will also need to be updated regularly as new projects are brought into the Plan. Finally, as KDOT policy changes, some of the strategies in the Plan will need to be revised to reflect those changes.

Section 1: Baseline Condition Report

1.0 Introduction

Background

Intelligent Transportation Systems (ITS) are the application of information systems technology and management strategies to increase the safety and efficiency of the surface transportation system. ITS can be applied to both urban and rural environments and to all modes of transportation. The contribution of information technology is to provide better information to assist users and operators of the transportation system to make better-coordinated decisions. Thus ITS initiatives are not emphasizing the proof of new technologies but rather supporting the transportation objectives of increasing safety, efficiency, and productivity, saving energy and improving environmental quality.

Rural America represents a small and dispersed portion of our nation's population, yet it encompasses a significant portion of the transportation system. In Kansas, the rural conditions are even more pronounced. For example, rural areas account for 97 percent of the total road mileage, 54 percent of the vehicle miles traveled and 78 percent of the total number of fatal accidents in Kansas. Rural roads have a unique set of characteristics related to travelers, operations and maintenance. Although it is easy to see the benefit of ITS in urban areas, rural areas can also benefit from using ITS. Rural ITS encompass seven critical program areas. These are listed below.

1. Emergency Services:
   - Mayday Systems (Automatic Collision Notification),
   - Advanced dispatching and vehicle-based response systems, and
   - Increased ability of emergency services to find rural locations.

2. Tourism/Traveler Information Services:
   - Increased stewardship for National and State Parks,
   - Traveler information on the Internet (weather and road conditions), and
   - Electronic Yellow Pages.

3. Public Mobility Services:
   - Advanced transit and paratransit systems using automated vehicle location (AVL) and improved dispatching,
   - Smart card payment/transaction systems for rider payment and tracking, and
   - Advanced ride sharing and ride matching systems.

4. Commercial Vehicle Operations:
   - Commercial Vehicle Electronic Clearance,
   - Automated Roadside Safety Inspections,
   - Commercial Vehicle Administrative Processes,
   - Hazardous Materials Incident Response, and
   - Services to assist agricultural harvesting and migration.

5. Fleet Operations and Maintenance:
   - Advanced dispatching and routing systems using AVL
   - Advanced vehicle tracking systems, and
   - Fleet maintenance and management systems.

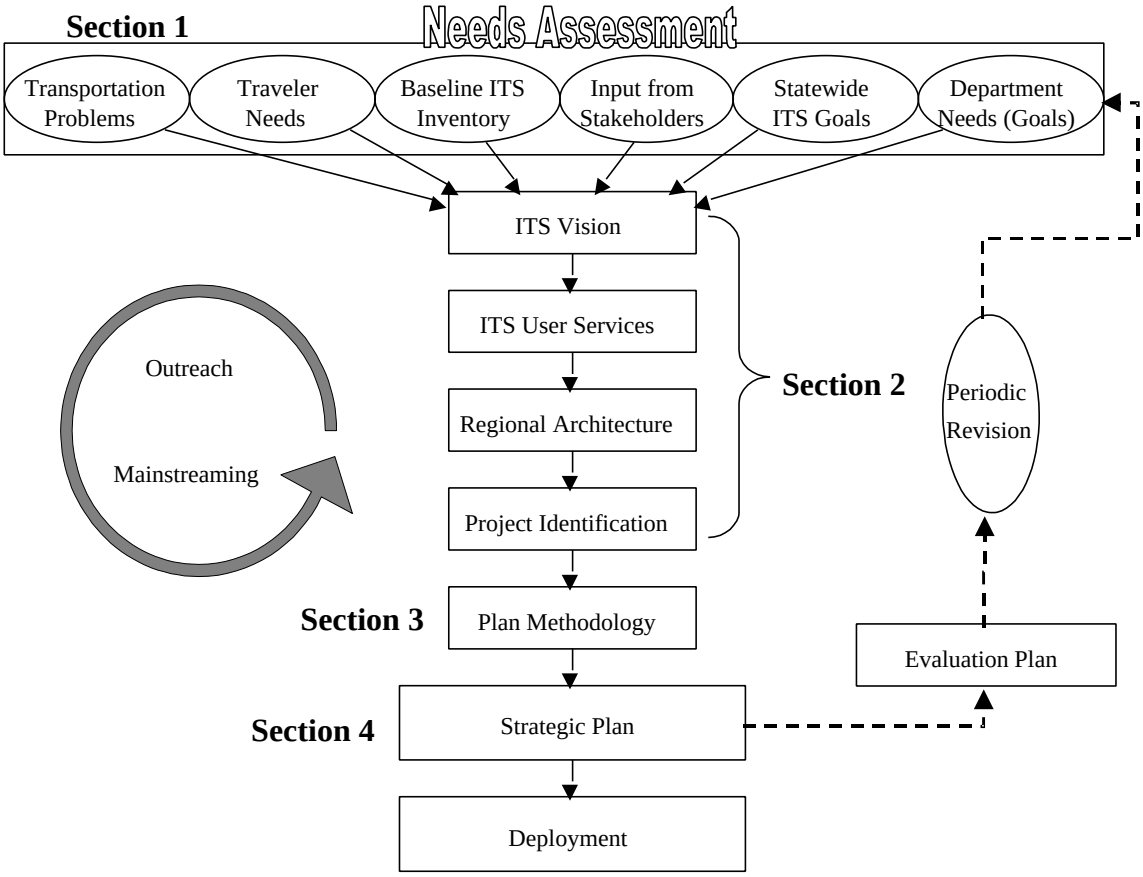
6. Traveler Safety and Security
   - Variable Message Signs (VMS) for advanced warning of hazardous conditions such as ice, fog, high water, work zones, etc.
   - Safety surveillance and monitoring, and
   - Grade Crossing Warning/Enforcement Systems.

7. Infrastructure Operations and Maintenance:
   - Road Weather Information Systems (RWIS),
   - Automatic Bridge De-icing Systems, and
   - Safety systems for work zones.

Purpose

The Baseline Condition Report presents the results of the first phase of the Statewide Intelligent Transportation System (ITS) Plan for Kansas. Figure 1.1 shows a flow chart of the process that was used to develop the Statewide ITS Plan for Kansas. The needs assessment phase, which can be seen in the top box of figure 1.1, has been completed and is documented in this Baseline Condition Report. The next four steps in the Statewide Plan are documented in Analysis of ITS Elements (Section 2 of the ITS Statewide Plan). These steps include defining an ITS Vision, screening ITS user services for potential ITS projects, developing a regional architecture, and identifying projects. Section 3 presents a methodology for identifying and tracking ITS projects and Section 4 presents the Strategic Plan for deploying ITS in Kansas. The final section of the Statewide Plan will be the Evaluation Plan.

Figure 1.1: Kansas Statewide ITS Plan Flow Chart



The Baseline Condition Report illustrates the existing foundation of ITS in rural and urban areas of Kansas. The baseline was determined by reviewing and investigating the following four sources of input:

- Review of existing KDOT-ITS planning studies, research efforts, and implementation programs,
- Outreach effort to six KDOT Districts with day-long Awareness Seminars,
- Interviews with KDOT Personnel and Feedback from ITS Steering Committee, and
- Analysis of survey information.

The information that was gathered from each of these sources is presented in the next four sections of this report. The final section of this report will synthesize these results to formulate a set of statewide ITS goals for the state of Kansas. The statewide ITS goals will be the basis for developing a regional architecture and strategic deployment plan for ITS in Kansas.

This study is a project administered by the Kansas Department of Transportation (KDOT). Although no steering committee was formed specifically for this project, the KDOT ITS Steering Committee is responsible for providing guidance, suggestions and feedback throughout the study. The ITS Steering Committee is comprised of KDOT representatives from numerous bureaus and offices with an interest in ITS for Kansas. The Steering Committee also includes representatives from FHWA and the University of Kansas. The following KDOT bureaus are represented in the Steering Committee: transportation planning, design, construction and maintenance, traffic engineering and local projects.

1.1 Review of Existing ITS Initiatives in Kansas

Kansas has several ITS initiatives currently taking place. Each of these initiatives is discussed below. The first set of initiatives includes all of the planning studies and research related to ITS in Kansas. The second set of initiatives covers the ITS Infrastructure an Implementation in Kansas. The section concludes with a summary of the current telecommunications infrastructure in Kansas.

Planning Studies and Research

1.1.1 Kansas City Early Deployment Study

An ITS Early Deployment Study was completed in 1996 for the Kansas City metropolitan area. The study was developed to facilitate coordination of ITS activities in the Kansas City area, and to provide a common framework for deployment. The study, which primarily focused on the freeway system, revealed that Kansas City freeways experience both recurring and incident related congestion. Therefore, the following ITS user services were recommended by the study for deployment in the Kansas City area: incident management, traffic control, emergency notification and personal security, and emergency vehicle management.

The study also recommended an ITS system architecture for the Kansas City area. However, at the time the study was completed, the National ITS Architecture was not yet released. Therefore, a system architecture was only recommended – not developed. The recommended architecture included two central servers, one for each state, with a single information server to exchange information between the servers and to provide information to outside sources. The system would include a single traffic operations center (TOC). Emergency management coordination would be based on the existing 911-dispatch system with TOC operators contacting emergency responders directly using the 911-dispatch system. Some, but not all, signal systems would be controlled from the TOC and transit functions will be maintained outside of the TOC.

The primary focus of the study was the deployment of a freeway management system in Kansas City. At the time the study was completed, there were plans to deploy the system

in four phases with the first phase being deployed within five years, phase two within ten years and phases three and four in ten or more years. Besides the freeway management system, some of the other ITS activities recommended in the plan included integration of weather information into the TOC, ramp metering, coordination with transit for the provision of information, and coordination with the provision of in-vehicle information. Also, some "early winners" were identified in the study. These are low cost projects that require a short development time. A few examples of these projects are:

- Implement closed circuit television (CCTV) cameras (currently under design as part of Kansas City Scout Project),
- Procure fiber optics on Kansas interstates and freeways (currently under construction per agreement with DTI under Project # 106K-6454-01),
- Expand motorist assistant patrol, and
- Install freeway reference markers and overpass signing on priority facilities (completed).

1.1.2 Wichita Early Deployment Study

In December 1998, an ITS Early Deployment Study was presented to the city of Wichita Department of Public Works. The purpose of the study was to identify the ITS user services appropriate for Wichita and to develop a Strategic Deployment Plan to provide these user services. Wichita currently has no freeway management center, advanced transportation systems, centralized traffic signal control systems, or incident management programs. However, the Wichita metropolitan area does have radio-based, electronic toll collection system along the Kansas Turnpike. This electronic toll collection system is owned and maintained by the Kansas Turnpike Authority. Wichita has also developed an incident management plan for I-135. Furthermore, the Wichita metropolitan area has a number of ITS projects in the planning stages, including expanding the traffic signal system to include all of the signals in the city, installing AVL (automatic vehicle location) on all public transit, and implementing a railroad crossing safety program.

The early deployment study revealed that unlike Kansas City, Wichita experiences very little recurring congestion with the majority of the congestion resulting from incidents. Therefore, many of the recommendations from the study are related to incident management. This study recommended short (within five years), medium (within ten years), and long-term (over ten years) goals. In the short term, a freeway surveillance and management system should be implemented to respond to incidents and identify locations of recurring congestion. In the medium term, the geographic extent of the initially implemented systems should be expanded, the scope of the incident activities should be broadened, and the information provided to travelers should be expanded. Additionally, the freeway systems should be further integrated with the arterial and transit systems in the metropolitan areas. In the long term, the ITS system should expand to cover the entire expressway system, implement technologies related to commercial vehicle applications, and implement programs, technologies, and facilities that would

provide alternatives to single occupancy vehicles. The study identified the highest priority user services as traffic control, emergency vehicle management, hazardous material incident response, incident management, and highway-rail intersections.

The study also recommended an ITS system architecture for the Wichita area. The recommended architecture includes a combined traffic/emergency operations center (T/EOC) which would house all traffic management and emergency management functions and personnel. It was also recommended that the T/EOC be located with the new 911/countywide emergency operations center, which is being planned by Sedgwick County. Emergency service providers were very involved in the Steering Committee for this project. Finally, the study recommended that the site should be in close proximity to the fiber optic network that will be installed in Wichita.

The major activity recommended for the short term is the implementation of a freeway management system in the Wichita area, along I-135 through Wichita. This system will help alleviate some of the congestion problems associated with incidents. Some of the "early winner" projects identified in the study were

- Expansion of the motorist assist patrol during peak periods,
- Freeway milepost markers at 0.2 mile intervals and overpass signing on all freeways,
- Traffic signal timing plans to accommodate freeway diversions,
- Implementation of signal preemption for fire department vehicles,
- Implementation of an AVL system for emergency response vehicles, and
- ITS at railroad crossings.

Since the Early Deployment Study for Wichita was completed, KDOT and the appropriate local agencies have approved its recommendations. The Wichita City Council accepted the recommendations outlined in the Wichita study on April 27, 1999. The ITS projects will begin once the necessary funding has been secured. This step will involve securing funds from both KDOT and the local agencies.

1.1.3 Sprint Paranet Study

This report details the variety of telecommunications infrastructure available to the State of Kansas. First, KDOT is currently using frame relay to connect its central offices in Topeka to the six (6) district offices and the twenty-six (26) area offices. The district and area offices connect to the frame relay network at a minimum rate of 384 Kbps and a maximum rate of 756 Kbps. The physical frame-relay connectivity includes the core in Kansas City, Topeka, and Wichita. KDOT also has one hundred twelve (112) sub-area offices in at least 64 counties where no physical frame relay connectivity exists.

Second, the State of Kansas has an extensive 800 MHz network with transmitters/receivers installed throughout the state. This radio network is in the process

of upgrading to digital equipment and interfaces with WAN and mobile devices to 6 district offices.

The Paranet report the following steps for KDOT:

- Implement VPN (virtual private network) for locally and remotely securing data communications to all 6 district offices
- Use the 800 MHz network as voice and data channel support, and AVL backbone
- Use microwave's large capacity infrastructure backbone for data transfer. Continue the migration to digital equipment
- Introduce wireless WAN (wide area network)
- Use ISDN (integrated services digital line) for redundancy to VPN
- Take advantage of Sprint's integrated, on-demand network (ION). Currently, Sprint ION is being beta-tested in Kansas City at Hallmark

The Sprint Paranet Study suggests that the existing and proposed telecommunications infrastructure would be used to enhance the voice, video and data connectivity to all KDOT offices. This infrastructure would benefit those using mobile data, the traveling public, and all external entities.

KDOT has several options to pursue in order to maximize the existing infrastructure. Currently, KDOT utilizes a minimum committed information rate (CIR) frame relay connection of 384k connection from the main offices in Topeka to the field offices. Should infrastructure be available, KDOT could increase the CIR of their frame relay connections from 384k to 756k. Regardless of the circuit type, the CIR will not exceed 1.0 Mbps. Additionally, KDOT could continue to replace its analog microwave equipment with digital equipment. Both of these options would increase the speed and/or bandwidth at which communications can be processed.

1.1.4 K-10 Smart Corridor

The K-10 Corridor will provide enhanced telecommunications and Information Technology (IT) services to the public through the work of a consortium of government, education, and private entities. When completed, the building blocks will be in place to provide ISDN, T-1 (1.544 Mbps) lines, asymmetric digital subscriber lines, and number portability at competitive, reduced rates. This Smart Corridor will also create new opportunities for telecommunications partnerships and competitive services for all units of local government, educational institutions, private firms, and citizens located within the K-10 Corridor's communities. These communities include Lawrence, Eudora, DeSoto, Olathe, Lenexa, Shawnee, Overland Park, Leawood, and Kansas City. The K-10 Smart Corridor will be a fiber optic based network.

As a consortium of local government, educational institutions, and private firms, the Smart Corridor members will have the clout to negotiate with telecommunications service providers to get better prices for more bandwidth. Obviously, this Smart Corridor

will benefit the communities between Lawrence and Kansas City; however, should this project be successful, its model may be expanded across the state.

This concept of banding together to get better prices for more bandwidth may also assist KDOT in obtaining bandwidth for the proposed statewide ITS system. With this bandwidth, KDOT may be able to provide many of the programs detailed in this report.

1.1.5 Transportation 2000 – Report to the Governor

On June 12, 1998, Kansas Governor Bill Graves announced the formation of a group of Kansans to study the state's transportation needs. Transportation 2000, as the group was called, was charged with gathering information from Kansas citizens, communities, regions and advocacy groups and using this information to create a priority needs assessment for the future of transportation in Kansas. The Transportation 2000 report was completed in December of 1998.

Following the guidance of Governor Graves, the report looked beyond the traditional emphasis on roads alone and also considered airport improvement, railroad safety, mass transit and a stronger state partnership with city and county government. The Transportation 2000 study group held a series of 12 town hall meetings in all geographic regions of the state to gather input from over 2,500 individuals, businesses, and government representatives with diverse transportation interests. The major conclusions drawn by the study group were:

- Kansas needs a new transportation program (existing 8-year program is wrapping up)
- Existing resources will not be adequate
- Recommended 8-year Comprehensive Transportation Program requires $4.3 billion in addition to current revenue
  - $194 million annually for Preservation Program
  - $376 million annually for Modernization Program
  - $2 billion over life of the program for System Enhancement Program
- Local Governments will also require additional resources
- All modes of transportation should be funded
  - Aviation should receive $3 million annually from state funds
  - Public Transit should receive $8.8 million annually from state funds
  - Rail should receive $5 million annually from state funds

Although the T2000 study does not mention ITS projects explicitly, the proposal still has a large impact on ITS in Kansas. In the future, ITS will be mainstreamed into the way KDOT does its business. This means that any transportation project funded by the state could potentially include ITS components in its scope. For instance, a traffic signalization project could also include signal preemption for emergency vehicles which is an ITS application. Since ITS will no longer be treated as special projects, all state transportation funding programs, such as the one proposed in the T2000 study, will have

an indirect impact on ITS. The T2000 plan was presented to the House and was not voted on due to discussion on funding methods of a new transportation program.

HB2071

On Friday April 30, 1999 the Kansas Legislature passed and on May 10, 1999 the Governor signed a $12.6 billion transportation plan. The enacted Comprehensive Transportation Program focuses on the ten-year period from FY 2000 through FY 2009. The bill has four sections. The first section is the State Highway System which includes expenditures to improve and maintain the State Highway System (maintenance, major modifications, system enhancements, demonstration projects, minimum expenditure per county, and noise abatement program). The second section assists local governments with roads and bridges not on the State Highway System. The third section assists modal partnerships such as railroad service, aviation, and public transit. The forth section outlines the annual reporting requirements.

This Comprehensive Transportation Program provides additional funding of $2.3 billion in the FY 2000 through FY 2009 from motor fuel tax, bond proceeds, and the sales tax transfer. This bill does not increase motor vehicle registration fees or the state sales tax.

1.1.6 KDOT Internet/Intranet Strategic Direction Study

In October 1997 the KDOT Internet/Intranet Strategic Direction Study was completed. This report provided recommendations for how KDOT could achieve the most effective Internet/Intranet strategy. The project encompassed a thorough review and evaluation of relevant KDOT documents and reports, current KDOT Internet/Intranet initiatives, interviews with KDOT staff, and joint application development meetings. The two major KDOT documents that were used as sources of input for the study were the Records and Workflow Management Report (1996) and the KDOT Information Technology Architecture Plan (1996).

The KDOT Internet/Intranet Strategic Direction Study addresses a number of topics including Internet and Intranet project management, technologies to be implemented such as Internet/Intranet software and web server hardware, network security issues, web site hosting options and a recommended implementation plan. The benefits of this Internet/Intranet strategy include reduction in software maintenance costs, wider access to KDOT data and applications across all of KDOT's business units, and enhanced communication with customers and employees.

This study has a significant impact on the Statewide ITS Plan in that the KDOT Internet and Intranet web sites will be an important medium for sharing ITS-related information. For instance, advanced traveler information such as planned construction projects, road closures, weather forecasts and road conditions will be made available to travelers via the KDOT Internet web site. Also, detailed RWIS information will be shared internally throughout KDOT via the KDOT Intranet. Thus, the KDOT Internet/Intranet Strategic

Direction Study will need to be taken into careful consideration as the Statewide ITS Plan is developed for Kansas.

1.1.7 CVO/ITS Business Plan

KDOT has been involved in ITS for Commercial Vehicle Operations (CVO) for about five years now. In 1994 a CVO Executive Working Group for Kansas was formed as part of a state initiative. This group had representatives from five major stakeholders: KDOT, Kansas Highway Patrol (KHP), Kansas Corporation Commission (KCC), the Department of Revenue and the Kansas Motor Carriers Association (KMCA). The purpose of this group was to meet quarterly and explore opportunities for better coordination of commercial vehicle operations.

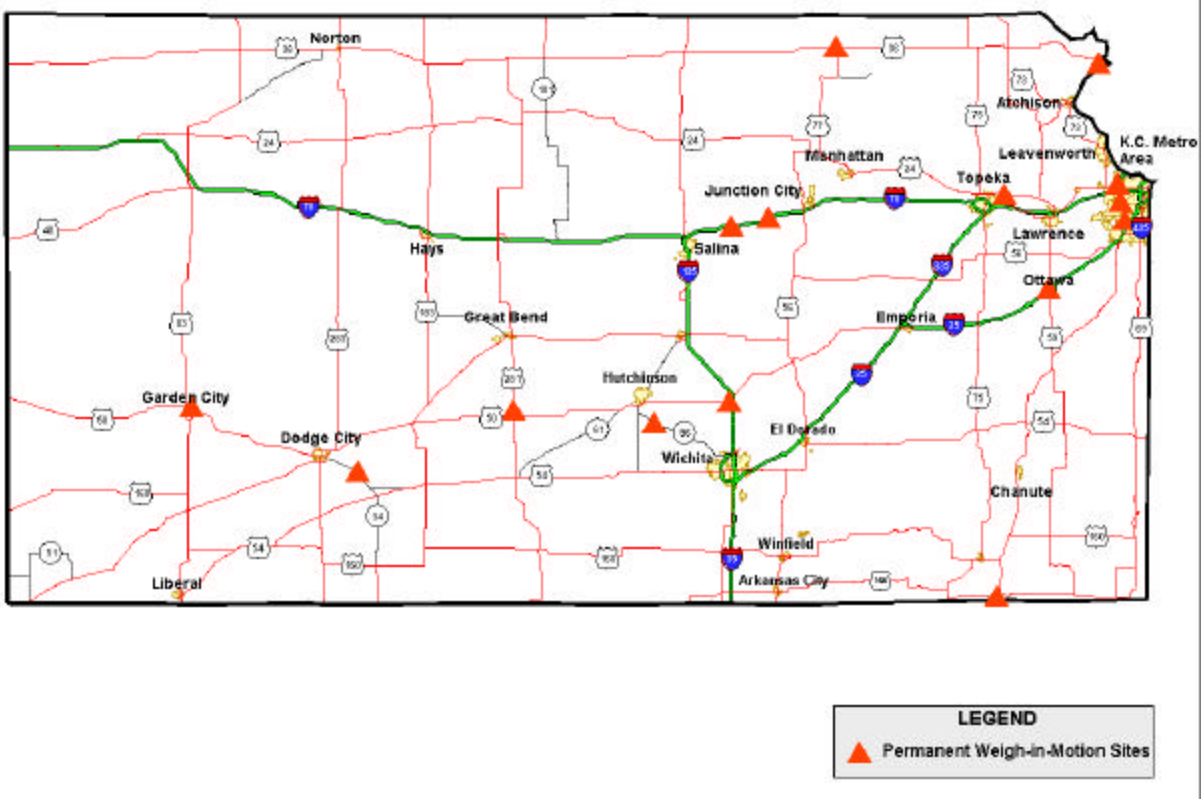
In 1996, Cambridge Systematics performed an Institutional Barriers Analysis for the states of Kansas and Missouri to determine the obstacles for having a common ITS/CVO platform between the two states. Later that year, federal CVISN funding was used to develop a regional CVO Plan for the regional trucking issues for Kansas, Missouri, Nebraska and South Dakota. Also, a CVO Business Plan for Kansas was developed in 1997 and later revised in 1998. These CVO Business Plans were developed by the Center for Transportation Research and Education (CTRE) at Iowa State University.

There are currently 14 permanent and over 70 mobile weigh in motion (WIM) sites throughout Kansas that were deployed through the Strategic Highway Research Program (SHRP). These sights are being used as a planning tool to collect CVO data but they are not being used for CVO enforcement. There are also plans to install a WIM system on I-70 in Wabunsee County in the summer of 1999 as an addition to an existing construction project. The WIM site will be designed the same way that the SHRP sites were designed. The purpose of this site is to study the increase in overweight truck traffic when the preexisting weigh station is closed. The site will be monitored by the KHP and will act as a precursor for WIMS installed for enforcement purposes.

The ITS/CVO user service that is most desired by Kansas motor carriers is electronic credentialing. This service involves the conversion of paperwork transactions for things like driver's license, insurance, registration and permits into electronic transactions. The Department of Revenue is responsible for collecting taxes and registration fees and the KCC (in cooperation with KHP) is responsible for insurance and safety compliance.

It is less likely that electronic screening initiatives such as PrePass will be adopted in Kansas in the near future. The current PrePass program requires motor carriers to prepay in order to bypass inspection stations and this idea is not popular within KDOT. Also, there are potential telecommunications issues with PrePass since it may not be compatible with KTAG.

Figure 1.2: Permanent Weigh in Motion Sites in Kansas



Future CVO/ITS initiatives have been outlined in the Kansas CVO Business Plan. The near term initiatives identified in the plan include automating the reporting process for Motor Carrier Safety Assistance Program (MCSAP) inspectors by installing PCs at each inspection station and joining the International Registration Plan (IRP) Clearinghouse which will reduce paperwork and make fee collection more efficient. These initiatives will be incorporated into the ITS Statewide Plan. The CVO initiatives need to be tied into the Wichita and Kansas City ITS projects. The next revision of the CVO Business Plan is currently on hold pending the completion of the ITS Statewide Plan.

1.1.8 Rural Mayday Study for Kansas

Mayday Systems are unique among rural ITS applications in that they are currently sold, operated, and maintained by the private sector, yet they must be integrated with public sector agencies, particularly those in the emergency response arena. While the private sector systems, such as General Motor's OnStar® system and Ford's RESCU® system, are in some ways in their infancy of development, the public demand for these types of services is very high, and the number of subscribers will almost certainly increase dramatically in the coming 3-5 years. Inasmuch as it is not feasible for any private sector

entity to deploy it's own emergency response units, the systems will continue to rely on public law enforcement, fire, and emergency medical services (EMS) to fulfill the role of responder. Consequently, public agencies must be prepared for the proliferation of this new category of emergency calls. Perhaps of greater importance is the opportunity for the public sector to positively affect the development of Mayday Systems and related public policies so that the systems integrate smoothly with the current policies and operations of the emergency response agencies. It is just such a proactive position on the part of the public sector that is necessary in order for Mayday Systems to realize their safety and security potential.

With this in mind, the Kansas Department of Transportation in 1997 funded the development of a Statewide Mayday System Development Plan. The plan, scheduled for completion in June of 1999, will identify characteristics of emergency response in Kansas that should have some bearing on the posture of the state regarding Mayday System development. An organizational architecture will be described which will promote acceptance both among the traveling public and within the public agencies that are most directly affected by Mayday Systems. The plan will also identify which roles are appropriately played by KDOT. The plan will be based on a comprehensive survey of emergency responders across the state.

There are several projects that have some bearing on the development of Mayday Systems. Those projects located in Kansas are discussed in more detail elsewhere in this document, but are listed here to highlight their relationship to Mayday development.

The Kansas Highway Patrol recently completed a pilot project in which 50 vehicles were outfitted with global positioning systems (GPS) receivers integrated with their 800 MHz radio systems. The pilot project has demonstrated that transmitting data over the radio is a feasible solution, and the KHP plans to expand the system statewide as the necessary funds become available. The experience of the KHP in their implementation of AVL is relevant to Mayday Systems development in Kansas in two veins. First, many of the components of AVL parallel critical components of Mayday Systems, including GPS reception, data transmission, and relating the location in geodetic coordinates (i.e., longitude and latitude) to the transportation network using a geographical information system (GIS). Because of this commonality, the implementation of Mayday Systems can avoid difficulties that have already been addressed by the KHP.

The second area of relevance is that with the addition of an automatic activation unit, or trigger, the AVL system can serve as a Mayday System as well. Thus, for a relatively small incremental investment, Mayday could be implemented for any vehicle already equipped with an 800 MHz radio.

KDOT has approved the funding of a project in which the cellular coverage on the state highway system will be mapped. Scheduled to begin during the summer of 1999, a mapping crew will drive the state highway system with wireless phones, using a GPS

receiver and a laptop computer to generate the database. The base map may be complete as early as September 1999, with a final report by year's end.

Because many rural ITS applications are dependent on some form of wireless communications, implementers often turn to cellular telecommunications for transmitting information. However, the available sources of information related to cellular coverage are limited. Most often, coverage maps originate with the cellular service provider, who has a vested interest in showing the coverage to be as complete as possible, sometimes to the point of providing unreliable information.

The magnitude of the benefits of any system that relies on cellular communications depends heavily on the extent of the cellular coverage. Without an accurate picture of this coverage, decisions about investments in rural ITS technologies become much more difficult and risky. Adequate information allows resources to be used more effectively.

1.1.9 GIS Study

The KDOT Cartography Unit of the Bureau of Transportation Planning is in the process of completing a study to determine all of the potential GIS related projects in KDOT. The study found 27 potential GIS applications for KDOT. The study will also rank these projects in order of priority. The study is due to be completed by August 1999.

Of the 27 projects that were identified, four of them were requested by the ITS Unit of the Bureau of Transportation Planning. Two of these projects involve using a GIS interface for tracking and controlling ITS field elements in both the Kansas City TOC and the Wichita TOC. Another of these projects involves using a GIS database to display a graphical representation of cellular coverage throughout Kansas. The fourth project would provide a GIS database and graphical representation of the telecommunications infrastructure that KDOT owns, lease or has rights to.

Three other GIS projects that were requested by the Bureau of Construction and Maintenance also have ITS implications. One of these involves developing a web enabled GIS application for Construction and Detour information. This application would give field offices the ability to report construction and detour information via the KDOT intranet and this information could be used to update the Road Condition Reporting System (RCRS, see section 1.1.15) and the 1-800 travel advisory hot-line (see 1.1.14). The other two projects with ITS implications are automated scheduling and routing of snow plowing activities which would tie into Road Weather Information Systems (see 1.1.15) and a GIS database for entering maintenance activities which would be modeled after the RCRS.

Infrastructure and ITS Implementation in Kansas

1.1.10 Kansas City Scout Project

Since the completion of the Kansas City EDP, the Kansas DOT (KDOT) and Missouri DOT (MoDOT) have undertaken a joint initiative to implement a freeway management system in the Kansas City metropolitan area. This initiative, which has been termed the Scout project, is currently in the first of four implementation phases. A map of the Scout implementation plan is shown in figure 1.3. Phase 1 of project includes implementing ramp metering on the south side of I-435 from the I-35 interchange in Kansas to the Grandview Triangle in Missouri. The ramp metering plans have been presented to local stakeholders. Also as part of the Scout project, a traffic operations center will be located in the new MoDOT building in Lee's Summit, Missouri. The traffic operations center will be able to monitor real time traffic conditions with video cameras and traffic counters installed on the Kansas City freeway system. A communications council has been developed to disseminate project information to the public.

Other tasks that are underway as part of the Scout project and their status are listed below.

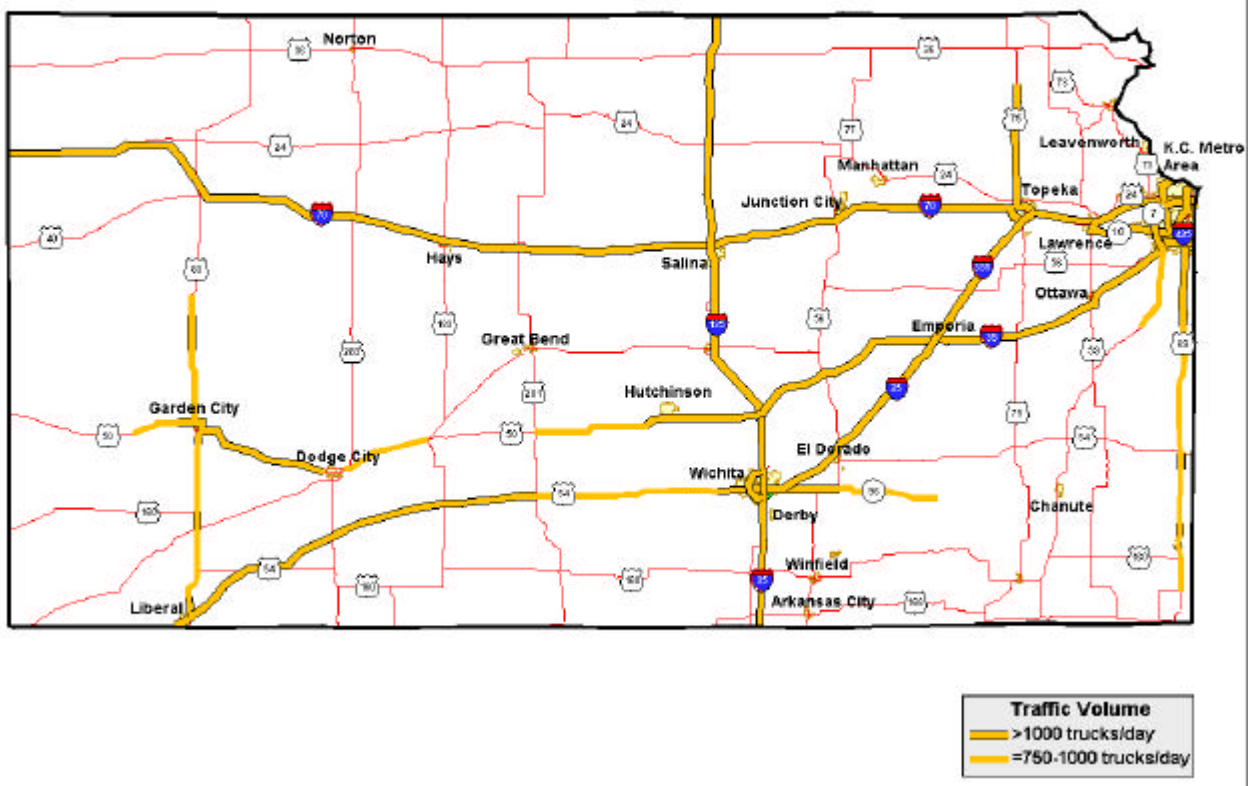
- User requirements were developed in December 1998,
- System requirements were developed in February 1999, and
- Incident response plan was developed in February 1999.

Figure 1.3: Kansas City Scout Implementation Plan

1.1.11 Major Truck Routes in Kansas

As shown in figure 1.4, there are two major and one minor east/west truck routes in Kansas. Also, there are three major and two minor north/south truck routes in Kansas. For this study, a major truck route is defined as a route having an average annual daily traffic (AADT) greater than 1000 trucks per day and a minor truck route is one that has an AADT mostly between 750 and 1000 trucks per day.

Figure 1.4: Major Truck Routes in Kansas



The largest east/west truck route in Kansas is I-70 as one would suspect. However, US-54 from Wichita to Liberal is another major route that carries nearly 50 percent trucks in some locations. The minor east/west truck route in Kansas is US-50 from Emporia to Garden City.

The three major north/south truck routes are I-35 from the Oklahoma border to Kansas City, I-135/US-81 from Wichita to the Nebraska border and I-335/US-75 from Emporia to the Nebraska border. The two minor north/south truck routes are US-83 from Liberal to K-4 and US-69 from Pittsburg to Kansas City.

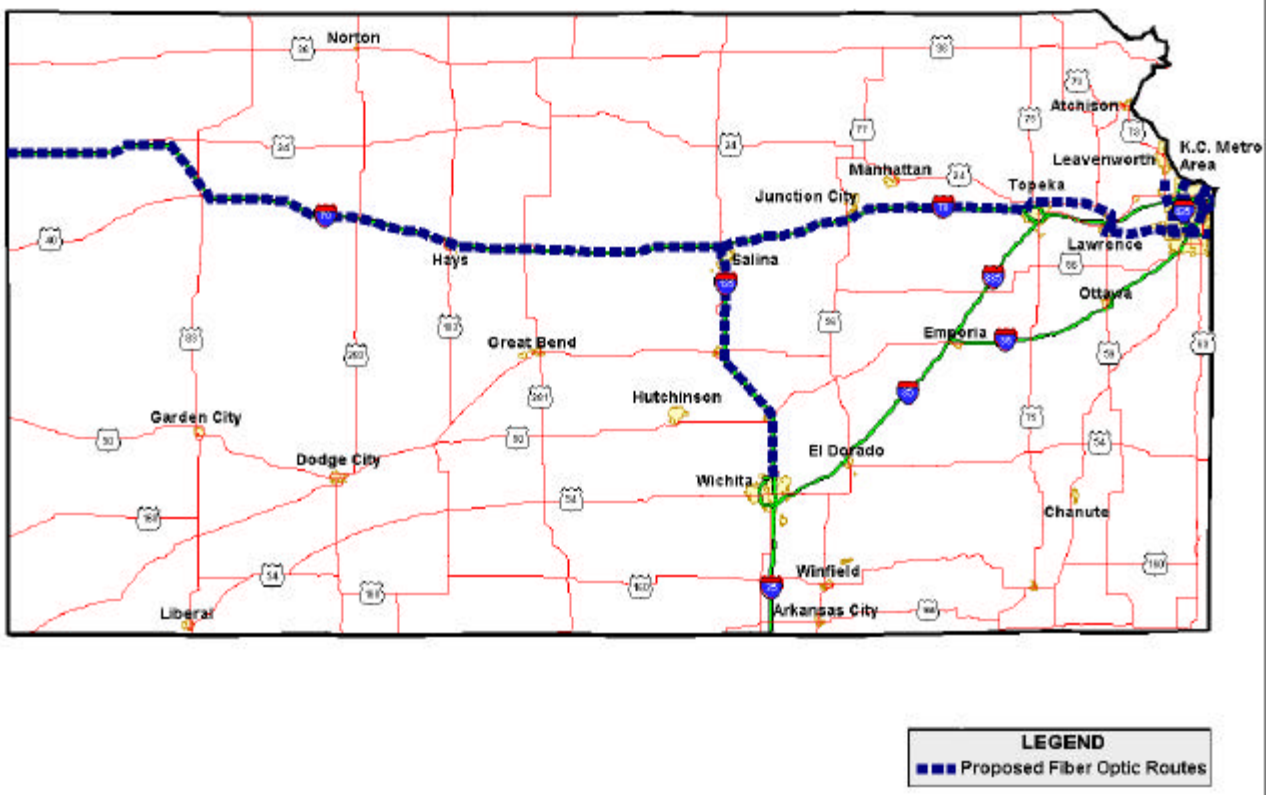
Since these routes carry the most truck traffic in Kansas, they will have the highest priority when considering ITS deployment in the Statewide ITS Plan for Kansas. Kansas routes other than the ones mentioned above will also be considered for ITS deployment when special needs arise.

1.1.12 Statewide Fiber Optic Network

KDOT has entered into a public-private partnership with Digital Teleport, Incorporated (DTI) out of St. Louis, Missouri to install a statewide fiber optic network throughout the state of Kansas. The entire cost for the fiber optic network ($75-150 million over a 30 year period) will be provided for by DTI in exchange for free use of KDOT right of way. The network will extend fiber from Kansas City to the Colorado State line primarily along Interstate-70, through Lawrence, Topeka, Junction City, Salina, Hays, and Colby. In addition, fiber will be run South from Salina on Interstate 135 to Wichita. Figure 1.5 shows a map of the proposed fiber optic routes in Kansas. It is estimated that the construction of the fiber optic backbone will be complete by September 2000.

The fiber optic cable will support a tremendous amount of applications through its bandwidth. At a minimum, the fiber optic cable will be capable of transmitting digital data at a rate of 155 Mbps (OC-3). It is more likely that the transmission speed will be 620 Mbps (OC-12), or greater. Additionally, fiber optic cable, through SONET, offers redundancy. Should the primary ring be compromised, data traffic is automatically re-routed onto a secondary ring or alternate path. All of this fiber-optic cable will expand telecommunication capabilities and options in towns across Kansas. KDOT would benefit by having increased access to a digital telecommunications backbone and larger bandwidth in order to transmit data and video. Ultimately, KDOT would be able to implement several of the ITS programs mentioned in this report.

Figure 1.5: Proposed Fiber Optic Routes in Kansas



1.1.13 Kansas Highway Patrol AVL System

The Kansas Highway Patrol (KHP) recently completed a pilot project in which 50 vehicles were outfitted with Automated Vehicle Location (AVL) technology. AVL is a surveillance technology that enables a vehicle's position to be tracked as it traverses the road network. AVL systems are comprised of vehicles equipped with locating and tracking devices such as GPS receivers for communicating back to dispatch, and central software that processes the information from vehicles so that they can be located.

KHP purchased the system from Location Technologies out of Parkville, Missouri for $1250 per vehicle. The life cycle of the system is estimated to be 3-5 years. The current system is comprised of 50 KHP units outfitted with GPS receivers integrated with the 800MHz-radio system. There is a requirement that the vehicle position updates must not interfere with voice communications and cannot exceed 20% of the total radio frequency time. The system can locate vehicle positions to an accuracy of 100 meters under normal

conditions and 10 meters on demand. The system is able to track up to 1000 vehicles at a time. An illuminated control head with status buttons in the vehicle allows a dispatcher to identify the vehicle, its status and location on mapping software in the communications center.

The AVL system will benefit KHP in a number of ways. It will provide better resource management, improve care for service response time, enhance officer safety, increase the ability to accurately identify crash locations, decrease voice radio traffic, and streamline dispatch operations. KDOT may want to use the KHP AVL system as a model when they consider using AVL in other applications such as transit fleet management and maintenance fleet management. The pilot project has demonstrated that transmitting data over the radio is a feasible solution, and the KHP plans to expand the system statewide as the necessary funds become available.

1.1.14 Smart Work Zones in Kansas

In work zones, it is often necessary for workers to operate in close proximity to moving traffic. Motorists, on the other hand, often become accustomed to traveling at highway speeds and do not adequately reduce their speed in work zones. Consequently, safety is a priority in highway work zones.

Kansas is actively pursuing safety and mobility in work zones through several channels. A number of existing systems provide travelers with information related to work zones. Other systems or improvements are planned. Also, new technologies are being evaluated which will not only help to expedite the movement of traffic through the work zone, but also protect the workers and reduce costs.

Traveler Information Systems

Several systems exist in Kansas which relay information related to work zones to the traveling public. The Kansas Turnpike Authority (KTA) maintains a Traveler Advisory Radio System—termed a highway advisory radio (HAR) system in most ITS literature—which broadcasts weather, pavement, and construction conditions to turnpike travelers. The system operates over 530 AM west of Emporia and over 1610 AM east of Emporia. KDOT operates a dial-in highway information Hot-Line (1-800-585-ROAD), which disseminates similar types of information. Both agencies maintain web sites that contain work zone related information. The following table gives a brief description of the various web pages.

Description	Link
KDOT	
The public information page contains links to news of major construction projects.	http://www.ink.org/public/kdot/pubinfo/
KTA	
A map of the turnpike showing the locations of ongoing and planned construction.	http://ksturnpike.com/map/map.html
A calendar of planned construction with locations as well as start and end dates.	http://ksturnpike.com/cnstschd.html

Mid-West Smart Work Zone Deployment Initiative

KDOT is evaluating new technologies through their participation in the *Mid-West Smart Work Zone Deployment Initiative*, a four-state pooled-fund study in cooperation with the states of Iowa, Missouri, and Nebraska. The study's objective is to evaluate technologies aimed at improving safety and reducing cost in highway work zones. A wide variety of technologies will be evaluated, ranging from simple signposts and anchors to computerized systems for real-time responsive traffic control. The project will be ongoing throughout the summer of 1999, culminating in a final report and project conference sometime the subsequent fall.

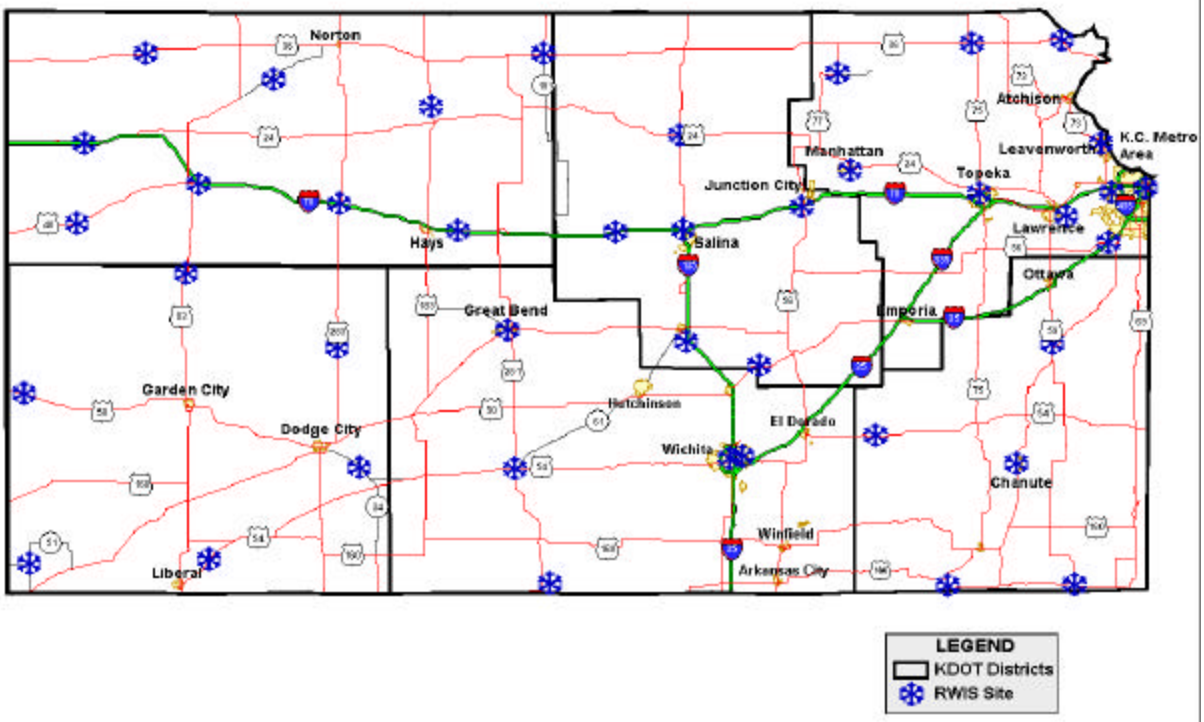
Kansas City Scout and Wichita Early Deployment Study

While both of these projects are discussed in more detail elsewhere, it bears mentioning here that both projects place a high priority on both traveler information and incident management. Informing the traveling public of work zones, potential delays, and alternative routes is an important function of advanced traveler information systems. Incident management goes a step further to help facilitate traffic flow through a work zone and quickly clear any accidents that might occur so as to preclude the occurrence of secondary accidents.

1.1.15 Weather Applications (RWIS and Weather Kiosks)

KDOT currently has a statewide network of 41 RWIS stations installed at various locations throughout Kansas (see figure 1.6). The 41 remote processing units (RPUs) collect current weather and pavement conditions for each site in 15-minute intervals. All of the data from the RWIS sites, as well as local forecasts provided by a meteorological service are provided on the KDOT Intranet. There are 45 other RWIS sites installed throughout Kansas that are not owned by KDOT. KDOT would like to have all of the RWIS data in Kansas stored on a central site, but there are some institutional issues that need to be worked out before this can happen. Issues include who will be responsible for maintaining the database and who will have access to the database.

Figure 1.6: KDOT RWIS sites



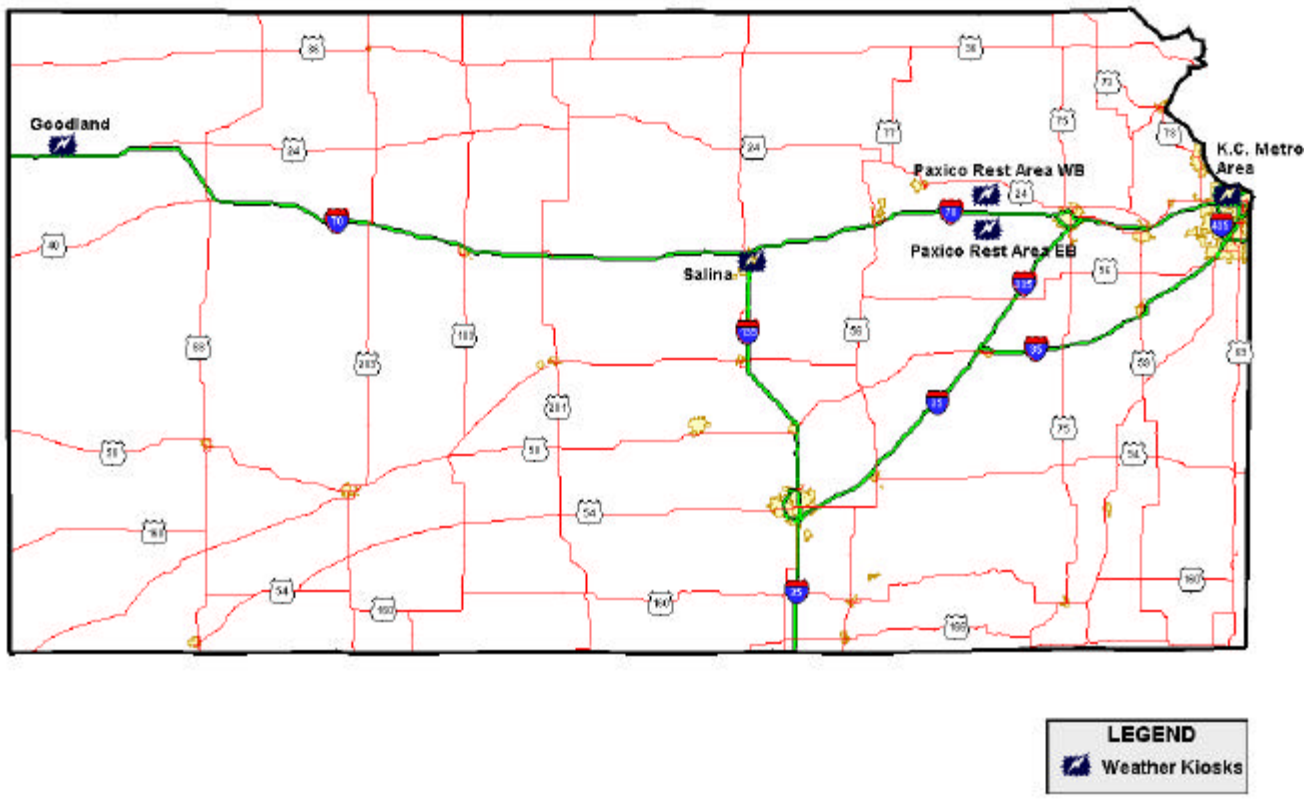
RWIS data has not yet been made available to the public either by means of VMS or the Internet due to liability concerns. However, there is a separate initiative within the Construction and Maintenance Bureau called the Road Reporting System (RCRS) that may eventually provide travel information to the public. RCRS data is collected from actual observations in the field and is currently shared internally using a color-coded map to display road conditions. Phase 1 of this initiative, which encompasses pavement conditions, has been completed. Phase 2 will provide information on detours and road closures. There are also plans to have a RCRS alert bulletin available to the public via the Internet at some future time.

KDOT has also recently begun a one-year evaluation project involving the use of weather kiosks as advanced traveler information systems. As part of the project, five stand alone weather kiosks will be leased from Data Transmission Network (DTN) for a one-year period. The kiosks will provide travelers with local and regional forecasts and radar and satellite images updated every 20 minutes. The five kiosks will be deployed in the following locations:

- Goodland and Kansas City traveler information centers off I-70,
- Safety rest areas on both sides of I-70 near Paxico, and
- KHP dispatch center in Salina.

Figure 1.7 shows a map of the 5 kiosk locations. The kiosks located at the rest areas and information centers will display preset screens that will change at predefined intervals and will not be interactive.

Figure 1.7: Weather Kiosk Locations in Kansas



Telecommunications Infrastructure in Kansas

With the Telecommunications Act of 1996 and the increasing importance of telecommunications, more competitive options are available to the Kansas Department of Transportation (KDOT) in order to provide Intelligent Transportation Systems (ITS) across the entire State of Kansas. These alternatives cover a wide variety of technologies and architecture, including fiber optic cable, wireline providers, asynchronous digital service line (ADSL), wireless radio, wireless cellular, satellite, SONET (synchronous

optical network), and ATM (asynchronous transfer mode). More specifically, these options include fiber optic backbone, telephone companies, 800 MHz radio, cellular and ATM over satellite.

Fiber-Optic Backbone

The State of Kansas is in the process of constructing fiber-optic backbones in Kansas City and statewide. The statewide backbone extends from Kansas City west to Topeka along route 10 and US-44, and from Topeka to the state line along Interstate I-70, from Salina south to Wichita along Interstate I-135, and then to Oklahoma along a route to be specified. It is estimated that construction of the statewide fiber-optic backbone will be complete by January 2000. In Kansas City, a fiber optic backbone is being constructed along all interstate routes and major highways to support communications for the traffic management system (Kansas City Scout). The fiber built-out in Kansas City is scheduled to be completed in September 2000.

Telephone Companies

Additionally, many telephone companies serve citizens of Kansas, including:

- Southwestern Bell (Topeka, Wichita)
- Birch Telephone Company (CLEC in Kansas City)
- Cunningham Telephone Company (Glen Elder)
- Elkhart Telephone Company (Elkhart)
- Gorham Telephone Company (Gorham)
- H&B Communications, Inc. (Holyrood)
- Haviland Telephone Company (Haviland)
- Home Telephone Company (Galva)
- JBN Telephone Company (Wetmore)
- Moundridge Telephone Company (Moundridge)
- Pioneer Telephone Association (Ulysses)
- Rural Telephone Service Company (Hays)
- South Central Telephone Association (Medicine Lodge)
- Southwestern Kansas Telephone (Clearwater)
- Sunflower Telephone Company (Dodge City)
- Wamego Telephone Company (Wamego)
- Wheat State Telephone (Udall)
- Wilson Telephone Company (Wilson)

Several of these rural telephone companies have replaced their copper service cables with fiber-optic cables. Between the State's fiber optic infrastructure plan and local telephone

companies, much of the State of Kansas is (or will be shortly) served by a fiber-optic backbone. This fiber backbone could be leveraged to provide ITS service to all citizens of Kansas.

Finally, other "telephone" service providers are:

- Nextel (Kansas City, Wichita)
- Sprint PCS
- AT&T Wireless
- VoiceStream (Wichita)
- Kansas Cellular (local coverage everywhere, roaming in Kansas City, Topeka, and Wichita)
- Aerial (Topeka)
- Cellular One (Kansas City, Topeka)

Sprint PCS, AT&T Wireless and Kansas Cellular are the only companies to offer wireless coverage/service across the entire state. Unfortunately, cellular service cannot provide the amount of bandwidth required for an ITS network at this time. However, they are all adequate to provide remote command and control of ITS field elements through voice or dial-in connections throughout the entire state. The Telecommunications study suggested providing enhanced remote communications (cellular service) for KDOT employees.

800 MHz Radio

The State of Kansas has built an extensive 800 MHz radio network serving the entire state. The Sprint study suggested migrating the radio equipment to digital. The study also suggested locating additional towers near fiber-optic terminus points to take advantage of the fiber optic cable for long-haul transport. It is anticipated that 80-100 new tower sites will be constructed by the year 2001. As of now, construction of additional towers in Districts 2 and 5 is complete. Construction of new towers in Districts 1, 3, 4, and 6 is on going.

ATM Over Satellite

Although this delivery method is not yet available, discussions and analysis are being conducted right now as to how to provide Asynchronous Transfer Mode (ATM) signaling over satellites. Currently, ATM is delivered over Synchronous Optical Networks (SONET), that is, fiber-optic cables. As deployment of terrestrial networks is quite expensive, satellites may eventually provide tremendous cost savings. However, this delivery method will not be available for the timeframe of the KDOT ITS implementation, but should be considered in the future.

Conclusion

Kansas has several initiatives with ITS and telecommunications implications. Coordination with the Missouri Department of Transportation (MoDOT) ITS program will play a large role in the implementation of ITS in Kansas City. Finally, the state of Kansas owns and maintains a large 800 MHz and microwave network. Inasmuch as KDOT does not want to re-invent the wheel every time it looks at these initiatives, KDOT must focus on the inter-operability of the initiatives with KDOT's ITS communications network. By using careful planning and having open discussions, KDOT will be able to leverage the technology used in all of these initiatives to their advantage. KDOT should identify how it wants to serve the citizens of Kansas, determine what applications will provide the most benefit, and then look at the architecture or infrastructure of how to make it happen.

1.2 Kansas ITS Awareness Seminars

The following section documents the Kansas ITS Awareness Seminars that took place between March 12th and April 1st as part of the Statewide ITS Plan. Section 1.2 begins with an overview of the entire seminar process and then summarizes the chief concerns offered by seminar participants. Section 1.2.1 provides documentation of each seminar. Finally, section 1.2.2 provides a summary of the written feedback from the seminars. The appendices contain a sample of presentation slides, a questionnaire, invitation letter and mailing lists, and attendance records.

Overview of Kansas ITS Awareness Seminars

The Kansas Department of Transportation, in association with TranSystems and Jane Mobley Associations, conducted six awareness seminars throughout the state of Kansas between March 12 and April 1, 1999. Seminars took place at KDOT district offices in Chanute, Hutchinson, Norton, Salina, Topeka and Garden City.

In addition to KDOT district personnel, 190 individuals were invited to attend the six seminars. Included in the non-KDOT invitations were city and public works officials, transit and paratransit providers as well as EMS, law enforcement, farming and business interests. A total of 206 participants attended the seminars.

KDOT personnel received invitations to attend seminars directly from KDOT District Engineers. Non-KDOT personnel received a letter from James E. Tobaben, P.E., Chief of Transportation Planning for KDOT (a copy of which is provided in Appendix B). Jane Mobley Associates faxed these letters to invitees and then followed up with phone calls to encourage attendance. The project team felt the outreach effort was very successful. Copies of the attendance lists for each seminar are included in Appendix C. Seminars consisted of a three-part presentation (a copy of which is included in Appendix D), which included an overview of ITS with an emphasis on rural applications, a review of ITS applications in Kansas and a discussion of the statewide plan. Each seminar was concluded with a question and answer session during which participants were encouraged to share their thoughts on ITS in general and its applications in their work in particular.

Participants were also given a questionnaire (a copy of which is included in Appendix E) to aid in the interactive discussion.

Overall, the seminars were well attended, audiences expressed interest in the subject and were engaged in the discussion. Participants provided feedback that will help the project team develop an effective statewide plan. Informal discussions and follow-up conversations also indicate that participants left seminars with a deeper understanding of ITS applications in the rural setting.

Chief Concerns or Recommendations Offered by Seminar Participants

Much of the discussion during the question and answer sessions centered on weather-related applications of ITS. These issues were of particular interest in Districts 2, 3 and 6, where severe snowstorms are most likely to cause travel-related problems.
Consensus was expressed that driver disregard or disbelief of weather-related warnings would continue to be an obstacle to overcome. However, workshop participants agreed that ITS applications could help meet the challenge of getting travelers off the road before they are in danger or before they are in areas where accommodations are inadequate by providing valuable real-time weather information.

Some applications discussed were variable message signs (VMS), radio broadcasts relating weather warning, information kiosks at rest stops, immediate access to weather and travel data and better communication and coordination among various agencies and authorities along major travel routes.

Certain policy issues related to AVL and CVO applications were discussed. Many participants were concerned that drivers and other front-line employees would consider AVL as a means of supervisory control or monitoring. Participants agreed that presenting the technology in terms of its capability to improve safety and efficiency would alleviate some but not all resistance. Some concern was expressed that the introduction of AVL may be unnecessary since 800-mhz radios are already being installed in maintenance vehicles and these radios will be sufficient for improving safety and communications.

1.2.1 Documentation of each Seminar

District #1 ITS Awareness Seminar – Topeka – March 30, 1999

Overview - The District #1 seminar took place at the KDOT District #1 headquarters in Topeka on March 30, 1999. In addition to KDOT district personnel, 45 individuals were invited to attend the seminar. Total attendance at the seminar was 54. 14 non-KDOT personnel attended.

Project personnel in attendance - Matt Volz, ITS Coordinator, KDOT; Chris Beightel, Assistant ITS Coordinator, KDOT; Erin Flanigan, Project Manager, TranSystems; Scott

Russell, Account Executive, Jane Mobley Associates; Bruce Baldwin, ITS/Safety Engineer, FHWA; Dr. Eric Meyer, Associate Professor of Engineering, University of Kansas.

Issues/Concerns/Questions – The following issues or concerns were presented during the question and answer portion of the presentation.

- Questions were raised as to the role of KDOT in the rollout of the Intelligent Vehicle Initiative (IVI) and other vehicle-based applications. Seminar leaders acknowledged that the introduction of IVI and similar technology was the province of the automobile manufacturers. Seminar leaders discussed the fact that this technology was available and was being offered in certain high-end cars and predicted that many IVI applications would be available in the coming years in moderate to low-end cars.
- Questions were raised as to who would be paying the $1,000 to $1,500 per GPS transponder for AVL and Mayday in public vehicle. KDOT personnel indicated that the funding issue was a matter of discussion at this point in the planning process.
- Seminar leaders were asked to discuss the "smart construction zone" technology being applied by KDOT at the present time. Seminar leaders discussed the zones being designed or applied in Kansas City, on I-35 south of Newton and in Topeka
- Other questions presented by the audience addressed issues such as increased driver distraction with the addition of navigation devices in vehicles, consumer cost concerns, and the ability of VMS to convey complicated information within their brief exposure period.

District #2 ITS Awareness Seminar – Salina – March 29, 1999

Overview - The District #2 seminar took place at the KDOT District #2 headquarters in Salina on March 29, 1999. In addition to KDOT district personnel, 33 individuals were invited to attend the seminar. 10 non-KDOT personnel attended the seminar. Total attendance at the seminar was16.

Project personnel in attendance - Matt Volz, ITS Coordinator, KDOT; Chris Beightel, Assistant ITS Coordinator, KDOT; Erin Flanigan, Project Manager, TranSystems; Scott Russell, Account Executive, Jane Mobley Associates; Bruce Baldwin, ITS/Safety Engineer, FHWA.

Issues/Concerns/Questions – The following issues or concerns were presented during the question and answer portion of the presentation.

- Workshop participants were particularly interested in the AVL technology. While some participants shared the concern that some personnel may resist AVL/GPS applications, most participants agreed that the value of location

assistance far outweighed any potential negative impact. This workshop group possessed a high degree of familiarity with AVL/GPS technologies and was very supportive of the uses presented by seminar leaders. The AVL, GPS and CVO technology utilized by Werner Truck Lines to improve fleet management efficiency was discussed specifically.

- Participants agreed that Salina was the place to locate VMS presenting weather information for western Kansas. Participants agreed that traveler disregard or disbelief of warnings was still the weak link in this strategy. They also agreed that in order to be effective, VMS posted in the Salina area should be controlled be KDOT or KHP personnel in western Kansas (District #3 or from Goodland).

District #3 ITS Awareness Seminar – Norton – March 24, 1999

Overview - The District #3 seminar took place at the KDOT District #3 headquarters in Norton on March 24, 1999. In addition to KDOT district personnel, 35 individuals were invited to attend the seminar. 16 non-KDOT personnel attended the seminar. Total attendance at the seminar was 26.

Project personnel in attendance - Matt Volz, ITS Coordinator, KDOT; Chris Beightel, Assistant ITS Coordinator, KDOT; Erin Flanigan, Project Manager, TranSystems; Ben McKeever, Engineer, TranSystems; Scott Russell, Account Executive, Jane Mobley Associates; Bruce Baldwin, ITS/Safety Engineer, FHWA; Kirk Fredrichs, Transportation Engineer, FHWA; Dr. Eric Meyer, Associate Professor of Engineering, University of Kansas.

Issues/Concerns/Questions – The following issues or concerns were presented during the question and answer portion of the presentation.

- The primary point of discussion during the Norton seminar centered on weather-related concerns. KHP officers and other public works personnel emphasized the need to utilize RWIS and other weather-related data during severe snowstorms in western Kansas. ITS applications in the area should be designed to try to get drivers off the highway at points where they can be accommodated safely and in a manner that does not place such a burden on KHP and small communities that do not have the hotel capacity of larger communities. Placing permanent Variable Message Signs (VMS) at strategic points in extreme western Kansas for eastbound drivers and in the central part of the state for westbound drivers was suggested. Participants also suggested weather-alert radio stations along I-70 and information kiosks at rest stops to reinforce the message that drivers should seek accommodations rather than try to drive I-70. Further discussion suggested that KDOT should seek means such as the Internet to encourage travelers to stay at home when inclement weather is approaching.

- Some of the discussion indicated that some participants shared the concern that AVL and GPS applications might be perceived by front-line personnel as means of monitoring their whereabouts. While participants agreed that the technology could be "sold" to personnel as increasing their safety while on the job, participants also thought that the 800-mhz radios that are expected to be introduced would accomplish this safety goal more effectively.
- Related to the weather-traveler issues, consensus was expressed from the workshop that information was only part of the equation. Travelers and their responses to weather-related warnings will determine the effectiveness of any applications.
- Participants suggested adding a visibility rating to the snow categories posted on the RCRS. Participants suggested that a field indicating "blowing snow" would be helpful in providing visibility ratings.

District #4 ITS Awareness Seminar – Chanute – March 12, 1999

Overview - The District #4 seminar took place at the KDOT District #4 headquarters in Chanute on March 12, 1999. In addition to KDOT district personnel, 31 individuals were invited to attend the seminar. 14 non-KDOT personnel attended the seminar. Total attendance at the seminar was 37.

Project personnel in attendance - Matt Volz, ITS Coordinator, KDOT; Chris Beightel, Assistant ITS Coordinator, KDOT; Ben McKeever, Engineer, TranSystems; Michael DeMent, Vice President/principal, Jane Mobley Associates; Scott Russell, Account Executive, Jane Mobley Associates.

Issues/Concerns/Questions – The following issues or concerns were presented during the question and answer portion of the presentation.

- Some participants were concerned about the reliability of the RWIS technology. There have been problems in this district with existing technology and some were skeptical that RWIS applications described would be effectively implemented. Maintenance personnel also pointed out that RWIS was just one of many tools used for planning winter maintenance activities.
- A concern was expressed that ITS implementation would mean adding additional technical support staff and would result in "chasing technology."
- The AVL applications prompted significant discussion. Concerns were expressed that AVL and GPS systems would be greeted with some resistance from front-line personnel who might view it as a supervisory tool. Participants suggested that maintenance drivers might view the technology as a means for supervisors to monitor their movements and that this perception might undermine morale. Supervisors at the seminar suggested that while this might be a problem, the emphasis should be placed on the

additional safety and efficiency provided by such a system. One participant suggested that "improved efficiency and delivery of services helps people get over hurt feelings."

- Questions were raised as to when weather and traffic information would be available on the Internet. Participants emphasized that the information would be valuable only if it was available in a timely and user-friendly fashion.
- A representative from Kansas Farm Bureau expressed a need for portable variable message signs to help control traffic during high traffic or low visibility periods such as harvest time and burning seasons.

District #5 ITS Awareness Seminar – Hutchinson – March 23, 1999

Overview - The District #5 seminar took place at the KDOT District #5 headquarters in Hutchinson on March 23, 1999. In addition to KDOT district personnel, 39 individuals were invited to attend the seminar. 16 non-KDOT personnel attended. Total attendance at the seminar was 34.

Project personnel in attendance - Matt Volz, ITS Coordinator, KDOT; Chris Beightel, Assistant ITS Coordinator, KDOT; Erin Flanigan, Project Manager, TranSystems; Ben McKeever, Engineer, TranSystems; Michael DeMent, Vice president/principal, Jane Mobley Associates.

Issues/Concerns/Questions – The following issues or concerns were presented during the question and answer portion of the presentation.

- There was general agreement that ITS applications would be accepted and utilized if they were properly promoted and people were adequately educated on the value of utilizing the systems capabilities.
- Some participants indicated that a case would have to be made that the cost of ITS technology would be worth the investment. Cost was offered as a major issue when participants were asked if they would utilize ITS technologies such as AVL and Mayday in their work or personal vehicles. One participant implied that legislation might be necessary (as in the case of seat belts and air bags) in order for Mayday systems to be more affordable and widely used.
- When asked to prioritize potential ITS benefits, participants placed high priority on accessible RWIS data and the value of eliminating paperwork through ITS applications such as pre-clearance and fleet maintenance applications. Participants also stated that safety benefit was a strong selling point of AVL applications.
- Some of the participants stressed the need for greater RWIS coverage, especially in Butler County, Harvey County and Reno County.
- Some of the participants were curious as to which of the traveler and weather data would be available to the public. It was explained that the raw RWIS

data would not be made available to the public but basic traveler information would be made available via kiosks and the Road Condition Reporting System.

- Some of the participants expressed concern that traveler information (e.g. construction projects) needs to be updated in real time if it is to be effective. The 800 KDOT hotline was criticized for not being updated frequently enough.
- A question was raised about how the Mayday System works in non-emergency situations. It was explained that most of these systems are able to distinguish between emergency and non-emergency situations (using data from vehicle sensors) and react accordingly.
- One participant suggested selling the idea of ITS as an alternative to building new roads but he also noted that people will need to see ITS in action in order to be sold on it.

District #6 ITS Awareness Seminar – Garden City – April 1, 1999

Overview - The District #6 seminar took place at the KDOT District #6 headquarters in Garden City on April 1, 1999. In addition to KDOT district personnel, 37 individuals were invited to attend the seminar. Total attendance at the seminar was 37.

Project personnel in attendance - Matt Volz, ITS Coordinator, KDOT; Chris Beightel, Assistant ITS Coordinator, KDOT; Erin Flanigan, Project Manager, TranSystems; Michael DeMent, Vice President/principal, Jane Mobley Associates; Bruce Baldwin, ITS/safety Engineer, FHWA; Dr. Eric Meyer, Associate Professor of Engineering, University of Kansas.

Issues/Concerns/Questions – The following issues or concerns were presented during the question and answer portion of the presentation.

- Participants indicated interest in being able to tap into and share real-time weather information to manage traveler safety issues during severe winter weather. Participants indicated that while sensors where helpful, they were not 100% reliable. Past glitches with RWIS was cited. Thus, access to information provided by weather stations was of interest to participants.
- There was some concern expressed regarding the reliability of the technology.
- Safety and reduced paperwork were strong selling points for AVL, CVO and fleet maintenance applications.
- Participants stressed the importance of inter-agency communication and capability in any system. KHP, EMS, city fire and police as well as KDOT must be able to communicate effectively if system is to achieve safety and efficiency goals.

1.2.2 Written Feedback from Seminar Participants

This section presents a summary of the responses to the questionnaires that were handed out at each seminar. A copy of the questionnaire is included in Appendix E. It should be noted that the purpose of the questionnaire was to enhance discussion and not to acquire statistically valid survey results.

The questionnaire was divided into two parts. The first part had general questions about rural transportation that could be answered by all of the participants. The second part contained more specific questions about rural transportation issues that targeted certain groups. The following write-ups attempt to summarize the written feedback received at each seminar. For each seminar, the responses to the general questions were synthesized and summarized in a qualitative manner. Next, for the tailored questions, specific quotes were taken from the returned questionnaires in order to provide an objective summary of the feedback.

KDOT District 1 – Topeka, KS
March 30, 1999
Number of Attendees: 54
Number of Questionnaires Returned: 40

Responses to General Questions:

When asked about their biggest safety concern when traveling in rural areas, the concern that was cited the most was lack of communication or isolation during emergency situations. Other safety concerns that were commonly mentioned (in order of frequency) included deficiencies in road design such as inadequate shoulders, dangerous intersections, poor sight distance and poor signage, deer, other drivers, road/weather conditions, traveler safety/security at rest stops, work zones and farm equipment. Some specific rural intersections experiencing safety problems were mentioned. These included

- K-96 @ 151st in Sedgwick County,
- US-75 @ K-47,
- US-77 @ US-50, and
- US-50 @ US-281.

When asked about how they prepare for winter travel, the majority of the respondents said that they check the weather forecast, make sure their car is serviced and bring plenty of food, water and warm clothes in case they get stranded. Most of the respondents refer to the weather channel or TV/radio reports for weather information. Other sources of road/weather information that were listed by the respondents included the Internet, KDOT hotline, KHP, RWIS via KDOT Intranet or DTN for weather information.

When asked about commercial vehicles, the majority of the respondents did not feel that there were too many trucks on the road. Also, the majority of the respondents said that truck traffic did not influence their choice of routes or when they chose to travel.

When asked about accident notification, over half of the respondents had heard of Mayday systems or Cadillac's On-Star before the seminar. Also, over half of the respondents said they would use their cell phone if they were in an accident in a rural area. For those who didn't have cell phones, walking to a nearby house or flagging down motorists were the most common answers to the question.

When asked about railroad crossings, the majority of the respondents did not feel that railroad crossings disrupted their travel but most admitted that they have seen motorists violate crossing gates and warnings and the majority were concerned about unguarded crossings in their area. One respondent singled out two crossings on K-99 north of US-36 as problem spots.

When asked about rural transit, most of the respondents stated that they rely on friends or family for rides when they don't have access to a vehicle. However, compared to the other districts, a high number of respondents (almost half) said that they would take a taxi or public transportation. A few respondents said that they would walk. Almost half of the respondents suggested expanding rural transit service in some manner. Some of the ideas mentioned were: meet same day requests, county bus service for the disadvantaged, vanpooling, commuter trains, county tax funded shuttle service, and having a semi-volunteer or semi-public group provide transit service.

Responses to Tailored Questions:

Winter Maintenance

How are winter maintenance activities scheduled?

"Snow removal on high traffic paved roads first and then all paved roads."

"From weather reports and radar."

"Based on weather forecasts from local TV, the Internet, the Weather Channel and any other weather information we can get."

"Using RWIS data, weather data and forecasts."

Is pre-treating pavements part of rural activities?

"We are establishing this throughout the district over the next several years."

"Becoming more common as KDOT moves toward preventative maintenance."

"Not now but will be in the future."

"To some extent if equipment is available."

"On bridges primarily."

Is overtime a concern in scheduling winter maintenance activities?

"It becomes a major concern if a multi-day storm develops. Construction forces are used to supplement the regular maintenance forces within KDOT. Overtime pay is budgeted."

"Yes, not so much because of the cost but getting the people to work the extra hours."

"Not a major concern."

"Yes in regards to public communication in rural offices after 5PM and no in regards to personnel to keep roads open."

KHP Winter Storm Procedures

What is the main source of KHP Weather forecasting needs? What other types of information would you like access to?

"We would like to know where ice or snow is and whether the pavement is dry, wet or icy."

CVO

No meaningful responses were given.

Fleet Operations and Maintenance

What are your concerns about AVL? Would drivers being accepting of this technology?

"Concern is cost and whether or not savings would outweigh costs."

"Drivers would initially resist it because of the work monitoring aspect."

"If explained and used appropriately it would be useful and probably accepted by most employees."

"At first they would be concerned but eventually I think they would see the benefits and accept it."

"What is the cost and where is that funding coming from?"

"Dependent on proper functioning of equipment and expense to keep technology functioning."

"The potential is there to be useful once an extended training period is incorporated."

KDOT District 2 – Salina, KS
March 29, 1999
Number of Attendees: 16
Number of Questionnaires Returned: 12

Responses to General Questions:

When asked about their biggest safety concern when traveling in rural areas, the concern that was cited the most was sight distance on two-lane roads when passing other vehicles. Other safety concerns that were commonly mentioned (in order of frequency) included lack of communication or isolation during emergency situations, deer, other drivers on the road, road/weather conditions, and railroad crossings.

When asked about how they prepare for winter travel, the majority of the respondents said that they check the weather forecast, make sure their car is serviced and bring plenty of food, water and warm clothes in case they get stranded. Most of the respondents refer to the weather channel or TV/radio reports for weather information. Other sources of road/weather information that were listed by the respondents included the Internet, KDOT hotline, KHP, RWIS via KDOT Intranet or DTN for weather information.

When asked about commercial vehicles, the majority of the respondents did not feel that there were too many trucks on the road although two respondents suggested that railroads were better suited than trucks for shipping freight. Also, the majority of the respondents said that truck traffic did not influence their choice of routes or when they chose to travel.

When asked about accident notification, over half of the respondents had heard of Mayday systems or Cadillac's On-Star before the seminar. Also, over half of the respondents said they would use their cell phone if they were in an accident in a rural area. For those who didn't have cell phones, walking to a nearby house or flagging down motorists were the most common answers to the question.

When asked about railroad crossings, the majority of the respondents did not feel that railroad crossings disrupted their travel but most admitted that they have seen motorists violate crossing gates and warnings and the majority were concerned about unguarded crossings in their area. One respondent singled out the crossing on Ohio Street in Salina as a problem spot.

When asked about rural transit, most of the respondents stated that they rely on friends or family for rides when they don't have access to a vehicle. Some respondents said that they would take a taxi or walk. One respondent suggested having more transit buses that are dispatched from a central location.

Responses to Tailored Questions:

Winter Maintenance
How are winter maintenance activities scheduled?

"We schedule according to the worst forecast since we cannot count on any forecast to be accurate."

"Watching weather forecasts on DTN and making observations of actual conditions."

"Weather forecasts and past experience."

Is pre-treating pavements part of rural activities?

"Yes, on I-70, I-135 US-50 and US-81."

"Sometimes, but if we had more accurate weather data, we could do a more cost effective job and keep traffic flowing."

Is overtime a concern in scheduling winter maintenance activities?

"Yes, we try to work it out is much as possible."

"We split shifts to minimize overtime"

"Yes, when you are on a budget it tends to influence your decision."

KHP Winter Storm Procedures

No KHP were present at the seminar.

CVO
No meaningful responses were given.

Fleet Operations and Maintenance

What are your concerns about AVL? Would drivers being accepting of this technology?

"No concerns."

"Operators will have concerns about big brother watching."

KDOT District 3 – Norton, KS
March 24, 1999
Number of Attendees: 26
Number of Questionnaires Returned: 15

Responses to General Questions:

When asked about their biggest safety concern when traveling in rural areas, the concern that was cited the most was the presence of deer and wildlife on the highways. Other safety concerns that were commonly mentioned (in order of frequency) included other drivers on the road, road/weather conditions, lack of communication or isolation during emergency situations, and lack of adequate shoulders.

When asked about how they prepare for winter travel, the majority of the respondents said that they check the weather forecast, make sure their car is serviced and bring plenty of food, water and warm clothes in case they get stranded. Most of the respondents refer to the weather channel or TV/radio reports for weather information. Other sources of road/weather information that were listed by the respondents included the Internet, KDOT hotline, Sheriff's Office, KHP, RWIS via KDOT Intranet or DTN for weather information.

When asked about commercial vehicles, the majority of the respondents did not feel that there were too many trucks on the road. Also, the majority of the respondents said that truck traffic did not influence their choice of routes or when they chose to travel.

When asked about accident notification, over half of the respondents had heard of Mayday systems or Cadillac's On-Star before the seminar. Also, over half of the respondents said they would use their cell phone if they were in an accident in a rural area. For those who didn't have cell phones, using their two-way radio, walking to a nearby house or flagging down motorists were the most common answers to the question.

When asked about railroad crossings, the majority of the respondents did not feel that railroad crossings disrupted their travel but most admitted that they have seen motorists violate crossing gates and warnings and the majority were concerned about unguarded crossings in their area.

When asked about rural transit, most of the respondents stated that they rely on friends or family for rides when they don't have access to a vehicle. Some respondents said that they would take public transportation, call for vanpool service or not make the trip at all. Nearly half of the respondents suggested expanding rural public transportation service.

Responses to Tailored Questions:

Winter Maintenance

How are winter maintenance activities scheduled?

"Use RWIS and all other available weather information. Also use KHP for input."

"Monitor DTN and NWS forecasts; some additional forecasting would be helpful."

"Get all of the snow plows ready and when the snow and wind stops, we clear the roads."

"Our crews seldom go out on snow removal until the storm is over." (County)

Is pre-treating pavements part of rural activities?

"Only on I-70 at present but it will probably be expanded in future."

"No, not in the City of Colby but KDOT used it last storm and it appeared to work well."

"Some minimal liquid application is used."

Is overtime a concern in scheduling winter maintenance activities?

"Safety is the first concern. During major storms, we run three 8-hour shifts to minimize overtime."

"It is usually allowed for."

"It is a concern but it does not limit the level of activities undertaken when necessary."

KHP Winter Storm Procedures

How are winter storms handled? What improvements do you foresee?

"Communication between DOT efforts and KHP are important. We would like to see more public awareness of road conditions, traffic, accidents, etc."

"Since we are a law enforcement agency, we are reactive. We foresee a continued open communication with KDOT."

"Communication is a necessity – between KHP, KDOT, Sheriff's Office, and school districts."

What is the main source of KHP Weather forecasting needs? What other types of information would you like access to?

"I access my information through KHP dispatch. I would like to be able to access information in my office through my PC."

"The main source of information is the area DOT personnel and troopers. We would like to have more advance notice of storms and quicker road closures."

"Teletype in dispatch office. DTN availability has been beneficial."

CVO

What are your concerns about the ITS/CVO services?

"Should be required."

"Concerns relating to transportation of hazardous materials."

Fleet Operations and Maintenance

What are your concerns about AVL? Would drivers being accepting of this technology?

"Concerns are accuracy and cost of investment, operations, and installation. There would be some reluctance from drivers."

"I don't think the drivers would like having their activities monitored in the beginning."

"Biggest concern is loss of trust in employees."

"The employees would have a hard time being watched and distrusted."

"They would be accepting if the purpose was explained."

"Operators would think we are checking up on them and loosing trust."

KDOT District 4 – Chanute, KS
March 12, 1999
Number of Attendees: 37
Number of Questionnaires Returned: 21

Responses to General Questions:

When asked about their biggest safety concern when traveling in rural areas, the concern that was cited the most frequently was lack of communication or isolation during emergency situations. Other safety concerns that were commonly mentioned (in order of frequency) included deer, other drivers on the road, road/weather conditions, lack of adequate shoulders, and blind intersections.

When asked about how they prepare for winter travel, the majority of the respondents said that they make sure their car is serviced and bring plenty of food, water and warm clothes in case they get stranded. Most of the respondents refer to the weather channel or TV/radio reports for weather information. Other sources of road/weather information that were listed by the respondents included the Internet, KDOT road conditions hotline, RWIS via the KDOT Intranet or DTN terminals.

When asked about commercial vehicles, the majority of the respondents did not feel that there were too many trucks on the road, however some respondents felt there were a number of unsafe truck drivers on the road. The majority of the respondents said that truck traffic did not influence their choice of routes or when they travel.

When asked about accident notification, over half of the respondents had heard of Mayday systems or Cadillac's On-Star before the seminar. Also, over half of the respondents said they would use their cell phone if they were in an accident in a rural area. For those who didn't have cell phones, walking to a nearby house or flagging down motorists were the most common answers to the question.

When asked about railroad crossings, the majority of the respondents did not feel that railroad crossings disrupted their travel but most admitted that they have seen motorists violate crossing gates and warnings and most were concerned about unguarded crossings in their area. According to one respondent, "it seems to be common practice down here to go around the gates while a train is connecting or disconnecting." Also, the 14th Street railroad crossing in Chanute was singled out as a problem spot.

When asked about rural transit, most of the respondents stated that they rely on friends or family for rides when they don't have access to a vehicle. Some respondents said that they would walk or call for a taxi.

Responses to Tailored Questions:

Winter Maintenance

How are winter maintenance activities scheduled?

"I monitor our RWIS, SSI Weather Service, and the Internet."

"We check RWIS site forecasts, DTN and TV weather stations."

"RWIS is used as one tool in combination with local radio and TV information to help determine call out of crews."

Is pre-treating pavements part of rural activities?

"Yes, but it is limited to higher volume routes and bridges."

"Yes, in my area we pre-treat pavements in advance."

Is overtime a concern in scheduling winter maintenance activities?

"No, only as far as availability of personnel, not for monetary reasons."

"Not a concern, but it is considered in some instances."

KHP Winter Storm Procedures

How are winter storms handled? What improvements do you foresee?

"Troopers patrol highways and report road conditions to their dispatcher, who in turn relays that information to KDOT to let them know of areas that need treatment."

"RWIS will provide quicker road conditions information to KHP."

What is the main source of KHP Weather forecasting needs?

"NWS, Weather Channel, KDOT road condition reports."

CVO

No meaningful responses were given.

Fleet Operations and Maintenance

What are your concerns about AVL? Would drivers being accepting of this technology?

"AVL costs are a concern."

"Operators will see this as looking over their shoulder"

"Value of system lies with being able to have real time information regarding location of fleet during emergency situations and as a safety factor for disabled vehicles"

"Education should help the negative perception."

KDOT District 5 – Hutchinson, KS
March 23, 1999
Number of Attendees: 34
Number of Questionnaires Returned: 24

Responses to General Questions:

When asked about their biggest safety concern when traveling in rural areas, the concern that was cited the most was lack of communication or isolation during emergency situations. Other safety concerns that were commonly mentioned (in order of frequency) included other drivers on the road, road/weather conditions, deer, lack of adequate shoulders and signing, and falling asleep at the wheel.

When asked about how they prepare for winter travel, the majority of the respondents said that they check the weather forecast, make sure their car is serviced and bring plenty of food, water and warm clothes in case they get stranded. Most of the respondents refer to the weather channel or TV/radio reports for weather information. Other sources of road/weather information that were listed by the respondents included the Internet, KHP, RWIS via KDOT Intranet or DTN for weather information.

When asked about commercial vehicles, about half of the respondents felt that there were too many trucks on the road. However, the majority of the respondents said that truck traffic did not influence their choice of routes or when they chose to travel.

When asked about accident notification, over half of the respondents had heard of Mayday systems or Cadillac's On-Star before the seminar. Also, over half of the respondents said they would use their cell phone if they were in an accident in a rural area. For those who didn't have cell phones, walking to a nearby house or flagging down motorists were the most common answers to the question.

When asked about railroad crossings, the majority of the respondents did not feel that railroad crossings disrupted their travel but most admitted that they have seen motorists violate crossing gates and warnings and most were concerned about unguarded crossings in their area.

When asked about rural transit, most of the respondents stated that they rely on friends or family for rides when they don't have access to a vehicle. Some respondents said that they would take public transportation or call for a taxi. One respondent suggested having a bus program for elderly persons.

Responses to Tailored Questions:

Winter Maintenance

How are winter maintenance activities scheduled?

"Using forecasts, DTN, and RWIS."

"Based on past experience, shape of the equipment, number of employees, and which way the storm is coming in."

"Split crews (day/night shift) when inclement weather is forecast."

Is pre-treating pavements part of rural activities?

"It has become part of maintenance this past year in some parts of our county."

"Not in Sedgwick County."

"Not yet, salt brine capabilities are to be in place for next winter."

Is overtime a concern in scheduling winter maintenance activities?

"It can be if it is late in the fiscal year but we will always put in the time required."

"Not too much. We don't use more than is needed."

KHP Winter Storm Procedures

No KHP were present.

CVO

What are your concerns about the ITS/CVO services?

"Too expensive."

Fleet Operations and Maintenance

What are your concerns about AVL? Would drivers being accepting of this technology?

"AVL costs are a concern."

"I think it is a great idea."

"No concerns; good idea for optimizing maintenance efficiency and having quick response to certain maintenance vehicle situations."

"Drivers would resent big brother watching their every move."

KDOT District 6 – Garden City, KS
April 1, 1999
Number of Attendees: 37
Number of Questionnaires Returned: 20

Responses to General Questions:

When asked about their biggest safety concern when traveling in rural areas, the concern that was cited the most was lack of communication or isolation during emergency situations. Other safety concerns that were commonly mentioned (in order of frequency) included deer, other drivers, truck traffic, road/weather conditions, work zones, farm equipment and inadequate shoulders.

When asked about how they prepare for winter travel, the majority of the respondents said that they check the weather forecast, make sure their car is serviced and bring plenty of food, water and warm clothes in case they get stranded. Most of the respondents refer to the weather channel or TV/radio reports for weather information. Other sources of road/weather information that were listed by the respondents included the Internet, KDOT hotline, KHP, RWIS via KDOT Intranet or DTN for weather information.

When asked about commercial vehicles, the majority of the respondents did not feel that there were too many trucks on the road. Also, the majority of the respondents said that truck traffic did not influence their choice of routes or when they chose to travel.

When asked about accident notification, over half of the respondents had heard of Mayday systems or Cadillac's On-Star before the seminar. Also, over half of the respondents said they would use their cell phone if they were in an accident in a rural

area. For those who didn't have cell phones, walking to a nearby house or flagging down motorists were the most common answers to the question.

When asked about railroad crossings, the majority of the respondents did not feel that railroad crossings disrupted their travel but most admitted that they have seen motorists violate crossing gates and warnings and the majority were concerned about unguarded crossings in their area. One respondent suggested having four quadrant gates at all crossings.

When asked about rural transit, most of the respondents stated that they rely on friends or family for rides when they don't have access to a vehicle. Other common responses given were taking a taxi or public transportation, walking, riding a bicycle and one respondent even said they would ride a horse.

Responses to Tailored Questions:

Winter Maintenance

How are winter maintenance activities scheduled?

"Using available systems and good sense."

"By checking roads on a regular basis and monitoring RWIS."

Is pre-treating pavements part of rural activities?

"KDOT is starting this in some areas. Timing and conditions have to be just right."

"If forecast will allow."

Is overtime a concern in scheduling winter maintenance activities?

"No, except to limit maximum hours for one employee at any one time for safety purposes."

"Yes, but so far the public seems unconcerned about costs just as long as the roads are open. KDOT people like the overtime up to about 3 straight days."

KHP Winter Storm Procedures

How are winter storms handled? What improvements do you foresee?

"Patrol roads, wait for phone calls."

"Better or more direct communications with KDOT personnel in the field. We could pass on problems to each other quicker and increase efficiency."

"Roads need to be closed quickly when the conditions are severe enough."

"Improvements foreseen are 4-wheel drive vehicles and improved communication between KHP and KDOT."

What is the main source of KHP Weather forecasting needs? What other types of information would you like access to?

"Main information sources are National Weather Service and teletypes."

"DTN and road troopers."

CVO

No meaningful responses were given.

Fleet Operations and Maintenance

What are your concerns about AVL? Would drivers being accepting of this technology?

"If we can show drivers how the system will aid them and provide better service to the customer, they will come around."

"Big brother concern. I personally would not want to see where my employees are at all times. It would be nice to know who was the closest to a problem or accident if they needed to respond."

"How reliable will the equipment be? Will be less concerned if a pilot program is successful."

1.3 Interviews with KDOT Personnel

The following section presents the results of a series of interviews held with key personnel from the following KDOT bureaus: design, traffic, planning, construction and maintenance, program management, computer services and the KDOT Metro Engineer in Wichita. The purpose of the interviews was threefold. The first objective was to learn what each KDOT bureau does and where they see ITS fitting into the way they do business. The second objective was to find out their level of understanding about ITS and their staff's level of understanding. The final objective was to learn what ITS projects each bureau currently has and what potential projects exist for each bureau in the short, medium, and long term. Summaries of the interviews follow:

Bureau of Design – State Road Office

Interview with Rex Fleming

The current ITS initiative of interest to the KDOT Design Bureau is the Kansas City Scout project. For this project, there are a number of ITS field elements that need to be considered in the design process such as loop detectors, VMS mounting requirements and video cameras. Currently, there are no KDOT standards for these ITS elements but these standards may be developed as part of the Scout project.

Within KDOT, most projects begin with a contract vehicle known as an 883, which defines the preliminary scope of the project. The 883 is initiated by the Bureau of Program Management and rarely contains detailed information on the scope of the project. The 883 is then sent from Program Management to the Design Bureau for the discovery phase of the project. In the discovery phase the design squad defines the scope of the project. After the discovery phase, the 883 goes to the Program Review Committee for final approval. Currently the 883 form does not explicitly mention ITS, therefore the only way that ITS elements could be included in the scope of a project would be if the need for ITS is identified in the scope of the project. This does not happen most likely due to the lack of mainstreaming ITS throughout KDOT and the lack of procedures for handling ITS in the discovery phase of a project.

One possible avenue to use in the 883 process would be to treat certain ITS applications the same way as signing, lighting or pavement marking on the 883. This would require having set criteria for considering certain ITS elements in a project resulting in having ITS written into the scope when the criteria is met. The Design Bureau feels that this would have to be done by Program Management. The Design Bureau is typically more concerned with completing plan sets rather than adding extra design elements in every project.

One obstacle to mainstreaming ITS into the way the Design Bureau does business will be a resistance to change. The Design Bureau has been designing projects the same way for many years and since ITS is relatively new, many of those working in the Design Bureau may not be totally sold on ITS. It is important that they are made aware of the benefits of ITS in order for ITS to become accepted into the design process.

Interview with James Brewer

There are very limited resources within KDOT for ITS projects. The only way for ITS elements to become effective is if they are integrated into the KDOT “design process”. One of the major barriers to this happening is the lack of ITS understanding within the Design Bureau. Currently, Rex Fleming is the only member of the Design Bureau with experience working on ITS projects. In order for ITS to be mainstreamed into the design

process, more resources need to made available for performing ITS work and the design squads should be educated about various ITS elements and their benefits.

Another concern is how the Midwest drivers will react to ITS. Success of ITS in other U.S. cities does not necessarily mean acceptance/success in Kansas. Also, there is a common misunderstanding within KDOT that ITS is strictly for urban areas where there is traffic congestion. Thus, KDOT needs to be made aware of the many ITS applications for rural areas. A major selling point of rural ITS applications is their safety benefits. The Design Bureau feels that rural ITS implementation should be focused on the major corridors to better justify their cost.

The most likely way that ITS will get mainstreamed into the KDOT design process will be from positive experiences. ITS applications that are successful and applied repeatedly will be the ones that are most likely to be standardized. In order for these applications to be implemented though they must be perceived by both KDOT and the public to be beneficial and worth their cost. Standard drawings will be adopted after an ITS element has been successfully completed two or three times. It is hoped that after a few years of experience working with ITS, designers will look at ITS as another tool in their chest.

It is not likely there would be a single design squad devoted to ITS applications. This is impractical since the KDOT Design Bureau is already struggling to keep up with their current workload. Therefore, the best alternative may be to educate the entire bureau on ITS technologies and benefits and let the standards fall-out of the successful ITS projects. The Design Bureau expressed interest in attending a two-hour ITS Awareness Seminar as part of the Statewide Planning process.

Bureau of Construction & Maintenance

Interview with Jaci Vogel

The main ITS initiative taking place in the Construction & Maintenance Bureau is the use of road weather information systems (RWIS) for winter maintenance activities. KDOT has been using these systems for eight years and currently have 41 RWIS sites established. Data from each of these sites is shared within KDOT via the KDOT Intranet. The system has recently been upgraded from collecting data every hour to collecting data every 15 minutes. Also, many of the area supervisors and superintendents have been provided with laptops and modems so that they can access this data remotely. The Construction and Maintenance Bureau would like to eventually expand their RWIS coverage after the maintenance supervisors have become adept at using the RWIS system to its full potential.

RWIS data has not yet been made available to the public either by means of VMS or the Internet due to liability concerns. However, there is a separate initiative within Construction and Maintenance called the Road Condition Reporting System (RCRS) that may eventually provide travel information to the public. Data is collected from actual

observations in the field and is shared internally. Phase 1 of this initiative, which encompasses pavement conditions, has been completed. Phase 2 will provide information on detours and road closures. There are also plans to have a RCRS alert bulletin available to the public via the Internet at some future time.

Other ITS applications that are of interest to the Construction & Maintenance Bureau include an automated crack sealer, thermal mapping, ITS for maintenance work zones, and route optimization for fleet vehicles using GIS. The Bureau is considering the use of AVL in their vehicles but are concerned about the benefits versus the cost of these systems. The Bureau expressed the need to automate their RCRS data collection process. Finally, the Construction & Maintenance Bureau expressed a desire to have some specific ITS projects funded as special demonstration projects. One project in particular that was mentioned was an automated anti-icing system for a bridge in Garden City. Jaci wondered if certain funding sources were available within KDOT for ITS elements in projects where budgets are tight, but the application appears to merit consideration.

Bureau of Program Management

Interview with Rosie Ingram

There are currently three strategies for ITS projects to be funded by KDOT. The first is to have set aside funds to be used specifically for ITS related projects. A request for these set aside funds must be sent to the Program Review Committee for approval. The second way is to request funds for ITS projects on an ad-hoc basis as projects become identified. The difficulty with this method is that the Program Review Committee must approve each project and these projects may be less likely to receive funding if the KDOT budget becomes tight. The final strategy would be to mainstream ITS into the design process. This would require identifying needs for ITS early in the project and including ITS applications in the scope of services. This strategy has been successful in the case of corridor management.

The Bureau of Program Management is responsible for initiating the 883 forms, which are required for every construction project. Program Management is not responsible for the project details however, thus the scope in the 883 is usually in a very general form. The Bureau of Program Management also views the 883 project scope as subject to change as project details are developed and design requirements identified, including the need for ITS elements. Unfortunately, this is unlikely to happen unless the 883 explicitly mentions ITS in the scope. If some criteria were established for considering ITS, then Program Management could write a line in the scope of the 883 suggesting that ITS be considered for that project. Also, educating and training the Design Bureau on ITS would help mainstream ITS into the way they do business.

Bureau of Traffic Engineering - Commercial Vehicle Operations

Interview with Ken Gudenkauf

KDOT has been involved in ITS for Commercial Vehicle Operations (CVO) for about five years. In 1994 a CVO Executive Working Group for Kansas was formed as part of a state initiative. This group had representatives from five major stakeholders: KDOT, Kansas Highway Patrol (KHP), Kansas Corporation Commission (KCC), the Department of Revenue and the Kansas Motor Carriers Association (KMCA). The purpose of this group was to meet quarterly and explore opportunities for better coordination of commercial vehicle operations.

In 1996, Cambridge Systematics performed an Institutional Barriers Analysis for the states of Kansas and Missouri to determine the obstacles for having a common ITS/CVO platform between the two states. Later that year, federal funding was used to develop a regional CVO Plan for the regional trucking issues for Kansas, Missouri, Nebraska and South Dakota. Also, a CVO Business Plan for Kansas was developed in 1997 and later revised in 1998. The CVO Business Plans were developed by the Center for Transportation Research and Education (CTRE) at Iowa State University.

There are currently over 30 Weigh in Motion (WIM) sites throughout Kansas that were deployed through the Strategic Highway Research Program (SHRP). These sights are being used as a planning tool to collect CVO data but they are not being used for CVO enforcement. There are also plans to install a WIM system on I-70 in Wabunsee County in the summer of 1999 as an addition to an existing construction project. The WIM site will be designed the same way that the SHRP sites were designed. The purpose of this site is to study the increase in overweight truck traffic when preexisting weigh station is closed. The site will be monitored by the KHP and will act as a precursor for WIMS installed for enforcement purposes.

The ITS/CVO user service that is most desired by Kansas motor carriers is electronic credentialing. This service involves the conversion of paperwork transactions for things like driver's license, insurance, registration and permits into electronic transactions. The Department of Revenue is responsible for collecting taxes and registration fees and the KCC (in cooperation with KHP) is responsible for insurance and safety compliance.

It is less likely that electronic screening initiatives such as PrePass will be adopted in Kansas in the near future. The current PrePass program requires motor carriers to pay a fee to bypass inspection stations and this idea is not popular within KDOT. Also, there are potential telecommunications issues with PrePass since it may not be compatible with KTAG transponder.

Future CVO/ITS initiatives have been outlined in the Kansas CVO Business Plan. The near term initiatives identified in the plan include automating the reporting process for

the Motor Carrier Safety Assistance Program (MCSAP) inspectors by installing PCs at each inspection station and joining the International Registration Plan (IRP) Clearinghouse which will reduce paperwork and make fee collection more efficient. These initiatives will be incorporated into the ITS Statewide Plan. The CVO initiatives need to be tied into the Wichita and Kansas City ITS projects. The next revision of the CVO Business Plan is currently on hold pending the completion of the ITS Statewide Plan.

Bureau of Computer Services

Interview with Patrick Tierce

Telecommunications are going to be a major issue with ITS in the State of Kansas. Currently, nobody other than the Telecommunications Steering Committee is looking at the telecommunications infrastructure as a whole for KDOT. By 2001, there will be three statewide communications networks in Kansas including a fiber optic backbone, the existing Wide Area Network and an 800 MHZ radio system being implemented by the Bureau of Construction and Maintenance. There is a need for these KDOT systems to tie together. There is also a need for a long-term telecommunications master plan.

Some of the challenges facing KDOT in the area of telecommunications include interoperability, data gathering, and network security. Other possible challenges arise from the fact that a lot of the state isn't near the fiber optic backbone, KDOT will need to address how remote sites will be connected to the telecommunication backbone.

Finally, with regard to funding of ITS projects, the Bureau of Computer Services acts primarily in an advisory role on all ITS projects. ITS projects would not be funded through Computer Services.

Interview with Cindy Wade

There are three main studies Cindy is concerned with:

- ITA Study
- RWM (Records and Workflow Management)
- KTRAN

The ITA Core Team meets every other week and has five KDOT staff and five consultant types on the committee.

The ITA Working Group has 70 people on it and it mainly serves to pump information to the folks that attend. Up to this point this group has met twice, the next meeting will be in late August.

The ITA Study timeline is due to complete in September. The ITA Study will be on the KDOT web site under "what's new".

IT Services is concerned with ITS activities that they would term "major efforts". A major effort is a project that:

- Is 4 to 6 months long
- Is over $1/2 million

Cindy suggests that Kansas Statewide ITS Plan merge with the ITA Study by having a checklist. If an ITS project is a "major project" as defined above, then the IT group is notified and confirmation is sent out that the project has entered into their program.

Examples of items on the checklist:

- When an ITS project is defined with costs over half a million dollars, contact ITA to include in their ITS Study.
- When an ITS project involving IT systems is defined, contact ITA for update in the ITS Study.

Office of Chief Council

Interview with Mike Rees and Leslie Spencer Fowler

The interview with the Chief Council's office was part of a larger meeting where representatives from KDOT and other state agencies discussed potential uses of the fiber backbone. KDOT Chief Councils Office worked extensively in negotiating the fiber agreement and feels the fiber could be used to facilitate communications or transmit data between many state agencies. Interested agencies include the Courts and Board of Corrections. The Bureau of Computer Services is interested in all data transmission on the fiber as it would relate to the use of computer services within KDOT.

Much of the discussion centered on the management or ownership of the fiber. It was viewed that KDOT would have the lead role for the use of fiber due to the large need for transmitting data in the application of ITS technology on the state's system of roadways. The amount of excess capacity on the fiber that will be available for other uses has yet to be determined. The interface with DISC (Division of Information Systems and Communications) was discussed. Discussion also involved the value of the fiber to KDOT, all its potential uses and other Kansas interests.

KDOT Metro Engineer, Wichita

Interview with Benny Tarverdi

The city of Wichita has recently completed an Early Deployment Study identifying areas where ITS could be applied in the city. It was identified that the major challenge to address is that of incident management. One area where Mr. Tarverdi sees a potential

for ITS applications is ramp metering on the Washington @ I-135 interchange. This is a high accident location due to a weave area and large platoons entering I-135. He feels that ramp metering at this location would break up the platoons enabling weaves to occur safely.

A priority for an ITS program in Wichita is to sell ITS to the city, specifically the Wichita City Council and County Commissioners. The authors of the Early Deployment Study must prove the benefits of ITS in layman's terms in order for there to be an acceptance of spending money on ITS for the city.

A top priority for the city should be "funding". It is necessary for the city to fund a portion of the ITS System (10-20%). In order to do this the city political forces must be on board. KDOT supports having an ITS program in Wichita, but the city wants to see cost benefits and guarantees that their investment in ITS will pay off. Mr. Tarverdi has concerns on continued growth, expansion and maintenance of an ITS system in Wichita after the initial implementation.

He feels that the KDOT Traffic Department at Headquarters needs to support and promote ITS and he also feels that ITS needs to be sold to the public. His fear is that KDOT will implement an ITS system and then the public won't use it (in the case of HAR).

KDOT Metro Engineer, Kansas City

Interview with Mick Halter

The Metro Engineer's Office would like to see ITS elements and applications mainstreamed into the design process. The Metro Office is not always involved in the early stages of project design, and if ITS elements are added late in design or after the project is let to contract those additions usually end up being costly. Therefore, Mick would like to see ITS elements considered early in the design process, possibly during the discovery phase. Mick is sometimes involved in the discovery phase of design projects and believes that, at a minimum, a cursory review of the need or application of ITS be looked at for in every urban KDOT design project.

Getting ITS into the design process via:

- 883
- discovery phase
- criteria/ checklist

The Kansas City area is in the design stages of a very large scale ITS Freeway Management System called the Kansas City Scout. It will be important to have measures of effectiveness to document critical cost/ benefits of the ITS implementation in Kansas City. Mick views the main benefits of the ITS system in Kansas City as time savings for travelers, responding to and clearing incidents faster, and providing the traveler with a

greater level of accurate travel information. Mick acknowledges that some of these benefits may be difficult to quantify.

The KC Scout project will also aid KDOT in implementing urban ITS systems in other Kansas locations such as Wichita. It will be very important to have clear measures of effectiveness and lessons learned to pass along to other cities in Kansas interested in implementing urban ITS applications.

Mick feels that the major benefits of urban ITS applications are:

- Reduction in incident related congestion,
- Reduction in the time to clear incidents,
- Reduction in the severity of accidents, and
- Reduction in the secondary accidents.

Mick suggests the following methods to measure and evaluate the effectiveness of an urban ITS application:

- Measuring the average travel time in recurring congestion areas before and after systems are implemented,
- Measuring the average time to detect, respond to and clear an incident before and after systems are implemented, and
- Noting increases in interagency coordination between KDOT and KHP due to the co-existence at the traffic operations center (TOC).

Bureau of Transportation Planning – Public Transportation Programs

Interview with:
Bret Rowe and Kathy Marion - KDOT
Gary Rohr – OCCK
Ron Straight – DSNWK

Northwest Kansas

Development Services of Northwest Kansas (DSNWK) is an organization that provides transit service parts of the area of Northwest Kansas (KDOT-CTD8). DSNWK has a fleet of 78 vehicles; 10 for transit, 15 for specialized transportation for the disabled consumers of DSNWK programs, and the rest for mostly staff use. There are fourteen other local transit providers in CTD8 and Northwest Kansas. The Transportation Coordinator for DSNWK is chairperson of CTD8. Two of the major transit programs operated by DSNWK are ACCESS and CareVan.

ACCESS serves the Hays community and surrounding area. The program operates 364 days per year and has a ridership of 40,000 passengers per year. There are 7 ACCESS vehicles used in the Hays city limits and one ACCESS vehicle serving all of Ellis County.

CareVan is a call-ahead service that provides round trip transportation from St. Francis to Hays. There are three CareVan routes, which were determined by a customer survey. The program uses one 15-person van that operates Monday through Friday taking a different route each day. In 1998, CareVan provided over 1000 rides to the Northwest Kansas community.

DSNWK received a grant from the Kansas Department of Aging to incorporate computer aided dispatching (CAD) into their transit program. They are currently experimenting with a CAD system that dispatches 10 of their vehicles using a Motorola radio system. DSNWK is interested in bringing more ITS into their program to realize benefits such as increased ridership, safety and efficiency.

North Central Kansas

The OCCK Inc. is responsible for providing transit service to the Salina community and a limited amount of service in the Beloit and Concordia communities. They are a member of KDOT-CTD7, which is made up of nine counties in North Central Kansas. OCCK operates 48 vehicles with 14 drivers. Not all vehicles are used in public transportation. All of the vehicles are equipped with cellular phones. One of the services that OCCK operates is the North Central Kansas Express (NCK Express) that operates a daily service between Belleville and Salina. Counties along the route can provide feeder service to the NCK Express. OCCK is interested in introducing ITS applications such as CAD and Mayday into their program to realize benefits such as increased ridership, safety and efficiency. OCCK understands that there is a large market for transit in North Central Kansas that is not being met and that ITS could provide assistance in meeting the transit needs in the area.

Bureau of Transportation Planning - Cartography

Interview with Brian Logan

The KDOT Cartography Unit of the Bureau of Transportation Planning is in the process of completing a study to determine all of the potential GIS related projects in KDOT. The study found 27 potential GIS applications for KDOT. Of the 27 projects that were identified, four of them were requested by the ITS Unit of the Bureau of Transportation Planning. The study is due to be completed by August 1999. For more information about this study please refer to section 1.1.9.

Regarding their interface with ITS in Kansas, Brian Logan of the KDOT Cartography Unit needs more information on what is required of his unit. For instance, what maps and information does he need to supply and to which KDOT Division? Also, the Cartography unit collects data for field elements such as bridges and signs for their GIS databases. ITS field elements such as video cameras, loop detectors and VMS could also be collected and stored in a GIS but Mr. Logan first needs to know how these elements are defined.

Finally, the KDOT Cartography Unit is also responsible for sending annual revisions on all Kansas highway maps to the major mapping companies. A concern of Mr. Logan's is that the suppliers of navigation systems may not have the most up to date map information. Also, there is presently no procedure in place for verifying that the navigation systems are using current data.

Bureau of Transportation Planning

Interview with James Tobaben

Jim believes that a major hindrance to mainstreaming ITS into KDOT is the fact that ITS is so new. The Bureau of Planning needs to educate the rest of KDOT on ITS and where it fits in to day to day KDOT business. Jim sees the Kansas ITS Statewide Plan as a step in the right direction. It is important to look at the potential for statewide ITS applications not just ITS in metropolitan areas. Jim sees safety services and traveler information as the highest priorities in the ITS area.

Jim also believes that ITS needs to be considered in all major urban road projects as an alternative to traditional methods of increasing capacity. ITS needs to be in the discovery phase of every project. This may require having it on the 883 form. The high AADT corridors are more likely to warrant implementation ITS and traveler information.

Another concern that Jim has with ITS is funding sources. The limited set aside funds for ITS will most likely be used for pilot and demonstration projects. However, larger projects like the Wichita TOC will be more difficult to fund. These projects will require a match from local agencies as well as going to the program review committee for additional funds. It will also be necessary to look at other programs available such as federal projects for additional sources of funding.

Bureau of Traffic Safety

Interview with Rosalie Thornburgh

Rosalie's bureau works with the "driver" and human factors. Much of the work the Bureau of Traffic Safety does includes accident data, processing of information and reviewing accident statistics. When a problem area is defined and can not be addressed with design or infrastructure improvements the bureau approaches it in one of two ways, enforcement activities or educational activities to influence behavior or the driver.

The Bureau of Traffic Safety compliments many of the activities of other bureaus and feels that ITS can play a role in the collection and display of information. They also work with many outside agencies that will play a role in the acceptance of ITS actives such at the Kansas Highway Patrol and local law enforcement officials.

A discussion of ITS applications in red light enforcement activities, which is a human factors issue, was discussed. Ms. Thornburgh believes that due to the conservative nature of Kansans, they may not accept such systems from the enforcement agencies. If such systems were investigated, the Bureau of Traffic (Mike Crow's group) would be responsible for implementation activities and the Bureau of Traffic Safety would be responsible for selling the system to the public and law enforcement officials. Matt Volz stated that there would most likely need to be changes to certain laws to allow such systems to be active in Kansas and that education would play a large role in the acceptance of such systems. Rosalie mentioned a red light enforcement campaign in Liberal Kansas. The Bureau of Traffic Safety paid local law enforcement overtime wages to have this system tested.

The Intelligent Vehicle Initiative (IVI) was discussed and the bureau of Traffic Safety would play a role in any IVI issues, mainly in the area of promoting the use of certain systems within the IVI. It would be very important to document cost/ benefit information of these systems.

The bureau of traffic safety would also be very interested in traveler information systems. Tips on safe driving and general safety information could be placed on a kiosk along with the traveler information.

Bureau of Design - Coordinating Section

Interview with Al Cathcart

The Coordinating Section of the Bureau of Design has three areas of responsibility:

- RR Crossings
- Utilities
- Preliminary Surveys

Al believes that the RR Crossing area has the most potential for ITS projects. He sees a need for ITS to help notify EMS and police units of the location of trains during emergency situations. This will help to reduce the delay caused by trains if the EMS units can be routed away from the trains. This type of application will be used mostly in urban areas. Two areas in Kansas that Al noted as needing this application are the Wichita area and Marysville. The City of Wichita is spending $100 million for grade separation but these projects will take from 4 to 7 years to complete. Al believes that ITS could be an interim solution.

Al suggested another ITS application that could be applied to KDOT construction near railroads. Worker safety could be improved by having crews equipped with beepers that alert them to oncoming trains.

There is currently an inventory being performed of all at grade railroad crossings in Kansas. This includes over 7200 crossings. The project involves developing a prioritizing scheme for the crossings and having the crossings entered into a GIS database.

KDOT is also looking at 4-quadrant gates, raised medians, and automated horn systems. Demonstration projects involving the use of automated horn systems in both Wichita and Marysville are slated for later this year. Other ITS applications related to railroads that KDOT would be interested in include photo enforcement at railroad crossings and coordinating railroad crossings with traffic signals.

There isn't as much need for ITS in the Utilities and Preliminary Surveys areas of the Coordinating Section except for the possibility of using GPS in surveying or locating utilities and entering them into a GIS database.

Kansas Department of Commerce and Housing (Travel & Tourism)

Interview with Mary Lou McPhail

There are currently four Traveler Information Centers (TIC) in the state of Kansas. The Travel and Tourism Division of the Kansas Department of Commerce and Housing owns and operates the TICs. The four TICs are located in Goodland, Kansas City, Olathe, and Bell Plain. According to Mary Lou, the Kansas Department of Commerce and Housing is planning to replace the Traveler Information Center in Goodland. The Goodland TIC receives the most traffic of the four with 160,000 visitors per year. All of the Centers have a reservation board, which allows travelers to pick up a phone and automatically be connected to a hotel of their choice. The hotels are charged $3 per call for this service. Two of the TICs are equipped with DTN terminals, which allow visitors access to real time weather data and live radar. DTN will be coming out with a new kiosk soon that combines both travel and tourism information. This type of kiosk may be ideal for the TICs. The TIC staff also provides traveler information verbally to customers. This information comes from two sources: KDOT detour sheets and KHP trooper verbal information to TIC staff.

The Travel and Tourism Division also maintains a database of tourist information called Kansas Attractions Travel Information and Events (KATIE). This database can be accessed via the Internet under the Kansas Department of Commerce's web site (www.kansascommerce.com). Mary Lou would like for visitors to have access to KATIE at each TIC via either a computer terminal or kiosk. One problem that may arise from this would be if certain users of the system tied it up for a long period of time. Overcoming this problem may require having multiple terminals or kiosks at each TIC.

Mary Lou would like to see her TICs as customer service oriented as possible. She sees technology playing a role in achieving this goal as long as the technology is low

maintenance and easy for the travelers to access. Furthermore, Mary Lou's staff is very "low tech" and they prefer to engage their customers in conversation. This should be considered before making any "high tech" investments. Advertising may play a role in financing the kiosks however it is not imperative that they pay for the entire cost. Mary Lou would also like to see information from the Kansas Parks and Wildlife and Kansas Historical Society tied into the kiosks.

Mary Lou pointed out the importance of having a VMS on I-70 before entering Kansas from Colorado since the TICs are closed whenever the road is closed. Thus, VMS is the best way to communicate travel information such as road closures, hotel availability, etc. Finally, Matt noted that future rest areas and TICs should have traveler information incorporated into the design process. This is another way to mainstream ITS into the way KDOT does business.

Kansas Turnpike Authority (KTA)

Interview with Tom Wordeman

In 1995 KTA adopted an Electronic Toll Collection System called KTAG. The system is an Amtech backscatter system, the same one that is used in Oklahoma and Texas. The KTAG system covers about 240 miles of Kansas freeway and currently has over 100,000 tags, 50,000 KTAG accounts and 73 readers in operation. Tags cost about $30 each and readers cost about $30K per lane. About 32% of the payment transactions on KTA use KTAG with the highest usage between East Topeka and LeCompton (over 50% during peak hours). Tom feels if it weren't for KTAG there would be large queue build-ups at the tollbooths.

Another advantage of the KTAG system is that it has the potential to provide KTA a great deal of information regarding traffic flows on the turnpike. This data could be used to detect congested areas and the information could be broadcast to the traveling public via HAR messages. KTA has also been looking into the use of permanent VMS locations to relay messages to travelers. Installation of VMS has been held up for two reasons. First, the East Terminal and East Topeka toll gates are in the process of being reconstructed and until this task is completed, it is difficult to decide where the VMS should be installed. Second, there is a question of who will operate the VMS. KHP's position is that they can't do it because they are responsible for dispatching emergency response to the scene and it is not feasible for KTA to hire full time VMS operators. There is also the issue of coordinating with KDOT and the local agencies.

Currently, when there is an incident on the Kansas Turnpike, a KTA dispatcher first calls KHP to respond and then calls KTA maintenance. KTA is then responsible for informing the traveling public. KTA has six KHP troopers (1 for every 40 miles) that are dispatched from Wichita (not Salina). All KTA operations are dispatched from Wichita. When permanent VMS are installed on the Turnpike, they will most likely be controlled from Wichita as well.

KTA has fiberoptic coverage from 18th Street in Kansas City, Kansas to Emporia. KTA is also remodeling a weighing station near the Oklahoma border and they are looking into using KTAG for electronic clearance. Tom would like to see the bypass occur after the turn off rather than in the main lanes. KTA has stricter standards for truck weight than KDOT. The heaviest load they allow is 120,000 lbs. KTA often turns away trucks that were permitted by KDOT. Finally, KTA has a number of RWIS sites, all of which are coordinated with the KDOT RWIS network. In conclusion, Tom stated that he would like to cooperate with KDOT as much as possible regarding ITS coordination between the two agencies.

1.4 Review of Survey Data

Overview

The Kansas Department of Transportation and other entities in the State of Kansas have conducted numerous surveys of residents during the past two years. Although none of these studies focused exclusively on Intelligent Transportation System (ITS) applications, selected results from previously administered surveys can be used to identify opportunities for ITS deployment in the State's transportation system.

The studies that were reviewed as part of this analysis include the following:

- The KDOT Statewide Citizen Satisfaction Survey
- The KDOT Internal Employee Survey
- The Governor's Transportation 2000 Committee Final Report
- The I-35 Corridor Study
- The US-69 Corridor Study
- Rural ITS Workshop 1996
- Mid America Regional Council's Transit Demand Assessment

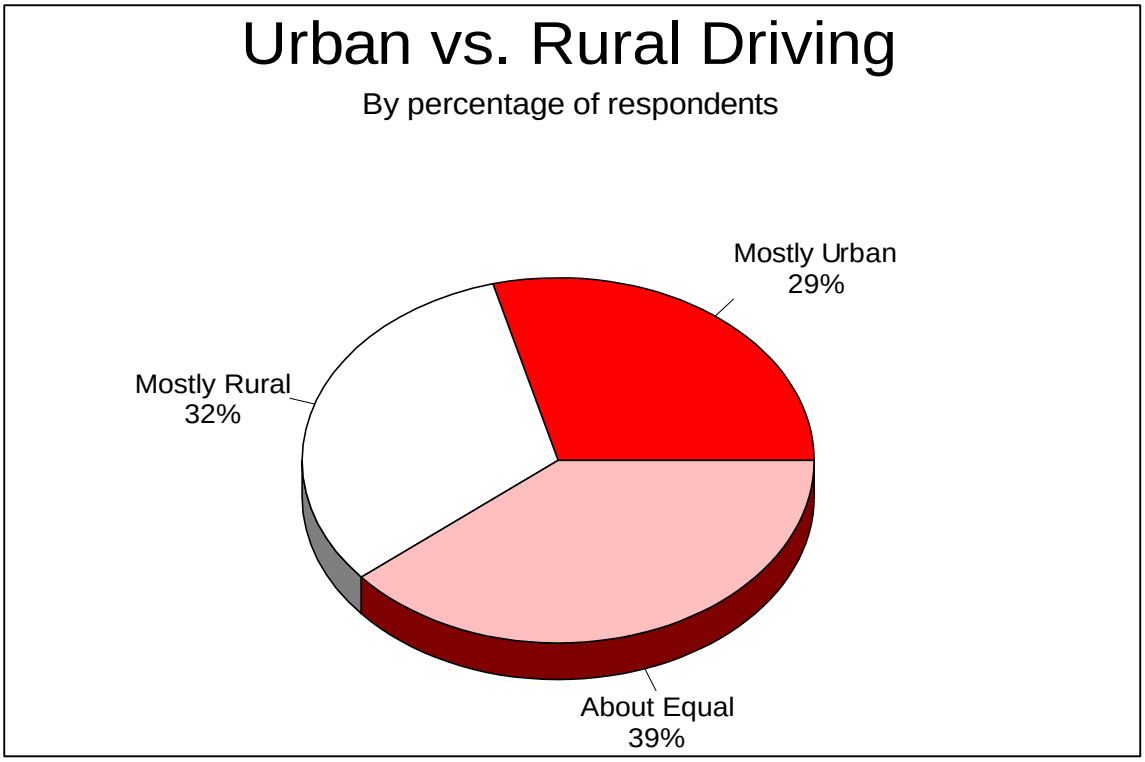
Although each of the studies listed above addressed some ITS applications, the only study that contained useful data that could be further analyzed for the purposes of this project was the Statewide Citizen Satisfaction survey. The following pages contain results of an extensive follow-up analysis that was performed on the data originally collected for the Statewide Citizen Satisfaction Survey, which was completed in the fall of 1997. The results reflect the perceptions and behaviors of more than 2000 Kansas residents. The results of the survey are statistically representative at the both the KDOT District and Area level. The overall results for the State have a 95% level of confidence with a precision of at least +/-2.3%.

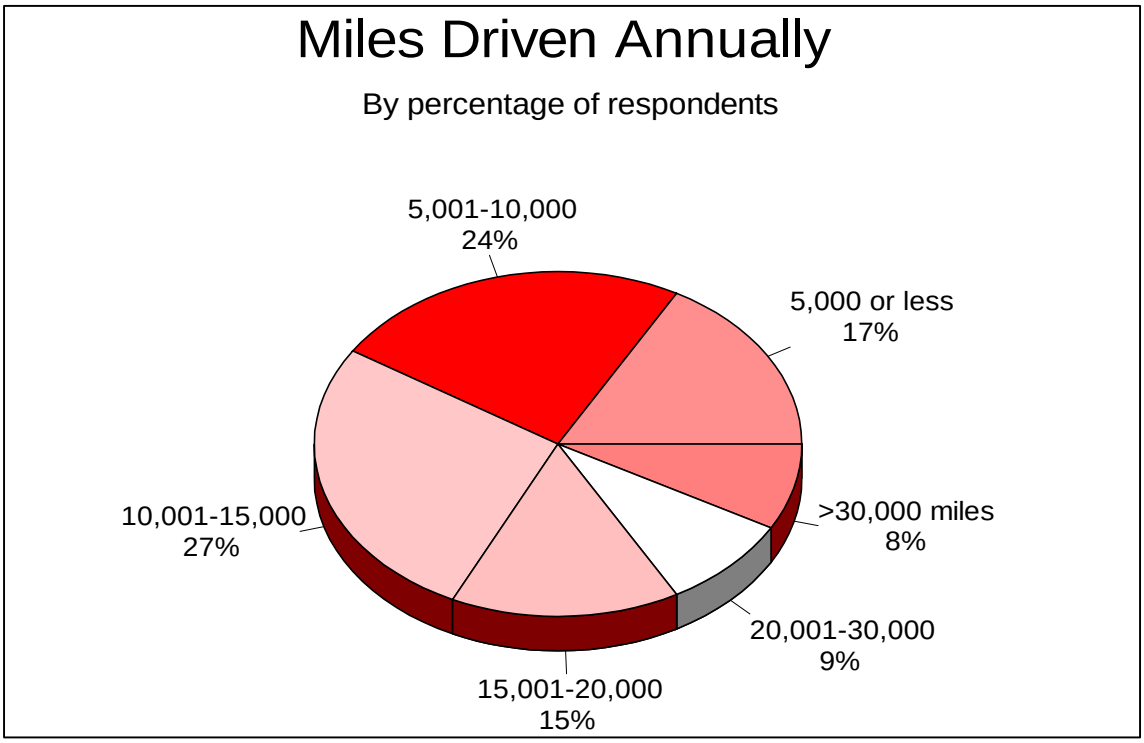
Demographic Characteristics of the Traveling Public

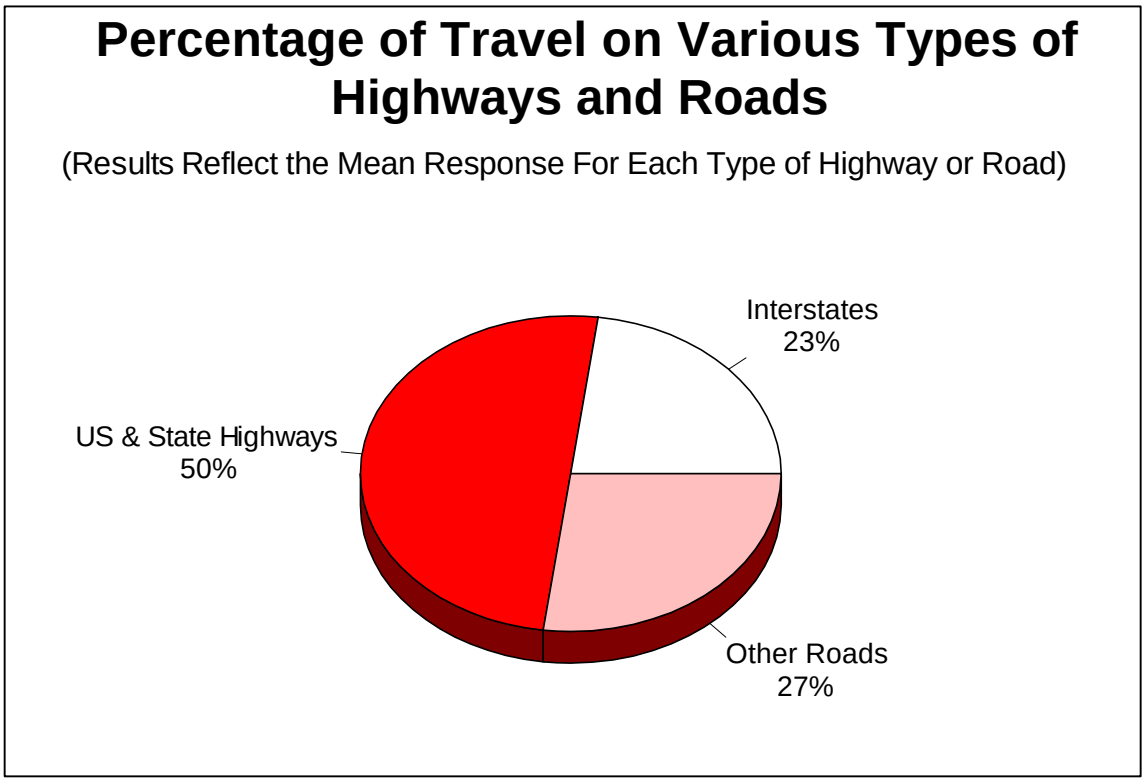
Rural vs. Urban. Rural and urban driving in the state of Kansas is fairly evenly split among three categories. About one-third of the State's residents do most of their driving in rural areas; another third do most of their driving in urban areas, and the remaining third drive about the same amount in both rural and urban areas.

Number of Miles Driven. Based on the mean percentage provided by all respondents, more than half (51%) of the State's residents drive between 5,000 and 15,000 miles per year. One-sixth (17%) drive less than 5,000 miles per year. Another sixth (17%) drive more than 20,000 miles per year.

Types of Roads Most Frequently Traveled. About half (50%) of all miles driven by Kansas residents are on state and US highways. About one-fourth (23%) of the miles driven are on Interstate highways, and 27% are on other roads.



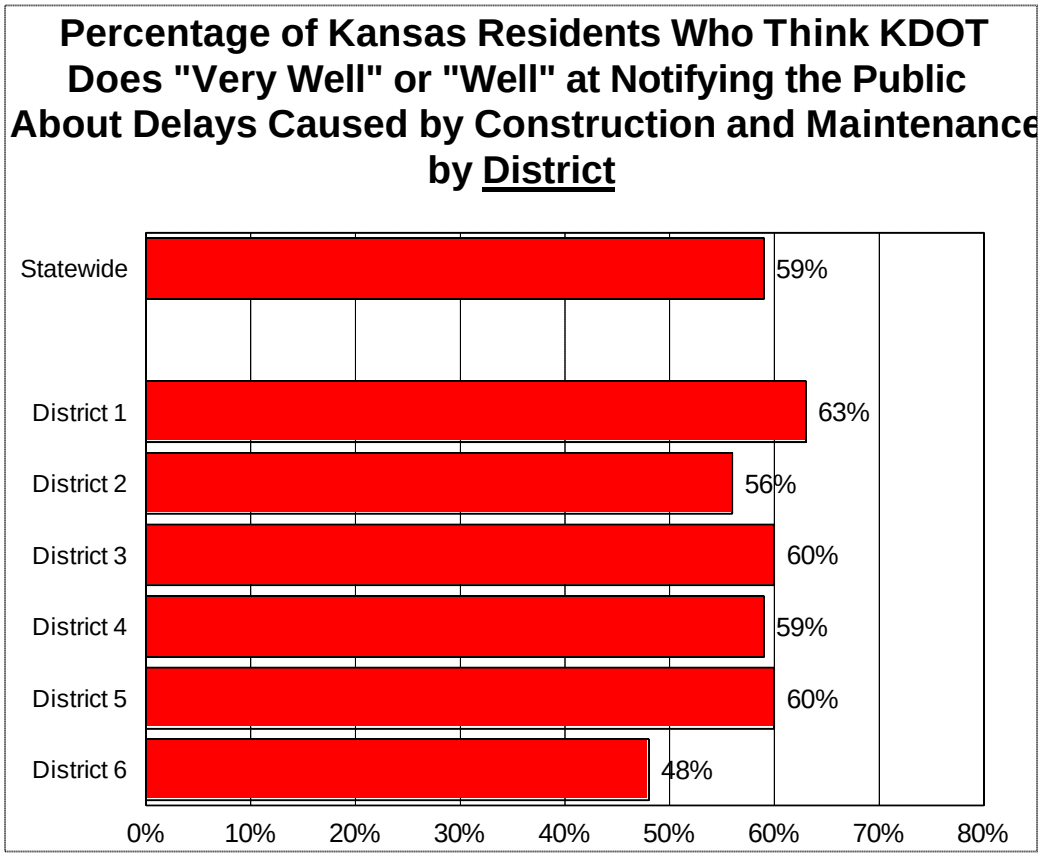

Miles Driven Annually
By percentage of respondents
5,001-10,000
24%
5,000 or less
17%
>30,000 miles
8%
20,001-30,000
9%
15,001-20,000
15%
10,001-15,000
27%

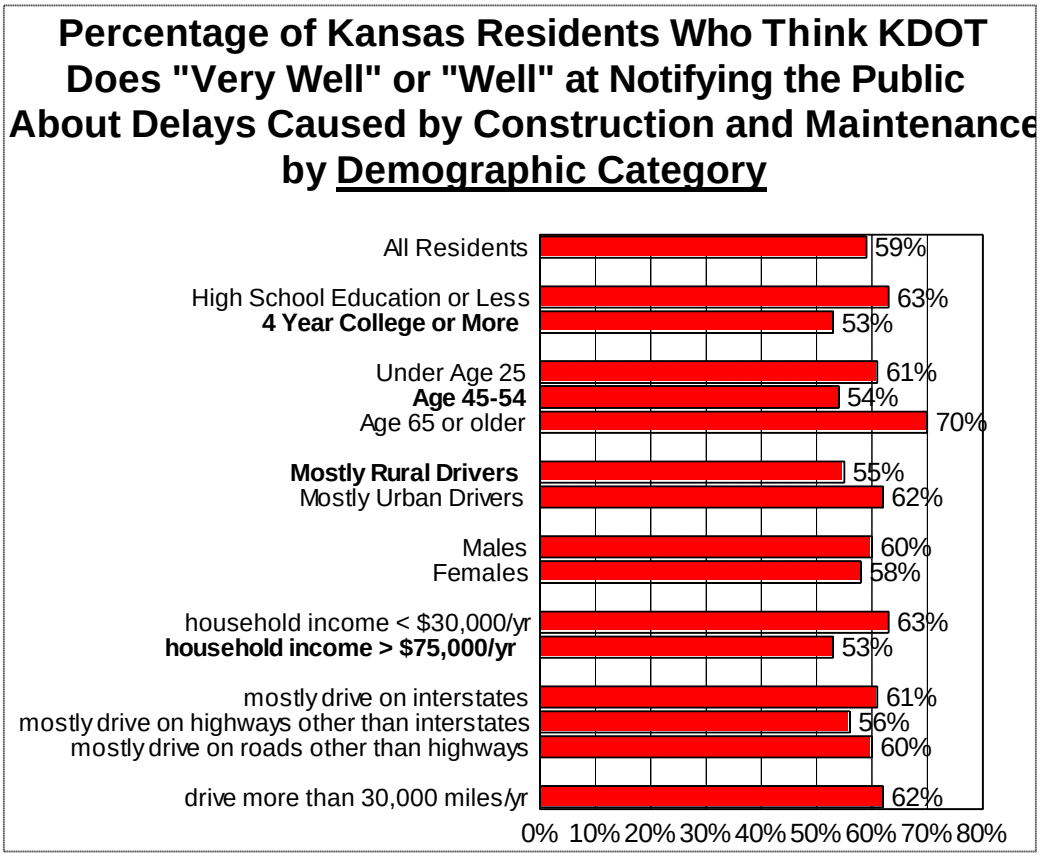

Percentage of Travel on Various Types of Highways and Roads
(Results Reflect the Mean Response For Each Type of Highway or Road)
Interstates
23%
US & State Highways
50%
Other Roads
27%

Overall Ratings of the Quality of Information Provided to the Public

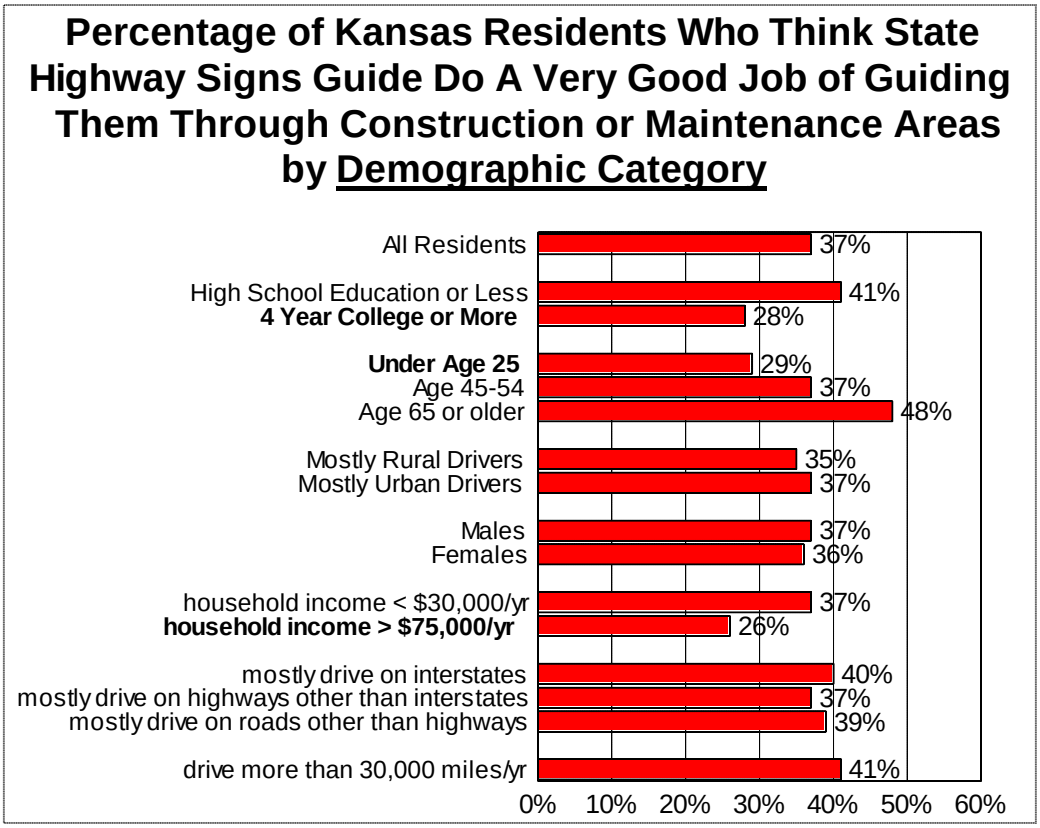
Overall Satisfaction with Information That Is Available. There are significant opportunities to use ITS to enhance the delivery of information about construction and maintenance area. Only 59% of those surveyed statewide thought that KDOT does "very well" or "well" at notifying the public about delays caused by construction or maintenance activities. Only 48% of the respondents in District 6 thought that KDOT does "very well" or "well" at notifying the public about delays caused by construction or maintenance activities.

Persons with a college education, middle age persons, those living in rural areas and those with very high annual household incomes were significantly less satisfied with the availability of information about construction and maintenance areas than other demographic groups. Senior citizens were the most satisfied group.



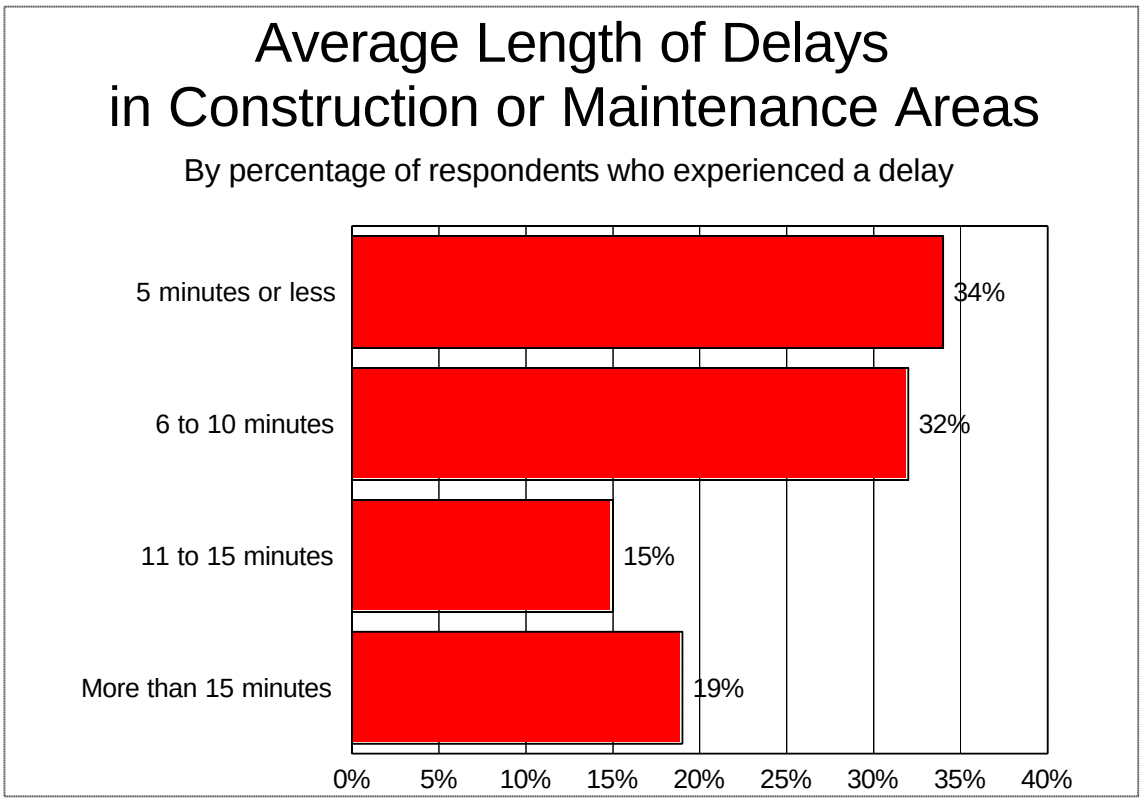


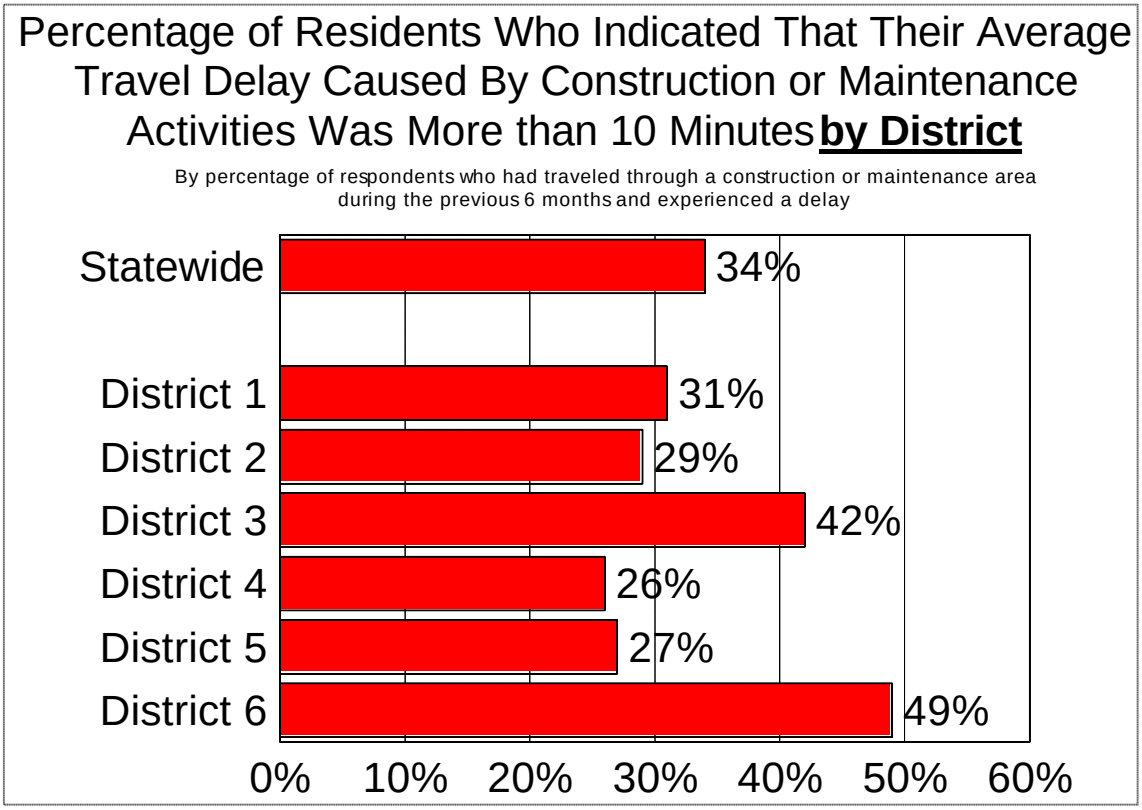
Usefulness of Signage in Construction/Maintenance areas. There are also significant opportunities to use ITS applications to enhance travel through construction and maintenance areas. Only 37% of those surveyed thought highway signs that are currently used do a good job of guiding residents through construction and maintenance areas.



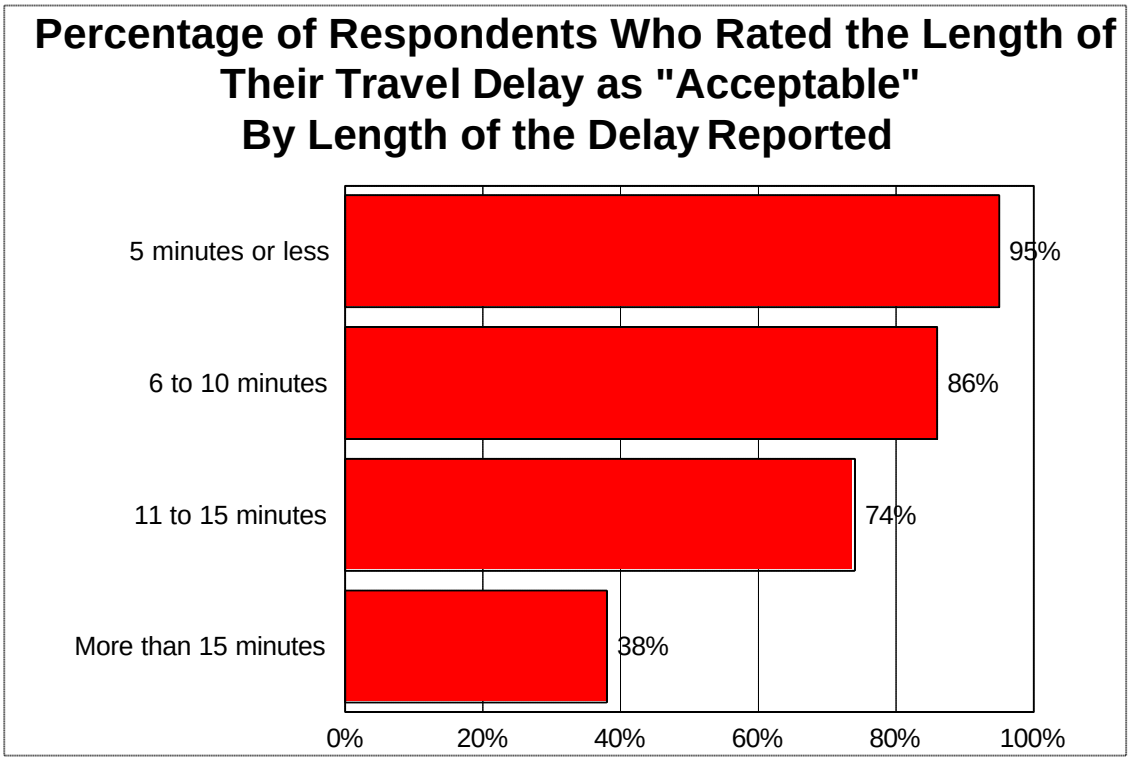
Construction Delays

Length of Delays. Overall 61% of the Kansas residents surveyed reported that they experienced a delay caused by construction or maintenance activities on state highways during the previous six months. Statewide, of those who experienced a delay, 34% reported that the average delay was more than 10 minutes. The average delays reported by residents living in Districts 3 and 6 (the western portion of the state) were significantly higher. In District 6, 49% of the respondents reported average delays of more than 10 minutes. In District 3, 42% of the respondents reported average delays of more than 10 minutes.


Average Length of Delays
in Construction or Maintenance Areas
By percentage of respondents who experienced a delay
5 minutes or less
34%
6 to 10 minutes
32%
11 to 15 minutes
15%
More than 15 minutes
19%
0%
5%
10%
15%
20%
25%
30%
35%
40%


Percentage of Residents Who Indicated That Their Average Travel Delay Caused By Construction or Maintenance Activities Was More than 10 Minutes by District
By percentage of respondents who had traveled through a construction or maintenance area during the previous 6 months and experienced a delay
Statewide
34%
District 1
31%
District 2
29%
District 3
42%
District 4
26%
District 5
27%
District 6
49%
0%
10%
20%
30%
40%
50%
60%

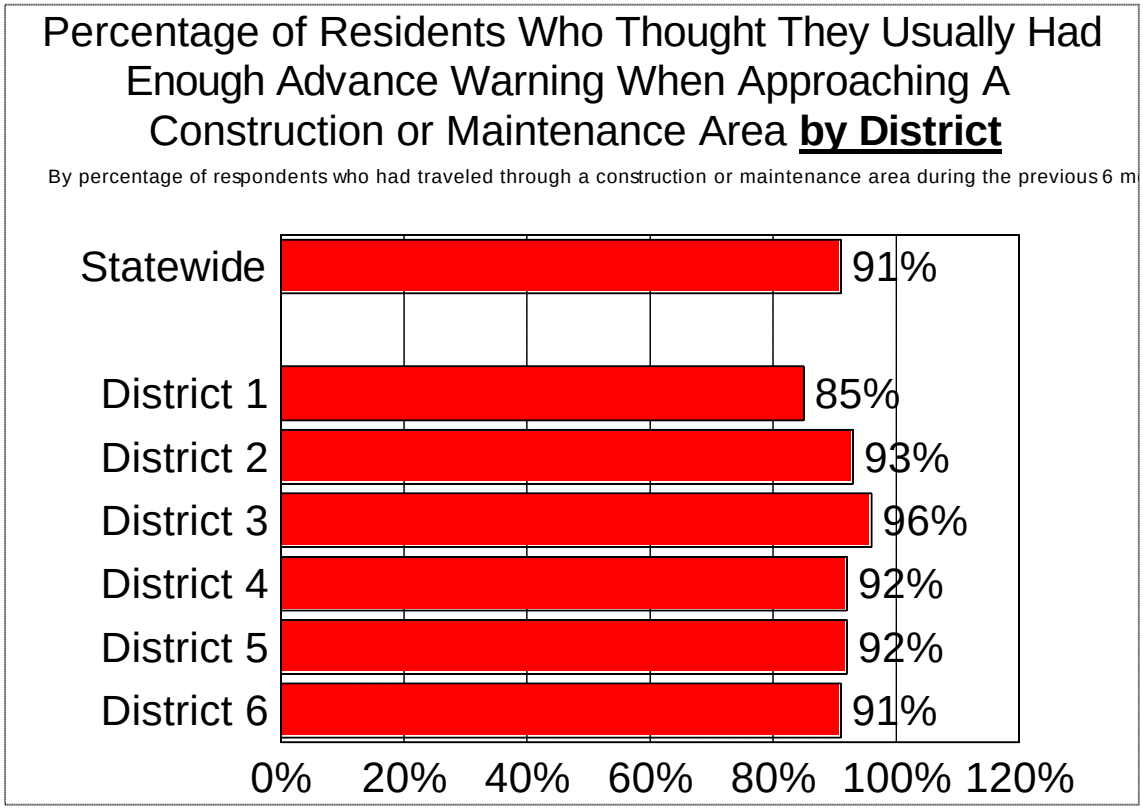
Acceptability of Delays. Almost all (95%) of those surveyed thought that travel delays of five minutes or less were acceptable. Only about one-third (38%) thought travel delays of more than 15 minutes were acceptable.

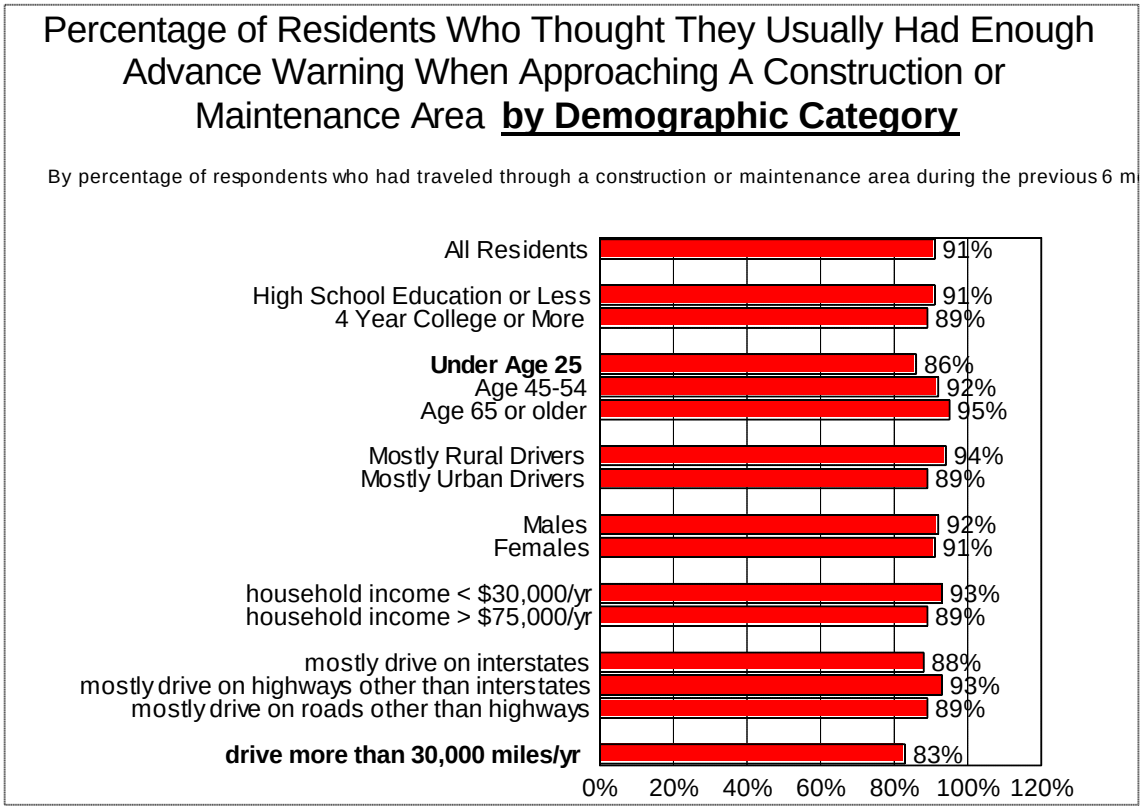


Advance Warning of Construction and Maintenance Projects

Statewide, most (91%) of the residents surveyed thought they usually have enough advance warning when they approach construction and/or maintenance areas on state highways. Residents in District 1 were somewhat less satisfied with the advanced warning they receive with 85% of the respondents indicating that they usually have enough warning when approaching construction or maintenance areas.

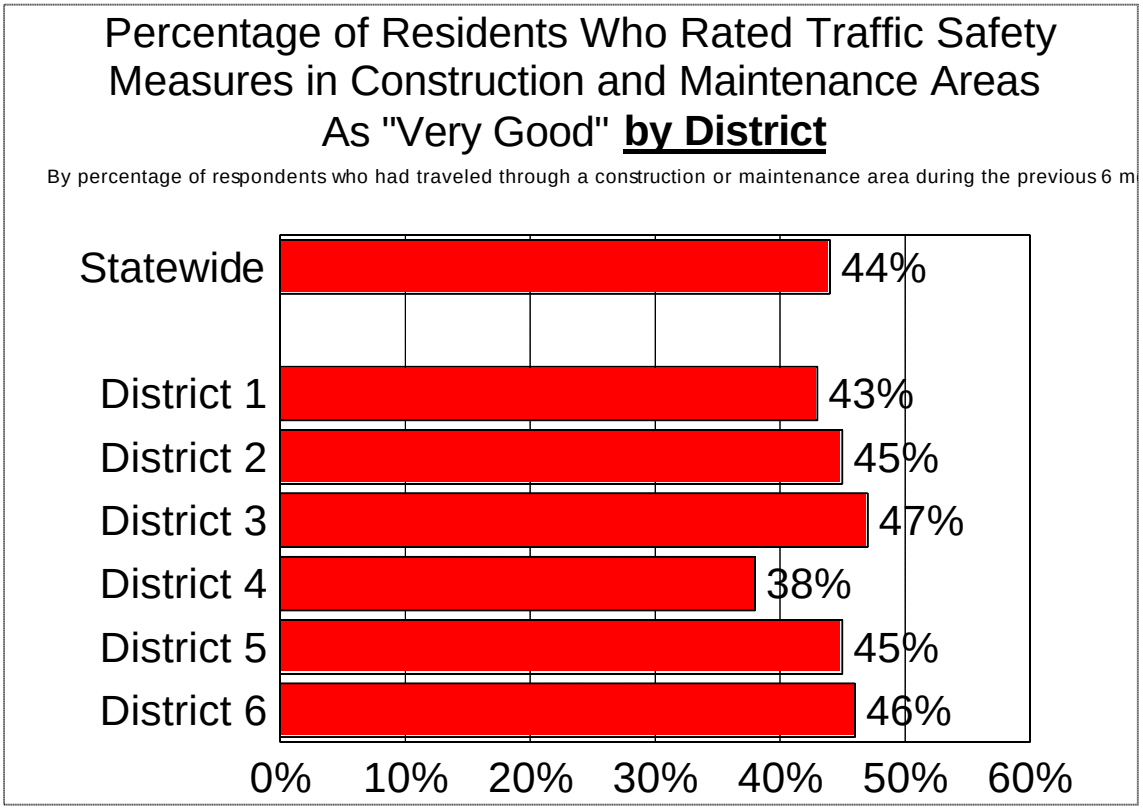
There was very little difference in the responses by demographic category with two exceptions. Younger persons (under age 25) and persons who drive more than 30,000 miles per year were significantly less satisfied with the advance warning they receive; 86% of the respondents under age 25 and 83% of the respondents who drive more the 30,000 miles per year thought they usually receive enough advance warning when approaching construction and/or maintenance areas.

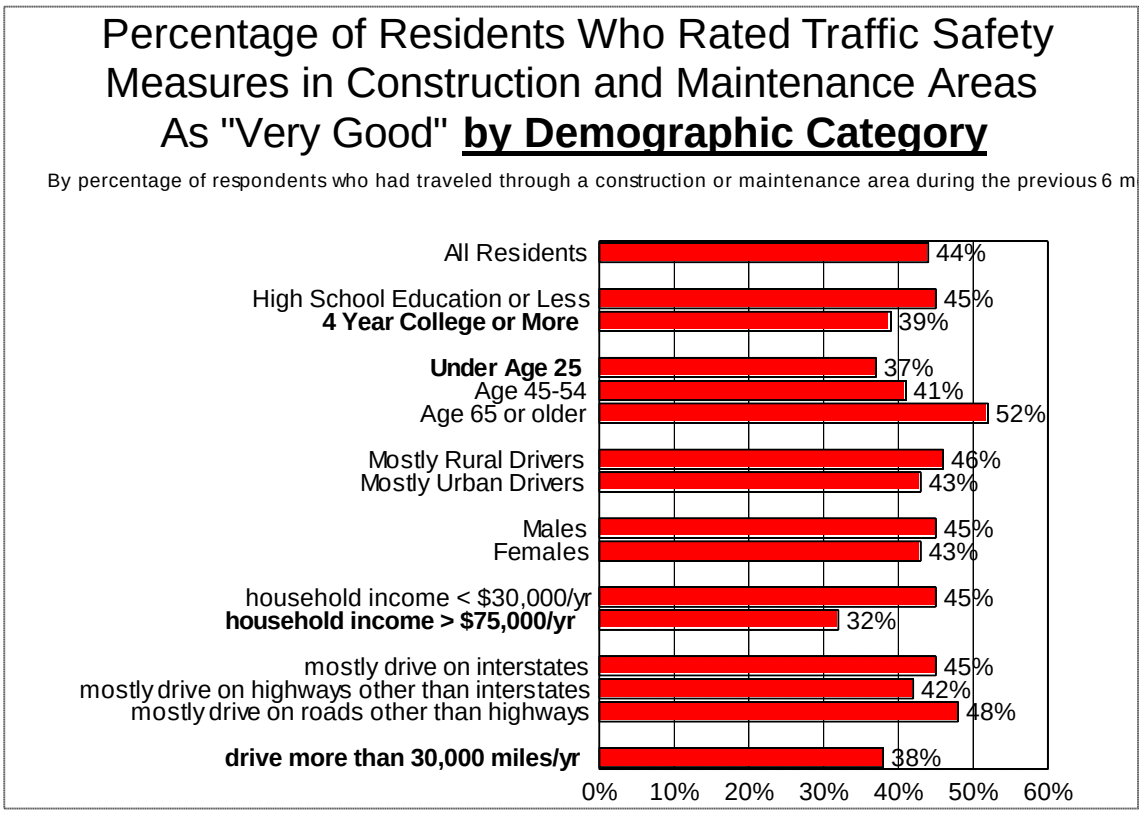

Percentage of Residents Who Thought They Usually Had Enough Advance Warning When Approaching A Construction or Maintenance Area by District
By percentage of respondents who had traveled through a construction or maintenance area during the previous 6 m
Statewide
91%
District 1
85%
District 2
93%
District 3
96%
District 4
92%
District 5
92%
District 6
91%
0%
20%
40%
60%
80%
100%
120%


Percentage of Residents Who Thought They Usually Had Enough Advance Warning When Approaching A Construction or Maintenance Area by Demographic Category
By percentage of respondents who had traveled through a construction or maintenance area during the previous 6 m
All Residents
91%
High School Education or Less
91%
4 Year College or More
89%
Under Age 25
86%
Age 45-54
92%
Age 65 or older
95%
Mostly Rural Drivers
94%
Mostly Urban Drivers
89%
Males
92%
Females
91%
household income < $30,000/yr
93%
household income > $75,000/yr
89%
mostly drive on interstates
88%
mostly drive on highways other than interstates
93%
mostly drive on roads other than highways
89%
drive more than 30,000 miles/yr
83%
0%
20%
40%
60%
80%
100%
120%

Traffic Safety Measures

There are significant opportunities to use ITS to enhance the perceived quality of traffic safety measures in construction and maintenance areas. Less than half of those surveyed rated traffic safety measures in construction and maintenance areas as "very good." The ratings were fairly uniform in all districts with the exception of District 4 where 38% of the respondents rated traffic safety measures as "very good."

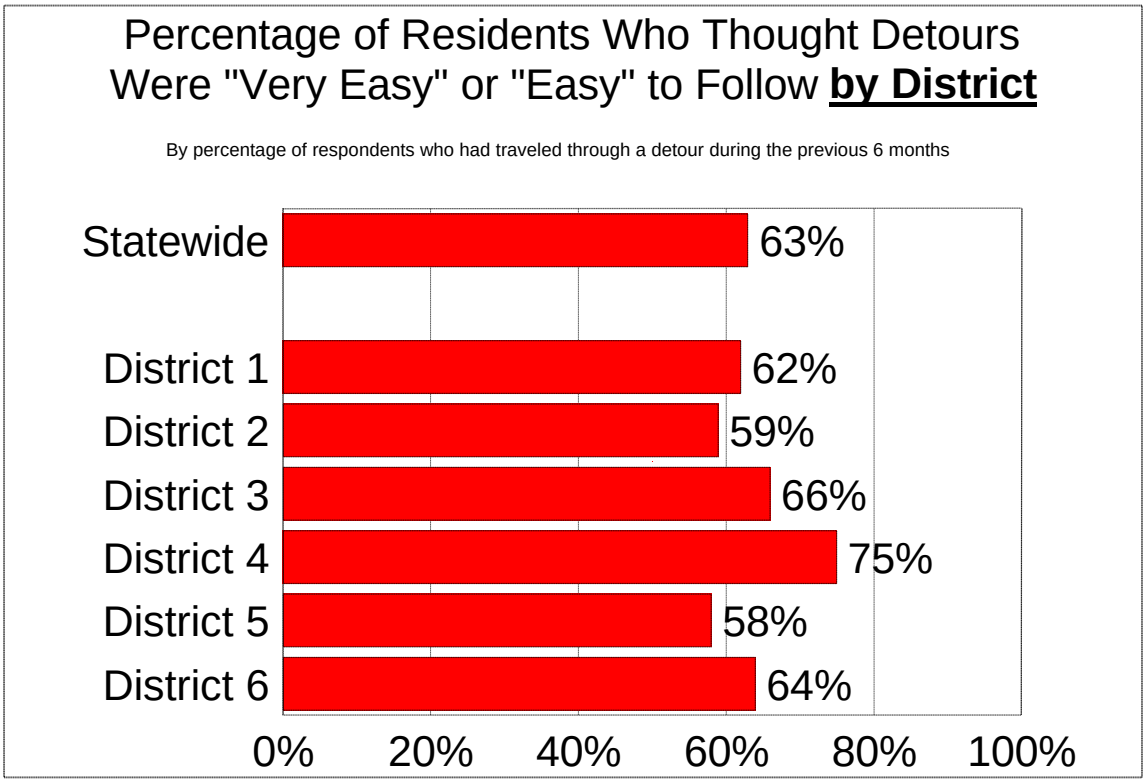


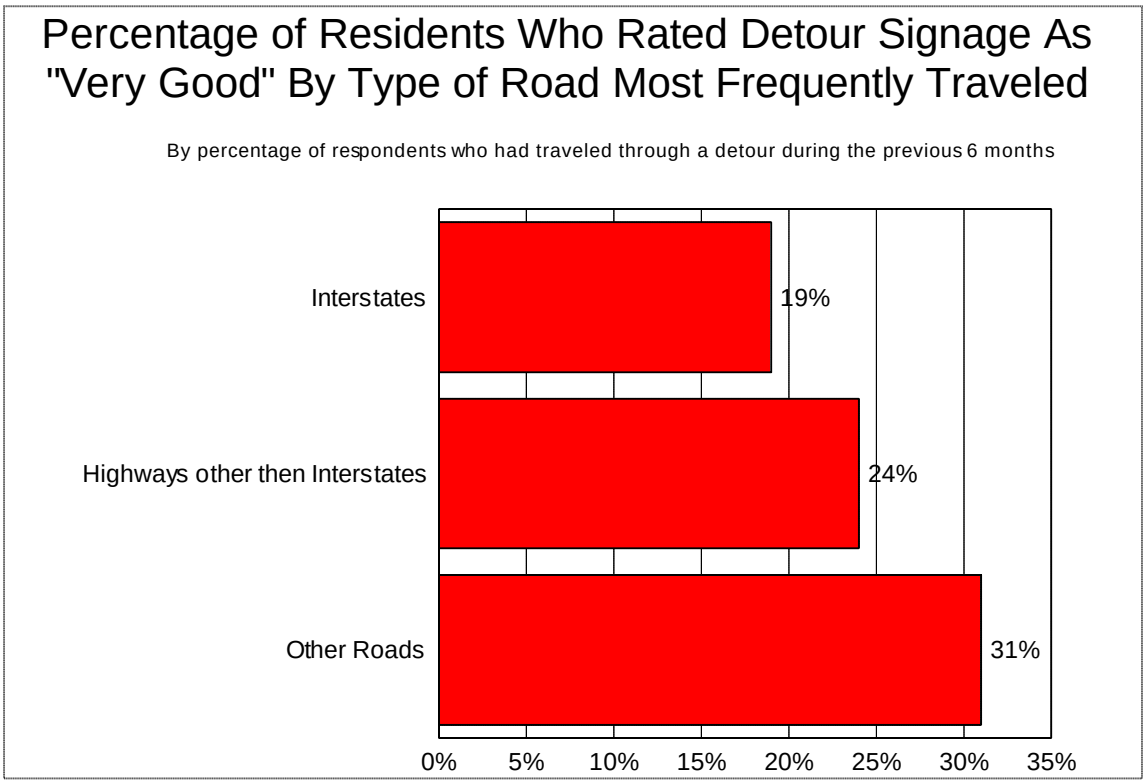


Detours

Ease of Following Detours. There are opportunities to use ITS to enhance the ease of following detours caused by construction and maintenance activities. Less than two-thirds (63%) of those surveyed thought detours were "very easy" or "easy" to follow. The ratings from residents in District 4 were significantly more positive than the ratings from other districts. Three-fourths (75%) of the respondents from District 4 thought that detours were "very easy" or "easy" to follow. In contrast, respondents in Districts 2 and 5 (central part of the state) were somewhat less satisfied than residents in other parts of the state.

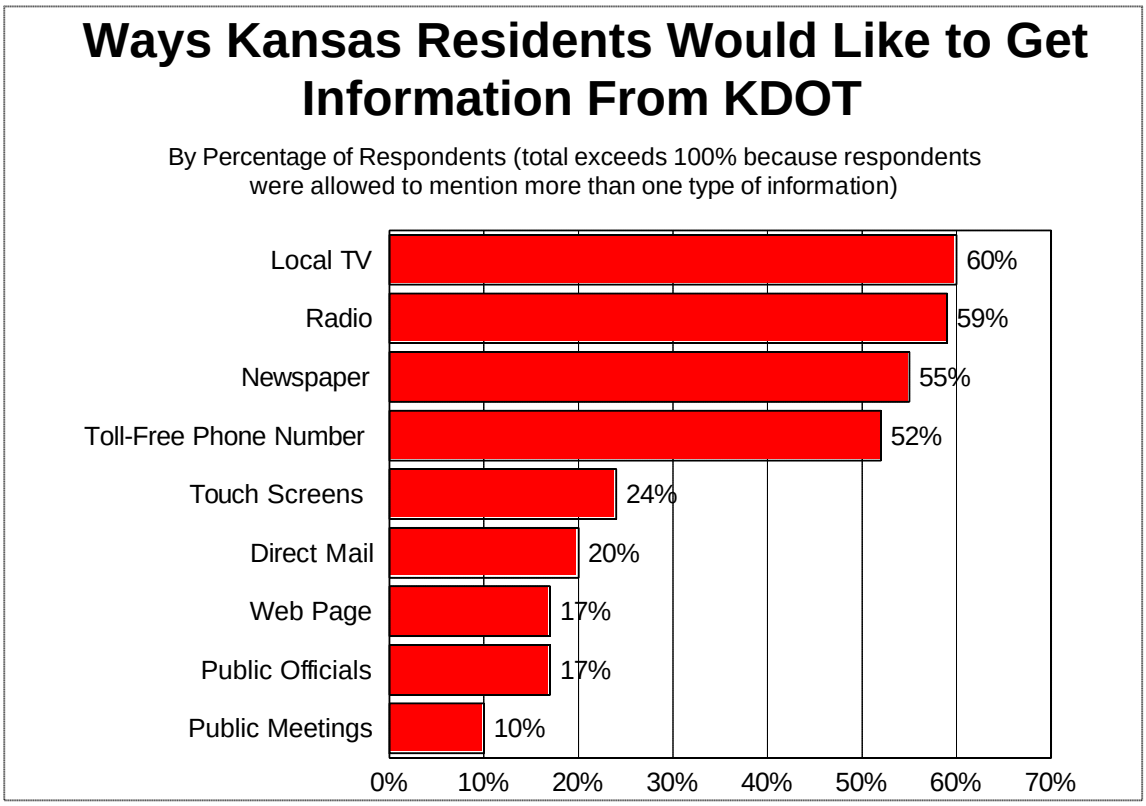
Ratings of Detour Signage. Respondents who most frequently travel on the interstates gave detour signage the lowest ratings. Of those who indicated that they travel on interstate highways most frequently, only 19% rated the quality of detour signs on state highways as "very good." Of those who indicated that they travel on other highways (excluding the interstate) most frequently, 24% rated the quality of detour signs as "very good." Of those who indicated that they travel on roads other than highways most frequently, 31% rated the quality of detour signs as "very good."


Percentage of Residents Who Thought Detours Were "Very Easy" or "Easy" to Follow by District
By percentage of respondents who had traveled through a detour during the previous 6 months
Statewide
63%
District 1
62%
District 2
59%
District 3
66%
District 4
75%
District 5
58%
District 6
64%
0%
20%
40%
60%
80%
100%


Percentage of Residents Who Rated Detour Signage As "Very Good" By Type of Road Most Frequently Traveled
By percentage of respondents who had traveled through a detour during the previous 6 months
Interstates
19%
Highways other then Interstates
24%
Other Roads
31%
0%
5%
10%
15%
20%
25%
30%
35%

Ways Residents Would Like to Get Information

Overall. The chart below shows the percentage of residents who would be interested in receiving information from KDOT from various sources. The three most preferred means of receiving information were through public access channels on television, radio, and newspaper.

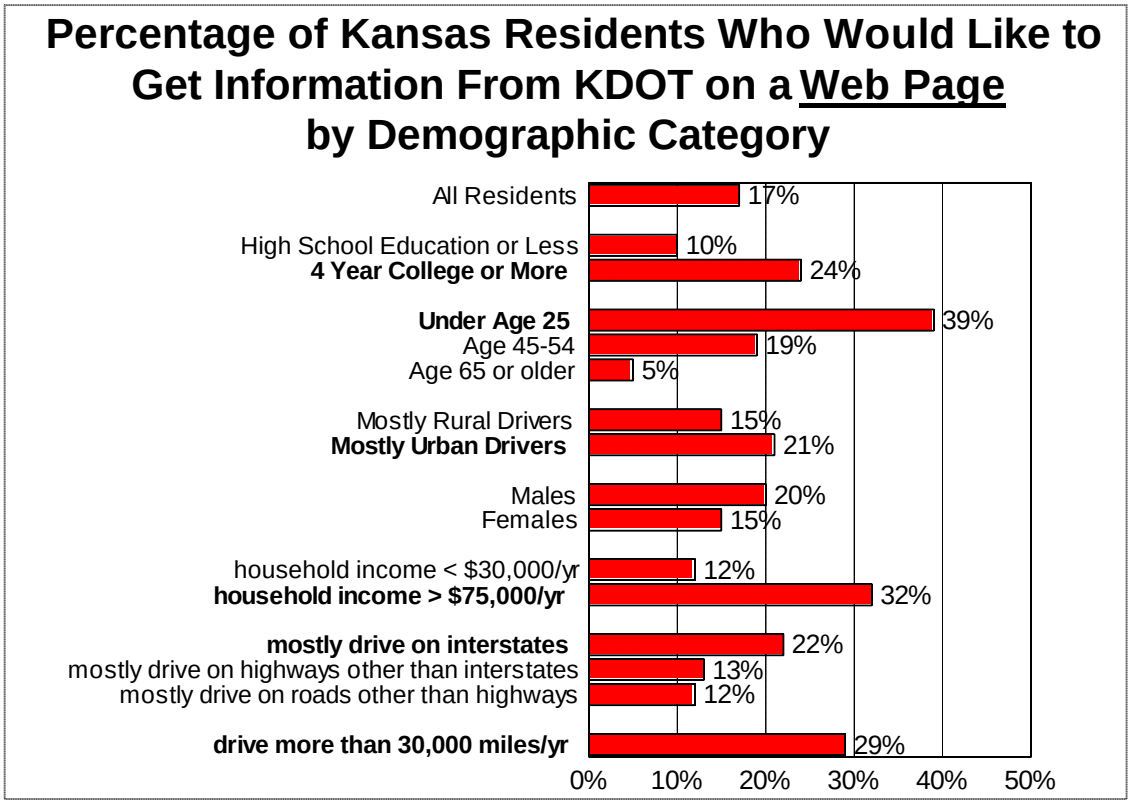


Interest in Receiving Information on a WEB PAGE

Groups that are significantly more interested. Almost two-fifths (39%) of Kansas residents under ***age 25*** are interested in receiving information from KDOT via the Internet. One-third (32%) of persons who live in households with ***annual income of $75,000 or more*** are interested in a web page. Persons with a ***college degree***, those who travel in ***urban areas*** and people who ***drive more than 30,000 miles per year*** are also somewhat more interested in using a web page than other demographic groups.

Groups that are significantly less interested. Only 5% of those ***age 65 or older*** are interested in receiving information from KDOT via the Internet. One-tenth (10%) of persons households who have a ***high school education or less*** are interested in a web

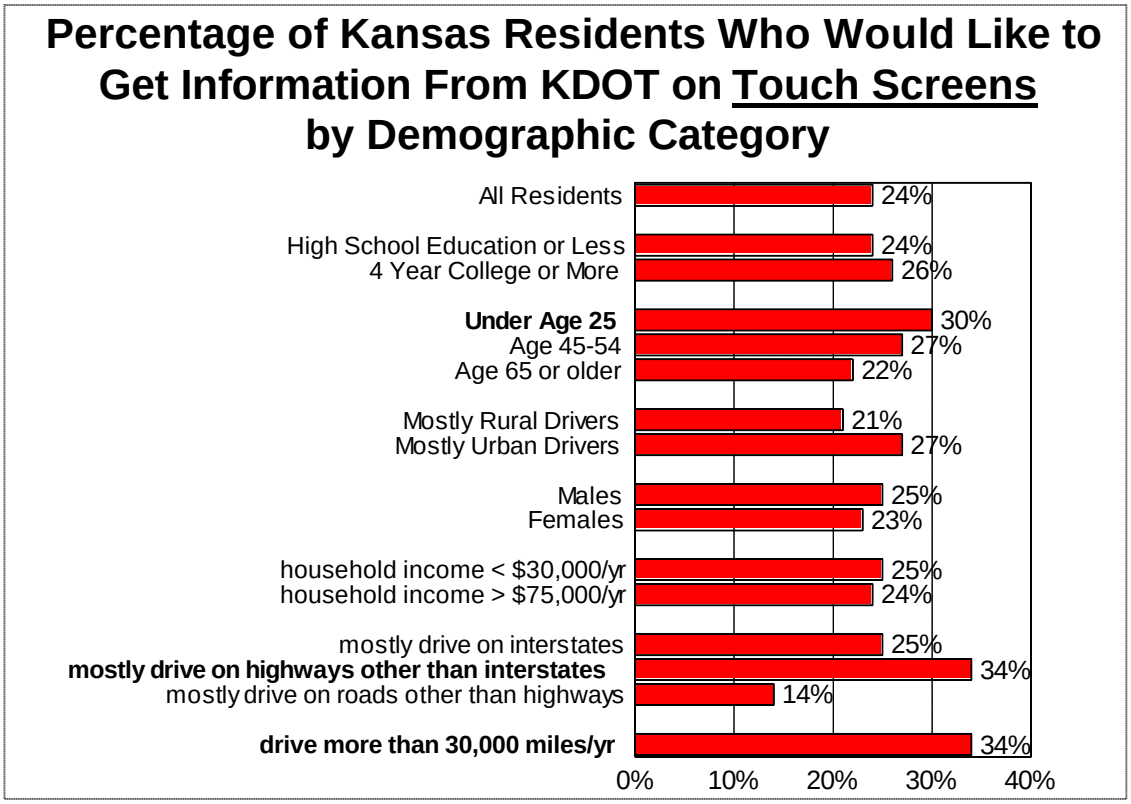
page. Persons with ***lower annual household incomes*** and those who ***do not frequently travel on interstates*** are also somewhat less interested in using a web page than other demographic groups.



Interest in Receiving Information on a TOUCH SCREENS

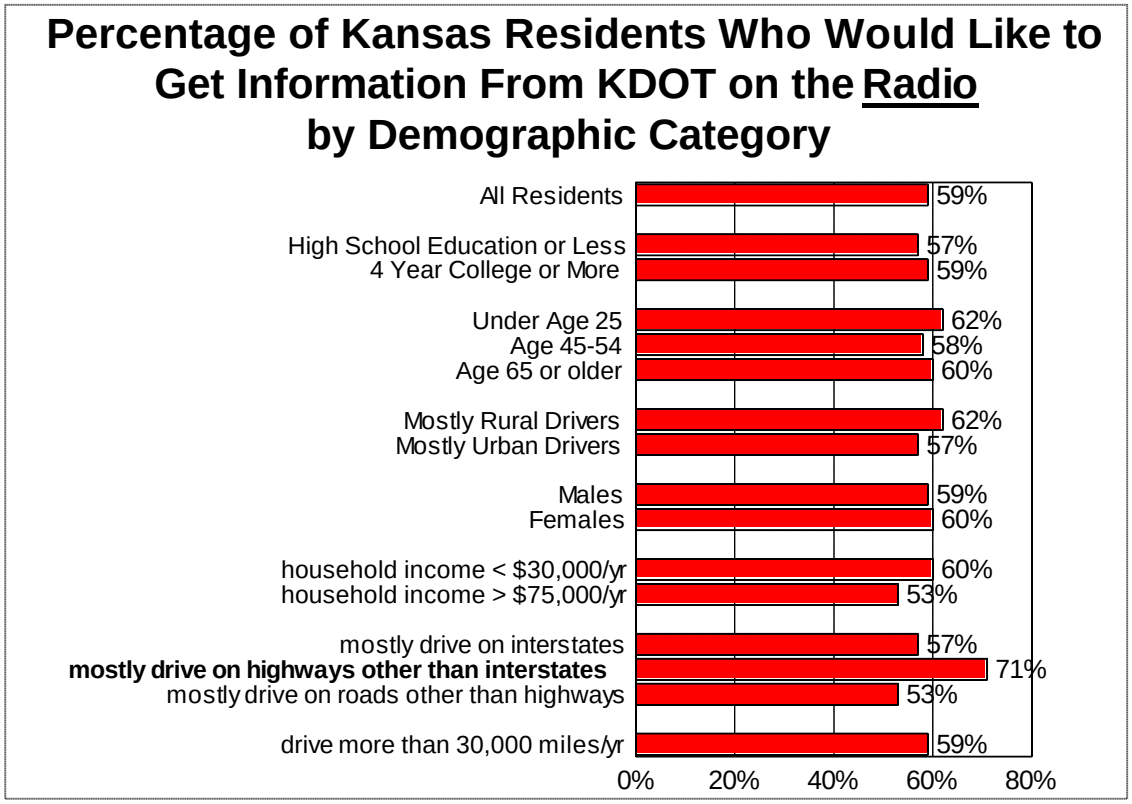
Groups that are significantly more interested. More than one-third (34%) of Kansas residents who ***frequently travel on highways other than interstates*** are interested in receiving information from KDOT via touch screens. Persons who ***drive more than 30,000 miles per year*** and persons under age 25 are also significantly more interested in using touch screens than other demographic groups.

Groups that are significantly less interested. Those who frequently ***do not drive on highways of any kind*** are significantly less interested in using touch screens than other demographic groups. Only 14% of those surveyed in this category expressed an interest in using touch screens.



Interest in Receiving Information from the RADIO

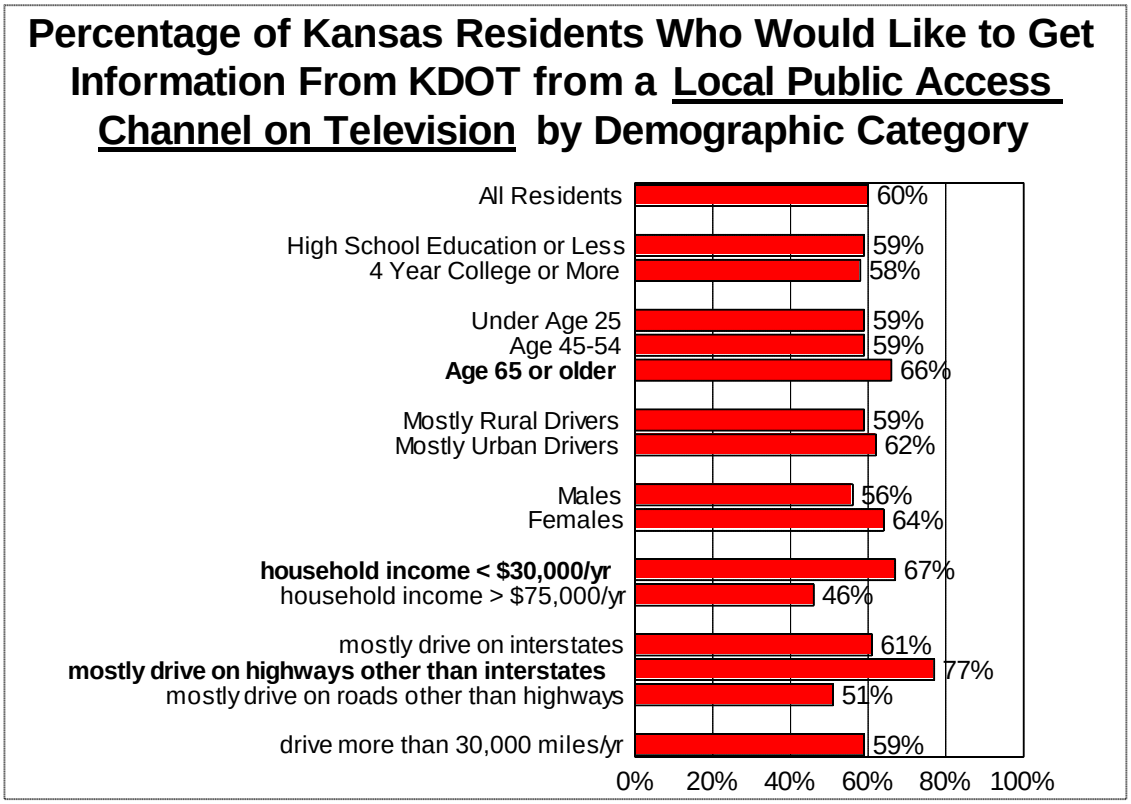
Overall interest in receiving information from KDOT via the radio was fairly uniform in all demographic categories with the exception of those ***who frequently travel on highways other than interstates***. Seventy-one percent (71%) of those who frequently travel on highways other than the interstate expressed interest in receiving information from KDOT via the radio compared to 59% for all respondents.



Interest in Receiving Information via PUBLIC ACCESS CHANNELS ON TELEVISION

Groups that are significantly more interested. More than three-fourths (77%) of Kansas residents who ***frequently travel on highways other than interstates*** are interested in receiving information from KDOT via public access channels on television. ***Persons with annual household incomes of less than $30,000*** and ***persons age 65 and older*** were also significantly more interested in getting information from television than other demographic groups.

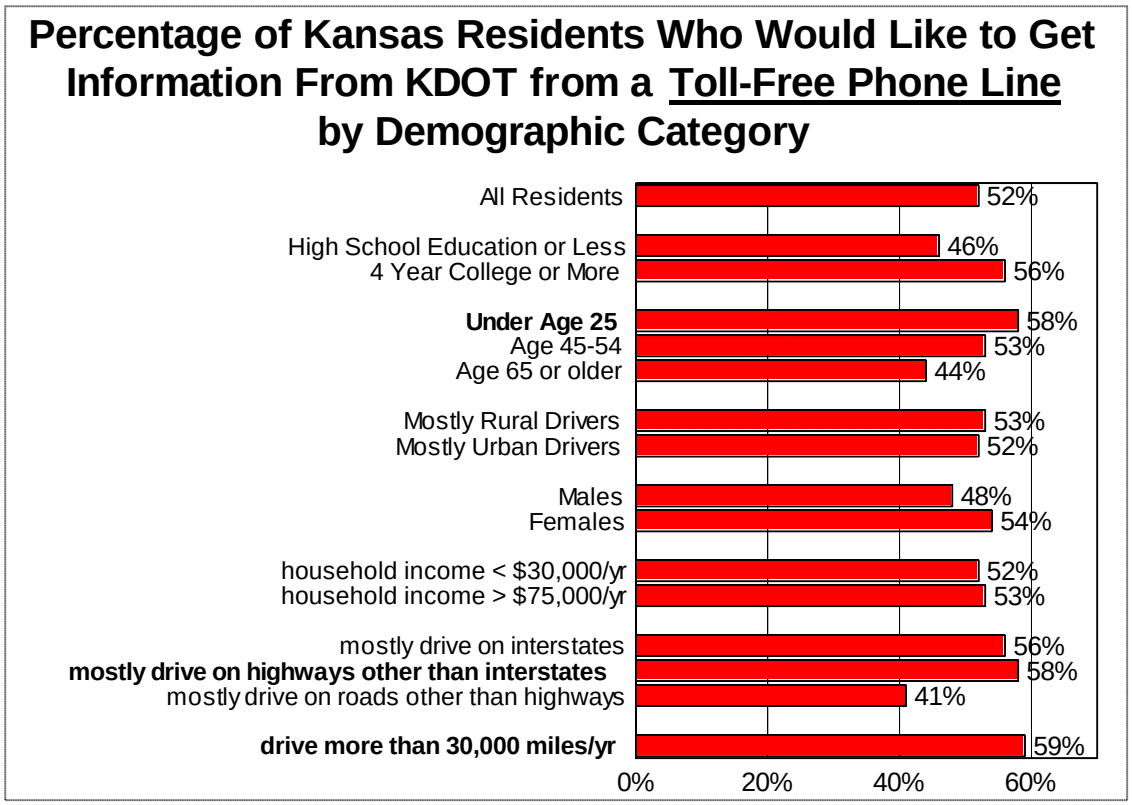
Groups that are significantly less interested. Those who live in households with ***annual incomes above $75,000*** and those who ***frequently do not drive on highways of any kind*** are significantly less interested in receiving information from KDOT via the television.



Interest in Receiving Information via a TOLL-FREE PHONE LINE

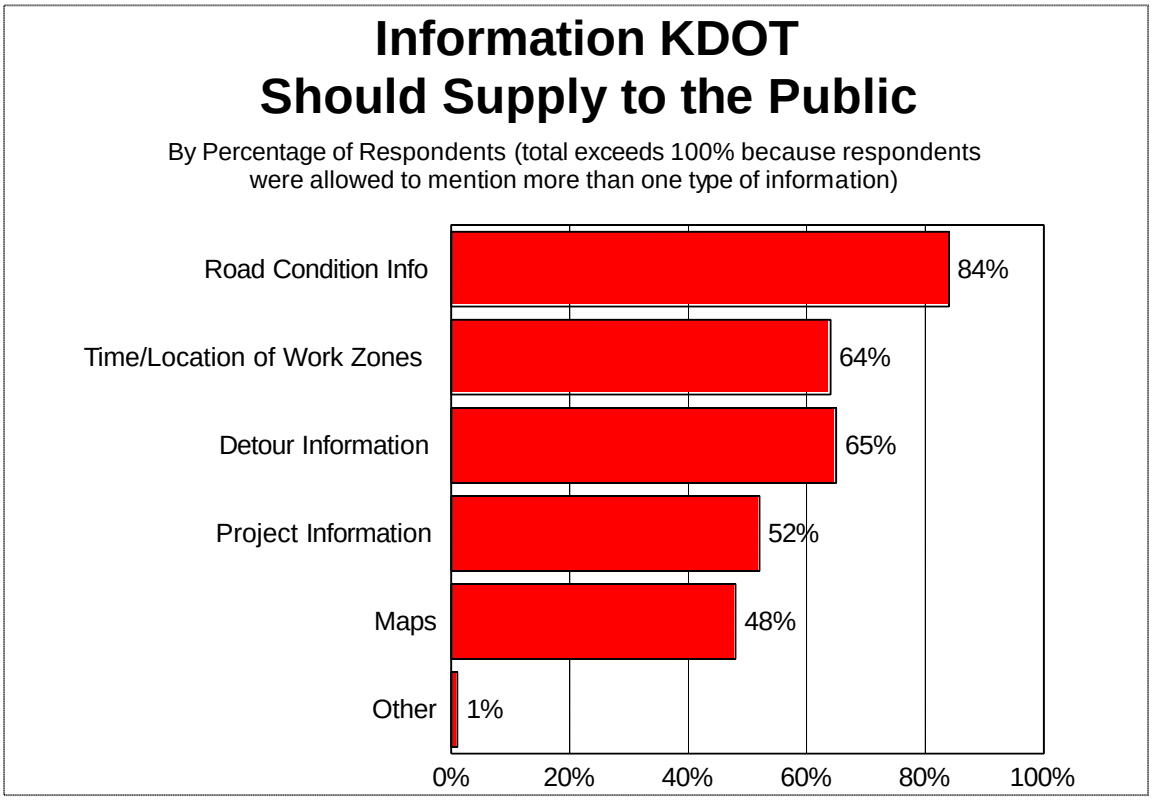
Groups that are significantly more interested. Kansas residents under ***age 25,*** those who ***drive more than 30,000 miles per year,*** and those who ***mostly drive on highways other than interstates*** are significantly more interested in using a toll-free phone line than other demographic groups.

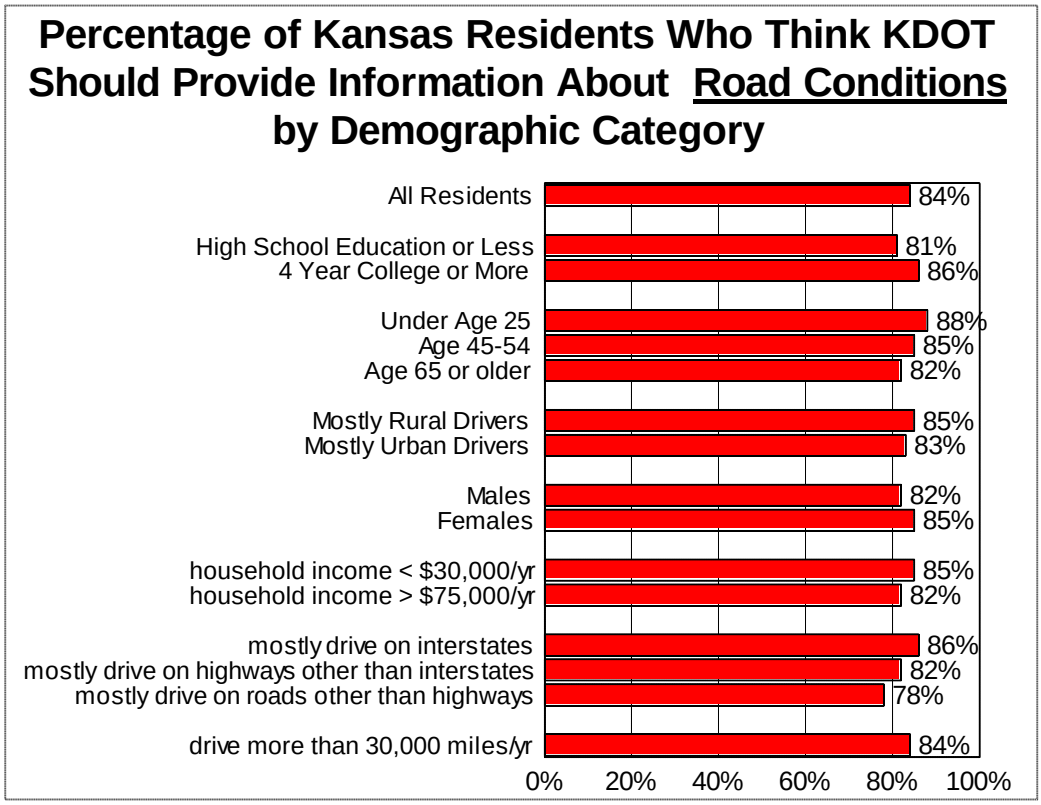
Groups that are significantly less interested. Kansas residents with a ***high school education or less, senior citizens (age 65 or older),*** and those who ***do not frequently travel on highways of any kind*** are significantly less interested in using a toll-free phone line than other demographic groups.

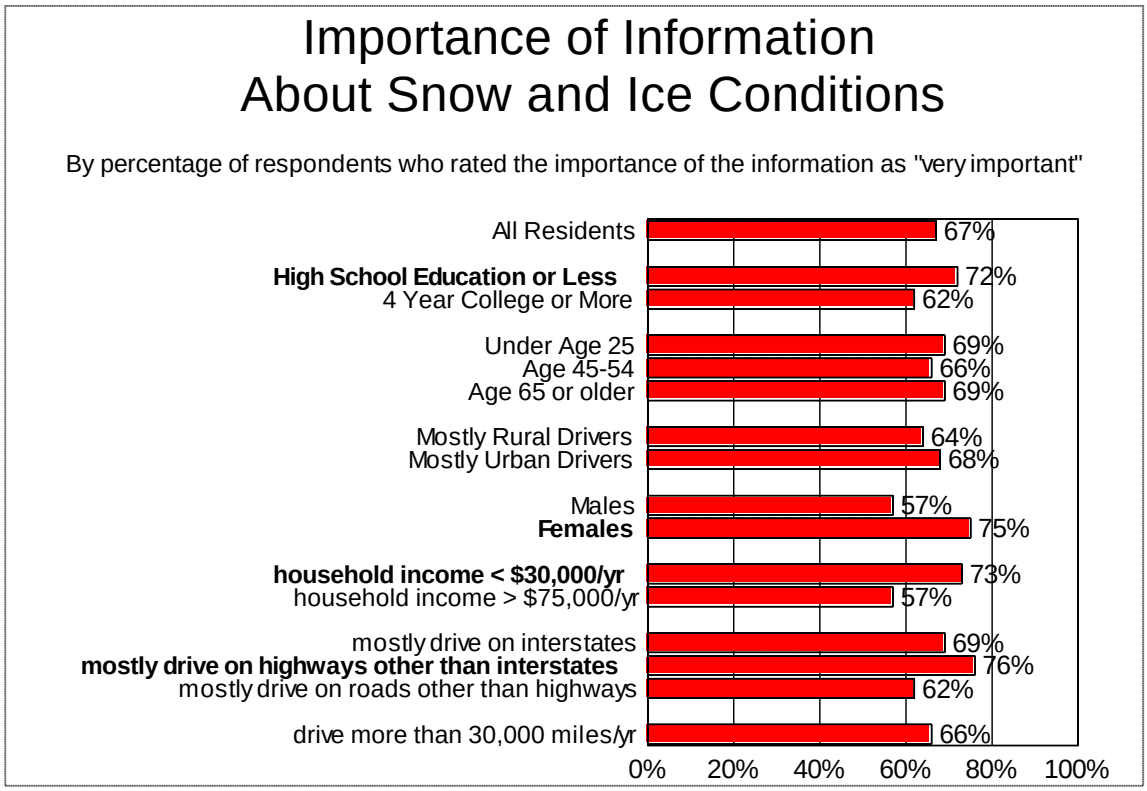


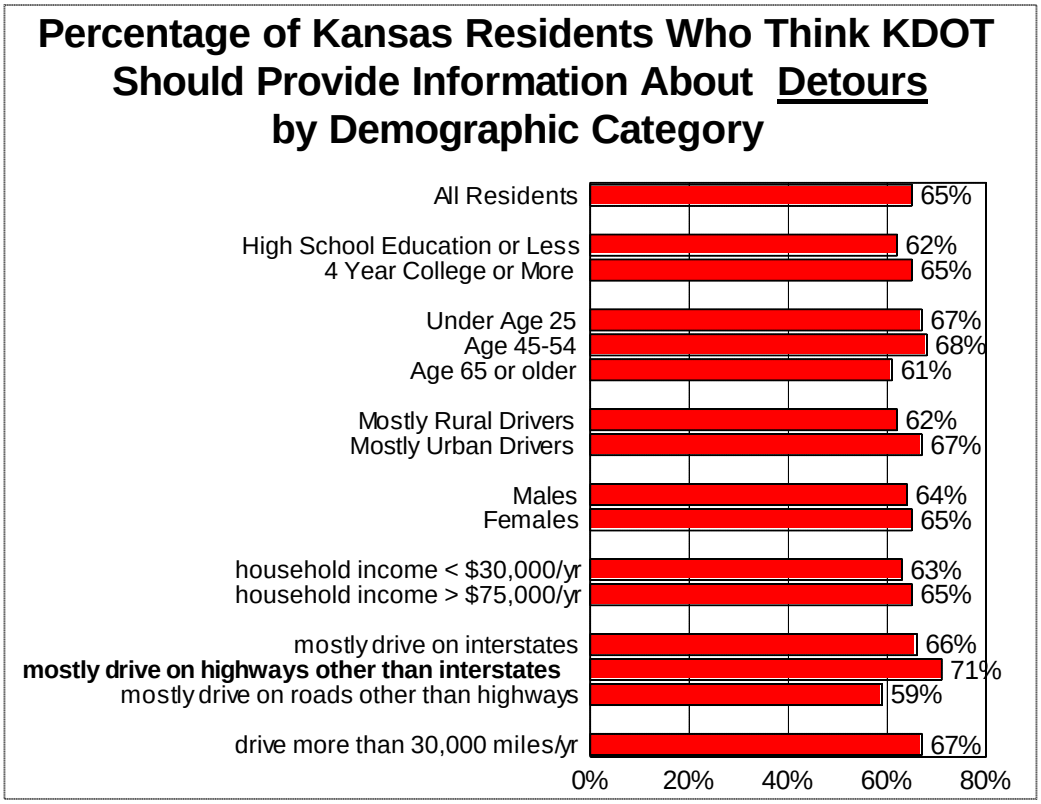
Types of Information Residents Would Like to Receive

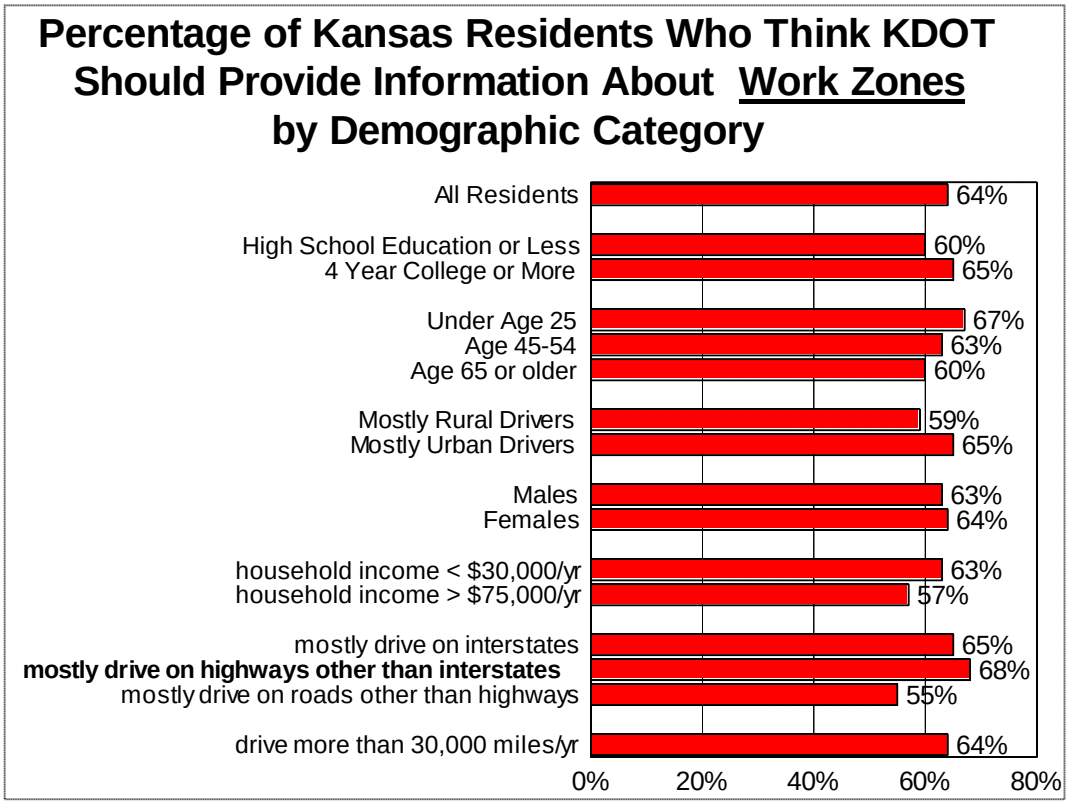
The following chart shows the overall level of interest residents have in receiving various types of information from KDOT. The charts on the subsequent pages show the level of interest in each type of information that KDOT could provide by demographic category.

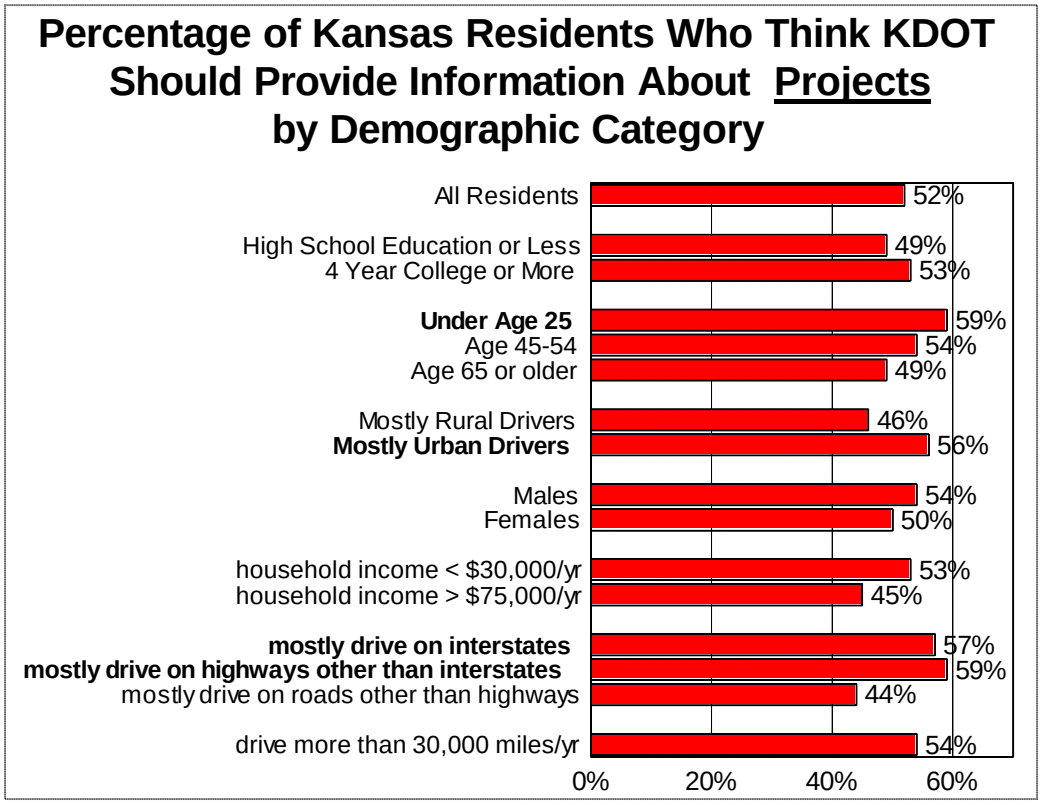

Information KDOT
Should Supply to the Public
By Percentage of Respondents (total exceeds 100% because respondents were allowed to mention more than one type of information)
Road Condition Info
84%
Time/Location of Work Zones
64%
Detour Information
65%
Project Information
52%
Maps
48%
Other
1%
0%
20%
40%
60%
80%
100%


Percentage of Kansas Residents Who Think KDOT Should Provide Information About Road Conditions by Demographic Category
All Residents
84%
High School Education or Less
81%
4 Year College or More
86%
Under Age 25
88%
Age 45-54
85%
Age 65 or older
82%
Mostly Rural Drivers
85%
Mostly Urban Drivers
83%
Males
82%
Females
85%
household income < $30,000/yr
85%
household income > $75,000/yr
82%
mostly drive on interstates
86%
mostly drive on highways other than interstates
82%
mostly drive on roads other than highways
78%
drive more than 30,000 miles/yr
84%
0%
20%
40%
60%
80%
100%


Importance of Information
About Snow and Ice Conditions
By percentage of respondents who rated the importance of the information as "very important"
All Residents 67%
High School Education or Less 72%
4 Year College or More 62%
Under Age 25 69%
Age 45-54 66%
Age 65 or older 69%
Mostly Rural Drivers 64%
Mostly Urban Drivers 68%
Males 57%
Females 75%
household income < $30,000/yr 73%
household income > $75,000/yr 57%
mostly drive on interstates 69%
mostly drive on highways other than interstates 76%
mostly drive on roads other than highways 62%
drive more than 30,000 miles/yr 66%
0% 20% 40% 60% 80% 100%


Percentage of Kansas Residents Who Think KDOT
Should Provide Information About Detours
by Demographic Category
All Residents 65%
High School Education or Less 62%
4 Year College or More 65%
Under Age 25 67%
Age 45-54 68%
Age 65 or older 61%
Mostly Rural Drivers 62%
Mostly Urban Drivers 67%
Males 64%
Females 65%
household income < $30,000/yr 63%
household income > $75,000/yr 65%
mostly drive on interstates 66%
mostly drive on highways other than interstates 71%
mostly drive on roads other than highways 59%
drive more than 30,000 miles/yr 67%
0% 20% 40% 60% 80%


Percentage of Kansas Residents Who Think KDOT Should Provide Information About Work Zones by Demographic Category
All Residents 64%
High School Education or Less 60%
4 Year College or More 65%
Under Age 25 67%
Age 45-54 63%
Age 65 or older 60%
Mostly Rural Drivers 59%
Mostly Urban Drivers 65%
Males 63%
Females 64%
household income < $30,000/yr 63%
household income > $75,000/yr 57%
mostly drive on interstates 65%
mostly drive on highways other than interstates 68%
mostly drive on roads other than highways 55%
drive more than 30,000 miles/yr 64%
0%
20%
40%
60%
80%


Percentage of Kansas Residents Who Think KDOT Should Provide Information About Projects by Demographic Category
All Residents 52%
High School Education or Less 49%
4 Year College or More 53%
Under Age 25 59%
Age 45-54 54%
Age 65 or older 49%
Mostly Rural Drivers 46%
Mostly Urban Drivers 56%
Males 54%
Females 50%
household income < $30,000/yr 53%
household income > $75,000/yr 45%
mostly drive on interstates 57%
mostly drive on highways other than interstates 59%
mostly drive on roads other than highways 44%
drive more than 30,000 miles/yr 54%
0%
20%
40%
60%

1.5 Baseline Summary and Statewide ITS Goals

This Baseline Condition Report has presented the current KDOT planning and implementation activities involving intelligent transportation systems in rural and urban Kansas. The baseline conditions were derived from a number of sources including a review of existing documentation, ITS Awareness Seminars at the six KDOT Districts Offices, interviews and meetings with KDOT personnel, and analysis of existing survey information. From the feedback given at the ITS Awareness Seminars and interviews and meetings with KDOT personnel, it is clear that KDOT's primary goals as an organization are to improve safety, security and mobility for users of the transportation system and increase the operational efficiency and productivity of the transportation system. From the analysis of the survey information, it is clear that KDOT's customers would like to receive better travel information regarding road conditions, construction work zones, detours and projects and they would like to have access to this information in a variety of ways. Through the development of an effective Statewide ITS Plan, KDOT can make progress towards achieving all of these goals.

A focus area of the Statewide ITS Plan will be rural applications. Also, in order to have a successful Statewide ITS Plan, this plan must be structured around goals for the statewide ITS system. These goals will complement KDOT's primary goal of increasing safety, security, mobility and efficiency. From analysis of the baseline conditions, the five major statewide ITS goals are to:

- Mainstream ITS into standard KDOT business procedure,
- Integrate existing ITS programs into the KDOT system,
- Continue to educate KDOT and the Kansas public on ITS alternatives and benefits,
- Identify potential ITS projects and funding sources, especially for rural areas, and
- Prioritize ITS project areas.

These statewide ITS goals will form the basis of the ITS Vision and Statewide ITS Plan for Kansas. As the Statewide ITS Plan is being developed, there will be a continued focus on ways to achieve these goals.

A few points must be discussed with respect to the KDOT goals, identification of initiatives, and understanding of existing infrastructure. KDOT would like to provide ITS applications across the state. While the majority of the citizens in Kansas live in or near the major cities, the state has more highways and freeways in rural areas than in the urban cores of Kansas City and Wichita. KDOT must identify how it will serve the rural population of Kansas, determine what ITS applications will provide the greatest benefit, and look at the architecture and infrastructure needs to allow a comprehensive system.

As illustrated in this Baseline Condition Report, Kansas has several initiatives for ITS and telecommunication applications. Additionally, coordination with the Missouri

Department of Transportation (MoDOT) will play an integral role in the implementation of ITS in Kansas City. While it would be beneficial for all of these initiatives, programs, and networks to include each other in the planning stages, it is unlikely that this level of cooperation and inclusion exists. Furthermore, it is unlikely that all ITS systems or networks are designed with exactly the same system architecture. It is not necessary for each program or network to have exactly the same architecture; however, it is important that they all conform to an open and flexible architecture that recognizes the needs of each project and allows for coordination between different projects, initiatives and programs. This open architecture will allow for interoperability between existing and planned networks.

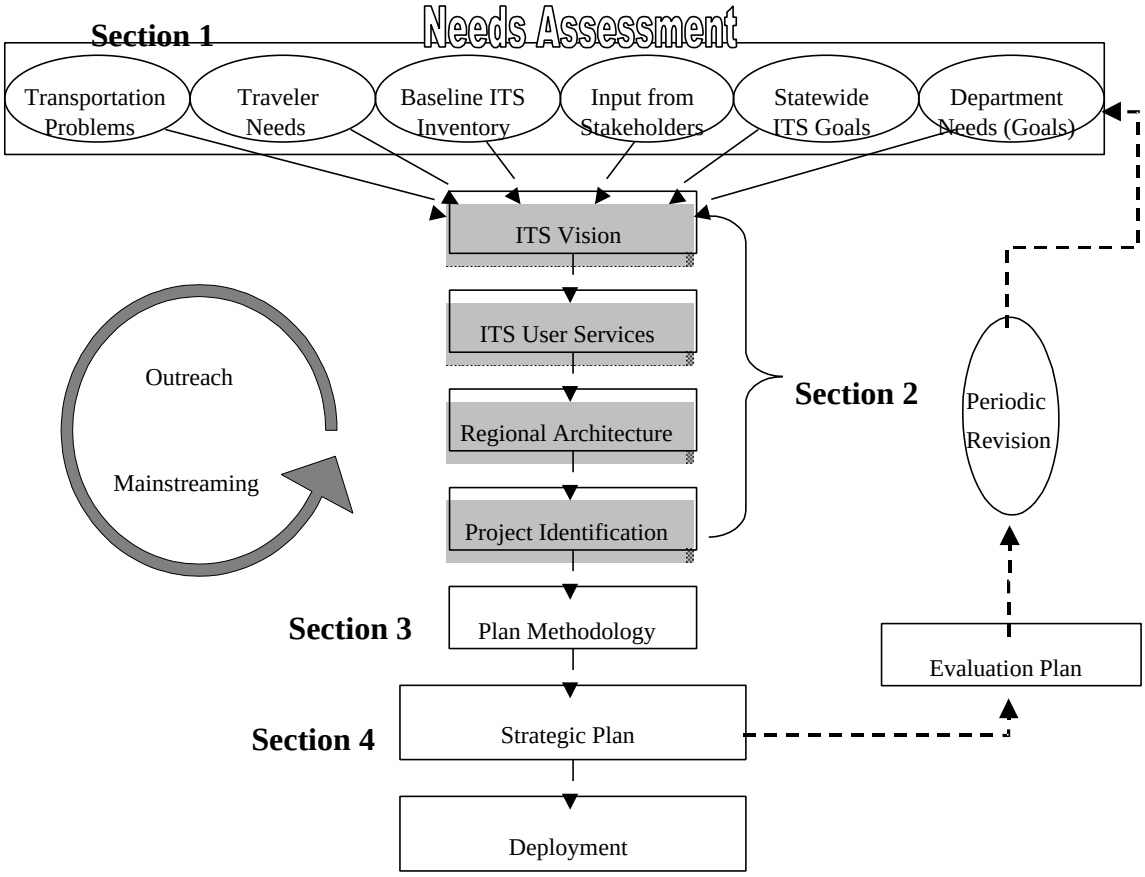
Section 2: Analysis of ITS Elements

2.0 Introduction

Objective

The objective of the Analysis of ITS Elements is to define an ITS vision, develop a regional architecture and identify potential ITS projects for Kansas. Figure 2.1 shows a flow chart of the process that was used to develop the Statewide ITS Plan for Kansas. The needs assessment phase, which can be seen in the top box of figure 2.1, has been completed and documented in the Baseline Condition Report (Section 1 of the Statewide ITS Plan). As shown shaded in figure 2.1, this section of the Statewide ITS Plan includes defining an ITS Vision, screening ITS user services for potential ITS projects, developing a regional architecture, and identifying projects. These steps have been completed and the results are presented in this section (Analysis of ITS Elements). Section 3 presents a methodology for identifying and tracking future ITS projects and Section 4 presents a strategic plan for deploying ITS in Kansas.

Figure 2.1: Kansas Statewide ITS Plan Flow Chart



Kansas ITS Vision

The Kansas ITS Vision was developed based in part on the results of the Baseline Condition Report. This report synthesized input gathered from stakeholders, KDOT Districts and Kansas travelers to determine Kansas' transportation problems and needs. The vision defines what the statewide ITS system will look like in 20 years. The vision states that Kansas ITS will be an open, integrated and cost effective system that ensures safer, more secure and efficient movement of people and goods across Kansas through the use of advanced technologies and management strategies. This vision will guide the Kansas ITS planning process for the next 20 years.

The next sections of this document include a discussion of project development, state to state coordination and regional architecture with respect to ITS in Kansas. Next, the document presents a discussion of the major ITS program areas with respect to interagency coordination, system architecture, telecommunications needs, operating costs, cost-benefit analysis, and public/private partnership opportunities. The Kansas Statewide Architecture is discussed, followed by recommendations to mainstream ITS into KDOT business. Finally, the document concludes with a summary and discussion of the Kansas ITS vision and recommendations to achieve this vision.

2.1 Project Development

Potential Kansas ITS projects were developed through numerous interviews with key personnel in KDOT Bureaus and by soliciting projects at the KDOT ITS Steering Committee meetings. This list of projects will continue to evolve as new projects are identified and existing ones are modified.

Appendix G of this document includes over 50 potential projects involving ITS that were identified for Kansas. Each project is presented in the same format following the Kansas ITS project form located in Appendix F. The projects are stored in an Access database called the Kansas ITS (KITS) Database.

Kansas ITS Project Form

The project form used to identify and track projects for the Kansas Statewide ITS Plan is presented in Appendix F. The purpose of developing the project form was to establish the standard information that needs to be collected for each project involving ITS in Kansas. Having the projects documented in a consistent format ensures that the same pertinent information is being collected for each project and allows the projects to be stored in a database format. Appendix F also includes a companion sheet, which accompanies the project form. The purpose of the companion sheet is to explain each of the data fields on the project form in greater detail and to provide guidance to whoever is completing the form.

The project form includes seventeen pieces of information related to each ITS project. Each project sheet begins with the project name, owner and description. Project name and its description are self-explanatory. The owner of the project should be the project's major stakeholder or somebody who is firmly backing the project.

The next pieces of information on the form are the ITS group and identification number (i.e. "KITS ID"). The projects have been grouped into the following four areas under the heading “ITS Group”:

1. Rural
2. Urban
3. CVO
4. Telecommunications

The projects have also been assigned a unique identification number, referred to on the form as the KITS ID. The KITS ID is a unique identification number that is assigned to each project by the ITS Unit. It is a five digit number with the first number representing the ITS group (1 to 4) that the project falls under. The last number follows a dash and is only used for projects that are closely related. This system enables a logical grouping of projects and ensures that no two projects will have the same KITS ID.

The next data item on the form is for the advisory project team. This is the group of people or agencies that will act as the main resources for the project. After project team comes ITS user services or functional areas. This is used to further categorize the project beyond ITS group.

The next three data items are things that need to be considered when designing or implementing the project. These considerations relate to interfaces, telecommunications and design issues. The next piece of information on the form is the deployment timeline, which estimates when the project will start and be completed.

Estimated costs and expected areas of benefits are the next items on the form. Estimated costs for the projects were derived from equipment costs given in the National Architecture and experience from other deployments. Expected benefits could be in the areas of safety, travel time, customer satisfaction, cost savings, throughput or environmental.

Funding sources indicate how the project will be funded. Type of project could be either a planning study, technology assessment, new deployment or deployment expansion. Project status and a completion date are the last items on the form. These items will need to be updated frequently as the project progresses.

Kansas ITS Project Database

Projects involving ITS in Kansas, including those in Appendix G, are being stored in an Access database. This database, which is called the Kansas ITS Project Database, provides easy sorting and querying capabilities. This tool can be used to track the status of all Kansas projects involving ITS. It will be maintained and updated as new projects are identified or existing ones are modified. The database is also flexible enough to allow for changes to the project form if the need arises.

When maintained as part of the statewide planning process, this database will provide a useful tool for tracking the status of ITS projects and the availability of ITS infrastructure deployed within the state. The project forms may then be used in assessing each project's conformance with the ITS architecture. This capability will be useful in planning various projects and making updates to the architecture, when necessary.

2.2 State to State Coordination

A key issue that should be considered in the development of the Kansas Statewide ITS Plan is the value of cooperation with other states. Significant benefits can be achieved by forming multi-state alliances for the deployment and operation of ITS. One of these benefits would be having consistency and/or integration across state lines with regard to ITS. This is especially important for Commercial Vehicle Operations (CVO) and Advanced Traveler Information Systems (ATIS). Multi-state alliances are necessary when metropolitan areas are near state lines. In Kansas, this type of alliance is seen in the Kansas City Scout Project. KDOT is working closely with MoDOT in the design and operation of a freeway management system.

The rest of this subsection discusses actions that should be taken by Kansas to ensure cooperation with other states. The primary ITS program areas that are candidates for interstate collaboration are ITS/CVO, ATIS and a shared Traffic Management System in the Kansas City metropolitan area called Scout. This subsection concludes with a discussion of ITS Heartland, a regional chapter of ITS America that includes Kansas, Missouri, Iowa and Nebraska.

Commercial Vehicle Operations

Many of the ITS/CVO applications that are being considered for implementation in the Kansas CVO Business Plan require cooperation with other states. For instance, Kansas agencies responsible for enforcing commercial vehicle operations must be able to communicate with similar agencies from other states to enable nationwide access to credentials and safety information for administration and enforcement functions. It is also important for neighboring states to use compatible ITS/CVO systems so that truckers can travel freely from state to state without needing multiple systems (e.g. transponders). There is a national initiative called Commercial Vehicle Information Systems and Networks (CVISN) aimed at establishing standards for these types of systems and interfaces.

Aside from complying with the CVISN standards, multi-state cooperation requires identifying and coordinating with the key CVO contacts in other states. These contacts may be affiliated with the following types of agencies: Departments of Transportation, Departments of Revenue, state police, motor carrier associations, and corporation commissions. The ITS and/or CVO coordinators from other states' DOTs are the primary contacts for state to state coordination and they are provided in table 2.1.

With regard to ITS/CVO activities, Kansas has been successful in coordinating with other states in a number of different ways. First of all, Kansas has attended numerous CVISN training courses and workshops with a number of other states exchanging information on its plans for CVISN deployment. Kansas has also been involved in the development of a regional CVO Business Plan for Kansas and surrounding states. It is important for a

successful Statewide ITS Plan that Kansas continues to remain active in its ITS/CVO cooperation with other states.

Advanced Traveler Information Systems

Traveler information regarding road and weather conditions is another ITS service shared across state lines. For instance, it may benefit people traveling from eastern Colorado to Kansas to have advanced warning of weather conditions in western Kansas. This information could be communicated to motorists via a variable message sign or highway advisory radio installed near the border. Information can also be provided to a traveler en-route via kiosks installed at rest areas and other locations convenient to the interstate. Another information sharing activity would be having a link on the KDOT traveler information web site to the Colorado DOT traveler information web site (and vice versa) to allow easy access to multi-state traveler information.

The ITS coordinators from other state DOTs are the primary contacts for advanced traveler information. These contacts are listed in table 2.1. Other agencies to contact regarding traveler information may include state police in other states and local transportation agencies near state borders (in Kansas as well as other states).

Traffic Operations Center in Kansas City

Kansas City is a major metropolitan area that covers both sides of the Missouri-Kansas state border. Currently, there is a bi-state partnership between Kansas and Missouri to develop a shared Traffic Management System called Scout. The TOC will be located in Lees Summit, Missouri and will be operated and maintained by MoDOT personnel. It will be used to monitor and manage traffic conditions on freeways in both Missouri and Kansas. Key contacts for the Kansas City Scout project are provided in table 2.1.

ITS Heartland

ITS Heartland is a regional chapter of ITS America that is made up of the states Kansas, Missouri, Iowa and Nebraska. The organization has representatives from transportation agencies, private consulting firms, product vendors and universities. The purpose of this organization is to increase interregional coordination between the member states on ITS-related projects and research. This includes performing pooled fund studies, sharing ITS data and ensuring interoperability between ITS systems. In the future, ITS Heartland may incorporate other neighboring states such as Oklahoma, Arkansas and South Dakota. The kick off meeting for ITS Heartland is scheduled for the spring of 2000.

Table 2.1: ITS Contacts in Neighboring States

Name	Agency Affiliation	Responsibility	Telephone
Sabin A. Yanez	MoDOT	KC Scout	(816) 889-6450
Dale Ricks	MoDOT	KC Scout	(816) 889-6301
Steven L. Worley	MoDOT	KC Traffic	(816) 889-6421
Rick Bennett	MoDOT-Traffic	Statewide ITS	(573) 526-4842
Bruce Baldwin	FHWA-Kansas Division	FHWA resource	(785) 267-7284
Bob Thomas	FHWA-Missouri Division	FHWA resource	(573) 636-7104
Milo Cress	FHWA-Nebraska Division	FHWA resource	(402) 437-5977
Max Grogg	FHWA-Iowa Division	FHWA resource	(515) 233-7323
Ron Achelpohl	Mid American Regional Council (MARC)	MARC	(816) 474-4240
Norm Schemmer	Mid American Regional Council (MARC)	MARC	(816) 474-4240
Tom Ryan	MoDOT	St. Louis ITS (Gateway Guide)	(573) 526-0124
Bill Stone	MoDOT	Rural ITS/CVO	(573) 526-0120
Sharon Anderson	Iowa DOT	ITS/CVO Contact	(515) 237-3214
Jim Pearson	NDOR	ITS/CVO Contact	(402) 479-4881
Alan Stevenson	ODOT	ITS/CVO Contact	(405) 521-2861
Jim McGee	NDOR	ITS/CVO Contact	(402) 479-3812
Vacant	CDOT	ITS/CVO Contact	(303) 512-5807
Dennis Burkheimer	Iowa DOT	RWIS Contact	(515) 239-1355
Alan Trampe	MODOT	RWIS Contact	
Dave Frazier	CDOT	RWIS Contact	
Tim Hughes	Oklahoma	RWIS Contact	(405) 325-2541
Dalyce Ronnnau	NDOR	RWIS Contact	
Craig Markley	Iowa DOT	ITS Contact	(515) 239-1027
Tim Crouch	Iowa DOT	ITS Contact	(515) 239-1513

2.3 What is an ITS Architecture?

An ITS architecture provides the framework of an ITS system outlining how the individual ITS components, whether an element or an agency, communicate together and work with the other components of a transportation system. The purpose of developing a Kansas Statewide ITS architecture is to define the coordination of ITS applications in Kansas and its fit within the KDOT organizational structure and physical infrastructure. Moreover, the process of developing an ITS architecture can be helpful in planning for ITS deployment, conserving previous ITS investments, and identifying areas where standards are needed.

Standards

Developing an ITS architecture provides a sound basis for identifying where ITS standards are needed. The USDOT has undertaken a large effort to facilitate development of standards for communication between different ITS components. A number of standards have already been completed and many more are currently under development. Having these standards in place will enable users to purchase ITS products and services from a range of competitive providers and not get locked into a single one. Furthermore, ITS standards allow for system integration and interoperability. Finally, it should be noted that as these standards are adopted by USDOT, states will be required to comply with them in order to receive federal funding.

In addition to standards developed by various standards development organizations, many emerging ITS technologies are moving towards informal, de facto standards associated with their deployment. Kansas should investigate these informal standards that have been established and explore opportunities to promote their development. This will maximize the integration opportunities and minimize the possibility of Kansas deploying stand-alone technologies.

Kansas Statewide ITS Architecture

The Kansas Statewide ITS architecture encompasses the ITS applications and interfaces in Kansas. These include the ITS applications described in the Baseline Condition Report such as the traffic operations centers being designed in Kansas City and planned in Wichita, advanced traveler information systems, fleet management systems using AVL and ITS for commercial vehicle operations. The unique architectures for each of these systems are discussed in section 2.4. The statewide architecture, which ties all of these systems together, is presented in section 2.5.

2.4 Program Areas

Appendix G provides a number of ITS projects that were identified for possible implementation in Kansas. Since many of these projects are similar in nature and scope, it makes sense to group "like" projects into program areas so that they can be analyzed together and recommendations developed. The program areas were created to encourage a more integrated approach to ITS deployment in Kansas. It should be noted that some projects might fall under more than one program area. The five program areas that will be used to analyze Kansas ITS projects are:

- Priority Corridors
- CVO
- Maintenance
- Traffic Operations
- Rural Safety and Mobility

Some of the issues addressed in these program areas include 1) interagency coordination, 2) system architecture, 3) telecommunications needs, 4) operating cost analysis, 5) benefit/cost analysis and 6) public private opportunities. This section provides a description of each program area and how the six issues mentioned will be addressed in the Statewide Plan.

The benefit/cost analysis sections for each of the program areas provide a comparison of the anticipated level of benefits and costs that would be experienced by deploying the different project areas. Many of the projects are in the conceptual stage and it would be problematic to forecast potential benefits resulting from project deployment. Many other projects include technology assessments (i.e., pilot tests) that would result in less than the full expected benefits as the components would only be deployed in a limited number of scenarios. Therefore, the benefit/cost section is not intended to provide a comprehensive benefit/cost analysis of all the individual projects. Instead, this section presents the relevant findings and experiences of other states and regions, which have deployed similar ITS improvements. The types of benefits (e.g., travel time, safety, agency cost savings, etc.) are identified for each program area along with a discussion of the magnitude of benefits to provide an estimate of the range of impacts that may be potentially experienced in Kansas.

Priority Corridors Program Area

This program area includes rural ITS projects that can be grouped on a specific corridor. Priority corridors in Kansas may include I-35, I-70, US 400 or US 54. Some of the ITS applications that are being considered for corridors include advanced traveler information systems (ATIS), weigh-in-motion (WIM) and fiber optic communications. Because of the wide variation in application characteristics found among the projects that fall into this program area, ATIS applications are taken as an example in discussing the following issues.

Interagency Coordination

Part of the ITS Statewide Plan is to clarify the roles and responsibilities of the different agencies and organizations, and the interactions among them. This can range from an unstructured agreement between agencies to cooperate on ITS deployment to more ambitious plans involving sharing of common systems or an agreement on data exchange. The agencies involved in a corridor ATIS program include KDOT, KHP, Kansas Department of Commerce and Housing (Tourism Division), Kansas Turnpike Authority (KTA), local transportation agencies, emergency service providers, National Weather Service (NWS), television and radio stations, and other state agencies. Agencies such as KDOT, KTA, KHP, NWS and Kansas Department of Commerce and Housing would gather traveler and tourism information and send it to the Statewide Operations Center where it can be processed. KDOT could then process the data at the Center and send it on to the traveling public and other agencies. Other agencies that may use the data include local transportation agencies, emergency service providers, television and radio stations, and other state agencies. In some instance, the collected data will be archived for future use by planning agencies.

There will also be private entities involved in the ATIS program that need to be involved in the interagency coordination. These include information service providers such as Data Transmission Network (DTN) which provides real-time weather information to traveler information centers and rest areas along a given corridor. In the future, other information service providers could be involved in the ATIS programs as part of a public/private partnership. KDOT needs to develop a policy on how the data will be provided to these outside entities.

System Architecture Definition

The ATIS architecture in Kansas is a good example of how developing an ITS architecture can eliminate redundant, stand-alone systems and provide a more integrated system. As discussed in the Baseline Condition Report, there are a number of ongoing projects in Kansas involving traveler information. There is the DTN kiosk project, the Road Condition Reporting System (RCRS), the statewide RWIS network, and the 1-800 KDOT Traveler Information Hotline. There are also ways of providing traveler information to the traveling public such as television and radio broadcasts and the Internet. Currently, all of these ATIS applications are acting independently of each other.

Conceptual Architecture

Figure 2.2 shows a conceptual architecture for traveler information for corridors in Kansas. The architecture includes a central ATIS Center, which would integrate ATIS data collected from the information sources and then have it redistributed throughout Kansas. The development of a central ATIS Center as part of a Statewide Operations Center is one of the potential ITS projects being considered in The Kansas Statewide ITS Plan.

Figure 2.2: ATIS Architecture for Corridors

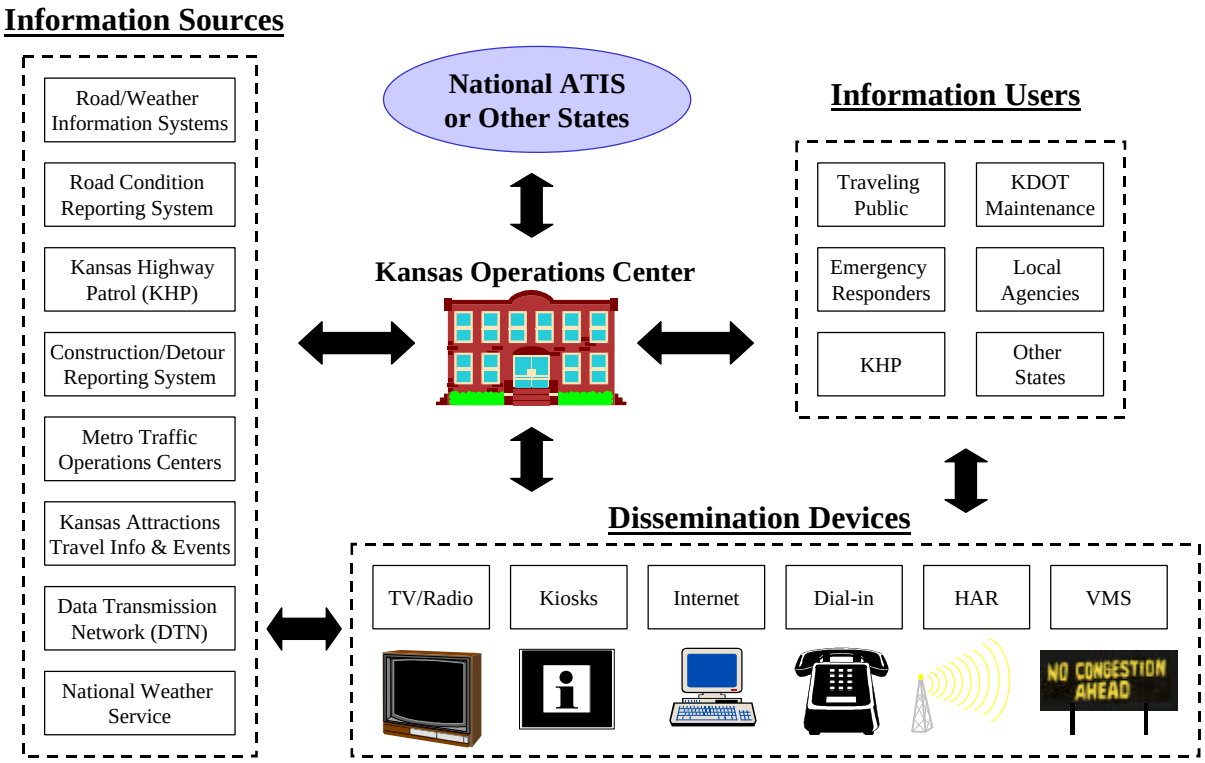


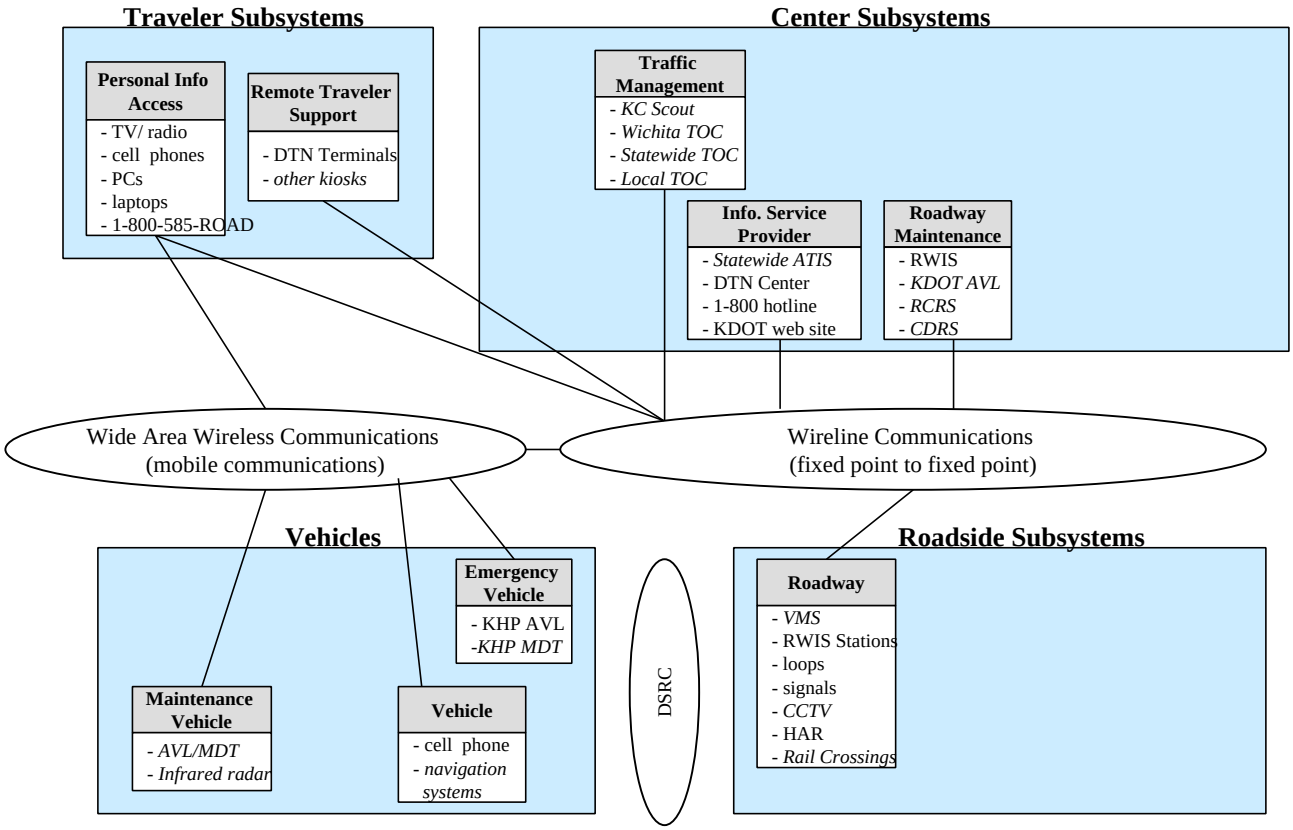
Figure 2.2 shows how traveler information could potentially flow from different sources to various users. Information collected at each source would be sent to the ATIS Center where it would be integrated with data from other sources. This may involve having full-time ATIS operators and a master ATIS computer system to track the ATIS data. The system operators would perform data validation at the Center to insure that the information is consistent and accurate before it is sent to the public. After the data has been validated, the operators would determine which data would be disseminated to the public and which mode of communication would be used. The architecture also allows for an interface between the Kansas ATIS Center and a National ATIS Center or ATIS Centers at neighboring states.

An example of traveler information dissemination would be a VMS that informs the public of travel conditions on I-70. In this example, I-70 travel information is collected from RWIS sensors, the RCRS, CDRS, KHP patrols and the National Weather Service and sent to the ATIS Center where it can be analyzed and validated. Operators at the ATIS Center would be able to access all of this data on the master ATIS system and then determine which message to display on the VMS. The statewide fiber optic backbone can be used for communication between the ATIS Center and the VMS sign located on I-70.

Mapping to the National Architecture

The National ITS Architecture separates the different ITS subsystems into four categories: traveler subsystems, center subsystems, vehicle subsystems or roadside subsystems. The different Kansas ATIS components can be mapped into these subsystems as shown figure in 2.3, which depicts an ITS architecture for ATIS in Kansas. The figure shows each subsystem linking to another subsystem by one of the following modes of communication: wide area wireless, wireline, or dedicated short-range communications (DSRC). Certain components in figure 2.3 such as the Statewide Operations Center, RCRS, VMS and RWIS correspond with the I-70 VMS example given in the previous section.

Figure 2.3: Kansas ATIS Architecture Mapped to National Architecture



In figure 2-3, travel information is collected from RWIS sensors and CCTV (roadway subsystem), the RCRS (roadway maintenance subsystem), KHP patrols (emergency vehicle subsystem), KDOT maintenance patrols (maintenance vehicle subsystem) and is sent to the ATIS Center (information service provider subsystem) where it is analyzed and validated. Operators at the Statewide Operations Center then send a message to be displayed on a VMS (roadside subsystem). The maintenance subsystem would also use the RWIS data to help plan winter maintenance activities. The maintenance subsystem functions are explained further in the Maintenance Program Area section.

Market Packages and Architecture Flows

The National Architecture includes 63 market packages. Market packages provide an accessible, deployment-oriented perspective to the national architecture. They are tailored to fit real world transportation problems and needs. Market packages identify the pieces of the physical architecture that are required to implement a particular transportation service. Architecture flows are the information that is exchanged between subsystems within the physical architecture.

There are three market packages being considered for implementation in Kansas that would fall under the Priority Corridors Program Area. They are

- Broadcast traveler information,
- Interactive traveler information, and
- Traffic and road condition information dissemination.

Figures 2.4 - 2.6 show information flow diagrams for each of these market packages. These diagrams illustrate the specific architecture flows between the subsystems indicated in figure 2.3.

Figure 2.4: Broadcast Traveler Information Architecture Flows

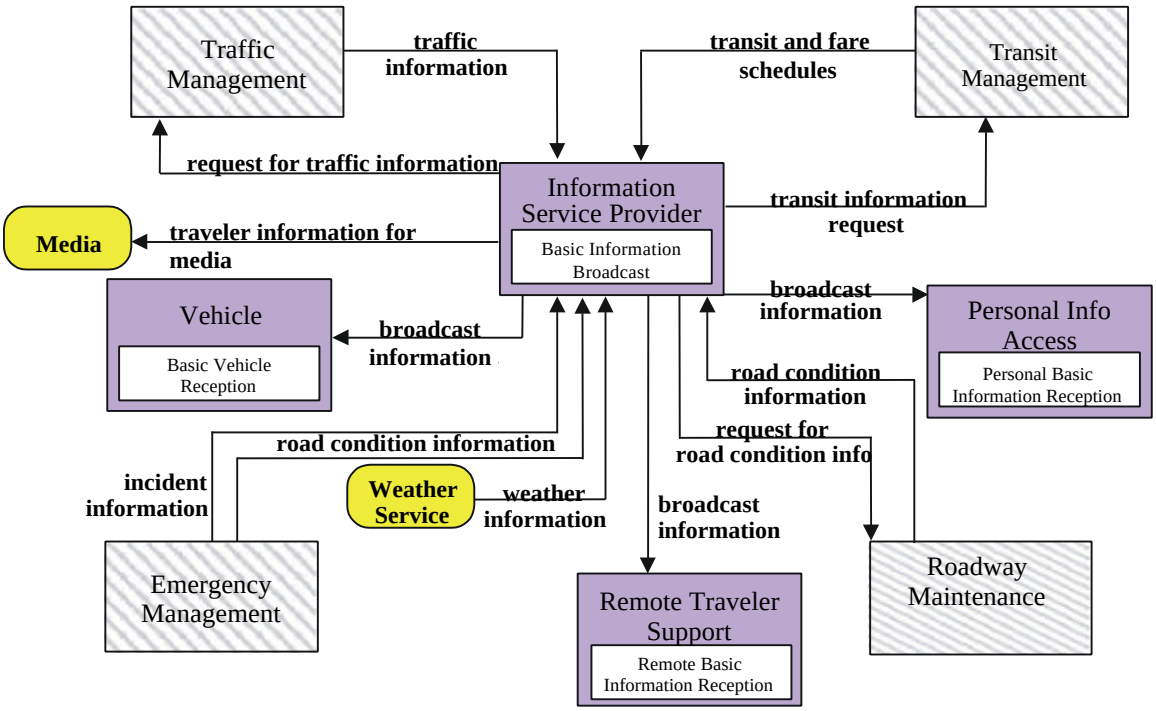


Figure 2.5: Interactive Traveler Information Architecture Flows

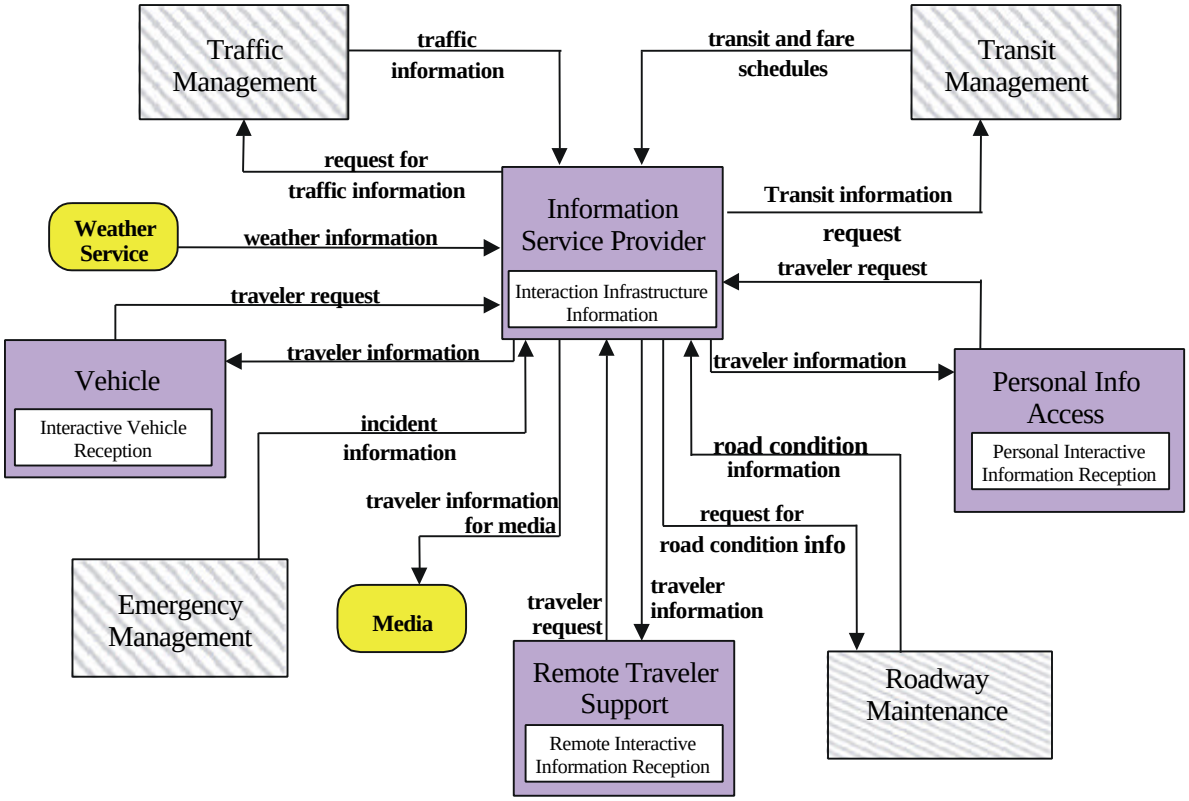
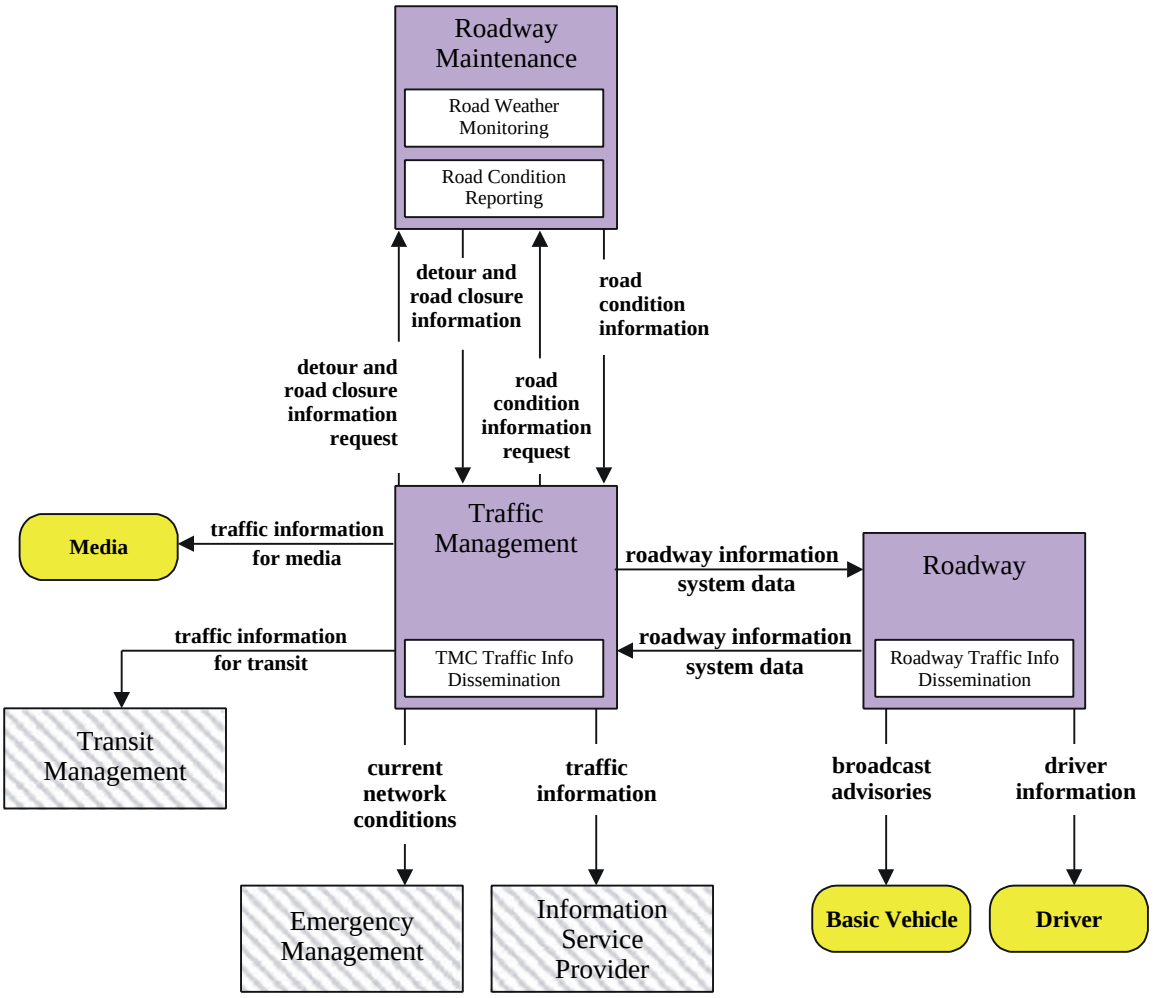


Figure 2.6: Traffic and Road Condition Information Dissemination Architecture Flows



The ATIS architecture described here is just one piece of the Kansas Statewide ITS Architecture. The Kansas Statewide Architecture represents many of the potential ITS components in Kansas including AVL, the Kansas City and Wichita TOCs and the ITS/CVO systems. Like ATIS, each of these other components will also have their own unique architecture but it is the Statewide Architecture that shows how all of the ITS components interrelate with each other and non-ITS elements. The Statewide Architecture is presented in Section 2.6.

Telecommunications Needs

Using Figure 2.2 as a model for ATIS architecture, a variety of telecommunications resources will be required to connect the Kansas ATIS Center to information sources, information users, and dissemination devices. These telecommunications resources include optical fiber, leased telephone lines, 800 MHz and microwave radio, cellular/PCS, WAN/LAN, and satellite systems.

Optical Fiber

KDOT has entered into a shared resource agreement with Digital Teleport, Incorporated (DTI) out of St. Louis, Missouri. This agreement provides KDOT with free bandwidth in exchange for providing DTI with free use of KDOT right of way. DTI is in the process of installing conduit and optical fiber along I-70 from Kansas City to the Colorado border and I-135 from Salina to Wichita. Any of the information sources, information users, or dissemination devices that will have fixed endpoints or located near a hand hole in the optical fiber backbone, will be able to utilize the optical fiber for transport of control messages and information if desired. Advantages of using the optical fiber backbone include the elimination of monthly recurring access telephone charges and the requirement of potentially large amounts of bandwidth to transmit video images.

Information sources, such as RWIS and the Kansas Attractions - Travel Information and Events (KATIE) database, information users, such as local agencies, and dissemination devices, such as TV/radio, kiosks, Internet, HAR and VMS, will have endpoints/devices located along priority corridors. Although the bandwidth requirements for these endpoints are typically quite small, typically 9.6 to 56 Kbps, they could still utilize the optical fiber. Attaching these endpoints to the optical fiber would eliminate the need for monthly recurring access telephone connections.

Transmission of video images requires a large amount of bandwidth. For example, a single video image could require bandwidth anywhere from 1.5 to 45 Mbps, however, it is anticipated that the video transmission system will be designed such that images will be compressed to allow for greater throughput and reasonable signal quality. Any information source, information user, or dissemination device transmitting video images will require a large bandwidth and hence, the use of the optical fiber backbone. For example, Metro TOCs will be collecting video images that may be required at the ATIS Center. As such, the interconnection between the Metro and ATIS Center will require utilization of the optical fiber link, or the use of bandwidth in the Kansas City Metro Area to extend connectivity from the metro TOC to the Statewide TOC.

Telephone Lines

When the information source, information user, or dissemination device endpoints or devices are not near hand holes or access points in the optical fiber backbone route, leasing telephone lines is an option for interconnection. The cost to connect a distant endpoint to the optical fiber backbone will be considerable when compared to the cost to lease a telephone line, unless the data rate required is significant. On a case-by-case basis, should an application with a large bandwidth requirement arise, it would be possible to justify extending the optical fiber backbone to that endpoint or device.

800 MHz Radio

Because of the public safety and often-remote nature of their responsibilities, both RCRS and KHP will utilize the 800 MHz radio system. The 800 MHz radio system would be used to connect the trooper or maintenance worker to a dispatcher. This dispatcher may be co-located with a District Office, or may be connected via 6 GHz microwave backbone to the District Office. It is this District Office that would be connected to the Kansas ATIS Center. Initially, the connection between the District Office and the ATIS Center may be a leased telephone line; ultimately, this will be an extension of the optical fiber backbone or use of a portion of the bandwidth.

The 800 MHz radio system is designed to be a medium for point to multi-point voice communications. It is not intended to connect devices for data communications. As such, 800 MHz radio will not and cannot be used to connect the ATIS Center to dissemination devices at this time.

Cellular

Cellular systems may be used to connect RWIS, KHP, KATIE, and all information users to the ATIS Center. Cellular solutions will work well in metropolitan areas. Unfortunately, rural areas of Kansas do not enjoy the same level of coverage as metropolitan areas and cannot rely upon the availability of cellular coverage at this time.

Cellular Digital Packet Data (CDPD) is another option for transmitting data over cellular links. This might prove useful for information sources, such as RWIS and KATIE, and dissemination devices such as kiosks, Internet, HAR, and VMS once CDPD is deployed over a larger area. Currently, CDPD is not available anywhere in Kansas.

WAN/LAN

WAN/LAN network structure will be required for all of these information sources, information users, and dissemination devices to transmit, manipulate, and access data from any location. This is intrinsic for the systems to work, and must be carefully planned and developed using the available resources (staff, systems, telecommunications links), and whatever support from other agencies is deemed necessary or most efficient.

Satellite

Both the National Weather Service (NWS) and DTN downlink weather information via satellite.

Additionally, it may be feasible to connect (both uplink and downlink) dissemination devices to the ATIS Center via satellite. These devices would require a satellite modem

and payment of a recurrent monthly access fee. The satellite transmission medium would facilitate relocating these devices to be deployed in a just-in-time manner.

There are a number of potential resources for satellite links, some of which are still in development stage; however, an acceleration of the availability and utility of these systems is anticipated over the next few years as more systems launch.

Timeline

Availability of each of the telecommunications methods discussed above will impact the deployment schedule for ITS. Construction of the optical fiber backbone is scheduled to be complete in September 2000. Any ITS project that proposes to transmit video images between locations with a minimum outlay of costs will require optical fiber. It is possible to transmit video images over telephone lines, but optical fiber is the preferred medium of transmission. For any application that is strictly data, a telephone line might suffice as the transmission medium. The timeline to install a telephone line is usually within a week.

Construction of the 800 MHz radio network is scheduled to be complete by the end of June 2002. As of now, construction is complete in Districts 1, 2, 4, and 5. It is the western, and rural portion of Kansas (Districts 3 and 6) where site identification, acquisition and construction remain to be completed.

Cellular coverage in rural areas remains quite limited. In rural areas, satellite coverage is more prevalent than cellular, but still a little expensive for transmitting messages. As deployment of rural ITS projects comes to fruition, both cellular and satellite services may be more prevalent in the rural areas of Kansas.

Construction of WANs/LANs is not difficult or time consuming compared with construction of optical fiber links. Mostly, construction of the networks requires time to order and install the network equipment and time to develop/install the software that will move and manipulate the data. WAN development in particular is also highly dependent on the availability of telecommunications resources to connect remote sites.

Operating Cost Analysis

Costs of ITS projects, such as these have high initial deployment and maintenance costs, but once these costs are realized, there are often little incremental costs involved in expanding the system. The provision of an integrated ATIS system along a priority corridor would require a substantial operating cost increase. Additional costs would be required to staff and operate a coordinated ATIS center. Staff would need to be trained to evaluate incoming data to determine its validity, and to properly relay the data through the proper channels. On-going communication costs involved with the collection and dissemination of information would also be incurred with this type of deployment.

Currently, the ATIS elements being planned do not contain an integrated element and are being planned as stand-alone systems. By integrating these systems, several cost advantages can be gained that would minimize the operating costs of such a system. First, the integrated system would serve to replace redundant systems and their associated

labor costs of the multiple ATIS deployments. Thus, these staff could be easily redeployed to operate the coordinated system with minimal training cost. Second, the linking of the redundant systems will provide the opportunity to collect and evaluate data from multiple sources. The availability of multiple data sources will allow improved automation of the data validation process and will improve the efficiency of staff by minimizing this tedious process. Finally, by integrating these systems, economies of scale are realized that allow additional elements, such as additional ITS components (e.g., new VMS deployments) or additional corridor coverage to be added at little incremental cost.

Costs of maintaining the communication infrastructure can be shared amongst the various projects comprising the various priority corridors. This cost sharing serves to lower the incremental cost for each additional component as it is added to the system.

Also, the inclusion of private sector partners in the collection, maintenance and dissemination of data may serve to lower the cost of operating the system. The partnership that exists to provide fiber optic cable along the I-70 and I-135 corridors is one such example of the benefits that may be obtained through private sector partnering.

Cost-benefit Analysis

The magnitude of benefits for the types of projects being considered under the Priority Corridors program area will vary greatly depending on many deployment factors. These factors include the location of components, quantity of components deployed, how the components will be used, and the characteristics of travel on the transportation facilities. Many of the projects planned, such as VMS and HAR deployments, provide the greatest level of benefits when deployed on facilities with non-recurring congestion and weather related closures. Deployed in this capacity, these Priority Corridor projects will provide favorable benefits.

Other projects in the Priority Corridor program area are concerned with providing a foundation of the basic communications infrastructure to enable the future deployment of additional ITS components. This communications backbone, when considered alone, would have a low benefit/cost ratio as the up front costs are significant compared with incremental benefits. The real benefits of this type of project, however, are derived from the additional ITS components that are linked to this infrastructure and make use of the efficient communication connections. Once the backbone infrastructure is in place, each additional project deployment can take advantage of incremental cost savings of linking to the existing infrastructure, and provide a greater level of benefits through the more efficient collection and dissemination of data.

Benefits of Priority Corridor Deployments - Kansas Example

One potential Priority Corridor deployment includes the installation of VMS and HAR along I-70 in western Kansas. These deployments would be connected with a fiber optic backbone that would allow KDOT and related agencies to tailor the messages to affect traveler behavior, particularly during periods of inclement weather. For example, when severe winter weather conditions result in a closure of a major corridor in the western part of the state, such as Interstate 70, the VMS and HAR upstream from the closure in central and eastern Kansas could be programmed to relay this information to travelers. The messages communicated to travelers would encourage them to stop traveling west and seek refuge in locations (e.g., Salina, Topeka, etc.) that have adequate traveler facilities available such as lodging and restaurants. The messages could even be programmed to communicate information about hotel room availability that would further assist travelers in finding appropriate lodging prior to the worsening of travel conditions. This type of information could also be provided to motorists traveling east into western Kansas from Colorado.

The primary benefit of this type of system would be the improvement of traveler safety and security. Auto and truck travelers would be given better information on road conditions ahead and would be better able to avoid unsafe travel situations where they are exposed to greater accident risks or where they may be stranded in locations with inadequate traveler amenities. Travelers would be informed when there was a road closure or dangerous conditions, and would be able to change their travel plans before being exposed to unsafe travel conditions. This increased security leads to greater customer satisfaction among the traveling public.

Beyond the traveler safety benefits, there are additional benefits that would be realized by agencies such as KDOT and KHP. The Priority Corridor deployments would likely reduce the number of accidents and stranded motorists that would need to be assisted by these agencies. This reduction would result in improved agency efficiency and would increase the quantity of resources that are available to deal with situations that do arise. The reduced number of stranded vehicles may also result in reduced time required for KDOT maintenance personnel to clear and re-open the highway corridor, thus improving agency efficiency as well as improving travel times.

The benefits resulting from the Priority Corridors deployments vary depending on the market sector using the capabilities of the system. Table 2.2 presents some of the types of benefits that may be enjoyed by various sectors (using ATIS as an example):

Table 2.2: Benefits of Priority Corridor Deployments

Sector	Benefit
Government Agencies	• improved highway and vehicle safety • improved monitoring of transportation system • improved transportation system performance • reduced agency costs (reduced need for field data collection, etc.) • improved customer service • improved communications capabilities • improved data availability for planning purposes
Traveling Public	• lower transportation costs (less travel time) • improved comfort and security of travel • improved highway safety environment • reduced energy and environment impacts • improved mobility

The magnitude of benefits resulting from the deployment of ITS projects similar to those planned for the priority corridor have generally compared favorably to the costs of those projects. A recent study by the Minnesota Department of Transportation used the FHWA developed *ITS Deployment Analysis System* (IDAS) software to compare the deployment of technologies (similar to planned ATIS projects) along several urban, suburban, and rural corridors. The resulting benefit/cost ratios from these corridor evaluations were consistent with previous national studies conducted by FHWA and are presented in table 2.3.

Table 2.3: Benefit/Cost Ratios for Priority Corridor Deployments

ITS Deployment Type	Range of Benefit/Cost Ratio
Variable Message Signs/CCTV Surveillance	1.3 to 5.6
Incident Management	1.9 to 7.2

Public/Private Partnership Opportunities

For effective ITS implementation, transportation professionals in the public sector will have to consider close cooperation with private sector organizations. One of the main reasons for seeking a partnership with the private sector is that ITS demands large financial investments (which can be eased by private investment) but it depends on access to state-owned or controlled transportation infrastructure. Public/private

partnerships should encourage a joint interest in delivering effective services with a clear division of responsibility between the two sectors.

An ATIS program for a priority corridor provides many opportunities for public/private partnerships. For example, KDOT has already entered into a public/private partnership with Digital Teleport, Incorporated (DTI) out of St. Louis, Missouri to install a fiber optic network throughout the state of Kansas. The network will extend fiber from Kansas City to the Colorado State line primarily along Interstate-70. In addition, fiber will be run South from Salina on Interstate 135 to Wichita. It is estimated that the construction of the fiber optic backbone will be complete by September 2000. The fiber optic cable will support a tremendous amount of applications through its bandwidth including VMS, CCTV, traffic counters, and RWIS. KDOT will benefit by having increased access to a digital telecommunications backbone and larger bandwidth in order to transmit data and video.

Many additional public/private partnership opportunities exist. For example, local media providers (radio and television) may be involved in the dissemination of traffic information. Further, KDOT could contract with a private entity that would provide value added traveler information such as touch-tone telephone services, Internet web sites and kiosks. KDOT would still be in charge of providing the basic traveler information services of VMS and HAR, which will be available to everybody. KDOT would also be responsible for ensuring that service standards are maintained and service users are not subject to unfair pricing.

Commercial Vehicle Operations (CVO) Program Area

This program area includes the ITS/CVO projects being deployed in Kansas. The state is currently updating an ITS/CVO Business Plan that will define an architecture for CVO/ITS as part of the Commercial Vehicle Information Systems and Networks (CVISN) project sponsored by FHWA. Kansas is also participating in CVISN training courses and workshops. Examples of the projects being considered include electronic screening, electronic credentialing, automated roadside safety inspections, weigh in motion, and participation in the International Registration Plan Clearinghouse. The Kansas ITS/CVO Business Plan will be used as a guide for this program area.

Interagency Coordination

The CVO Program requires a great deal of interagency coordination within Kansas. The primary agencies outside of KDOT that are involved with CVO operations are the Kansas Department of Revenue (KDOR), the Kansas Highway Patrol (KHP), the Kansas Corporation Commission (KCC), the Kansas Turnpike Authority (KTA) and the Kansas Motor Carriers Association (KMCA). These groups, together with KDOT, make up the CVO Executive Working Group for Kansas. This working group serves as a good example of an interagency coordination mechanism that the state may want to copy in other program areas. KDOR is responsible for collecting taxes and registration fees and has a major role in developing the Kansas ITS/CVO Business Plan. The KCC (in

cooperation with KHP) is responsible for insurance and safety compliance. KHP is responsible for motor carrier enforcement. These agencies will need to continue to coordinate using the Kansas CVO Business Plan as their guide.

In addition to the intrastate coordination between agencies, the level of coordination that must be maintained with other states and with national information clearinghouses also distinguish the CVO Program Area. This coordination is necessary to ensure the proper registration and credentialing of vehicles, and the accurate allocation of collected fees. In some instances, the coordination requirements can limit the flexibility in which ITS can be deployed in the State.

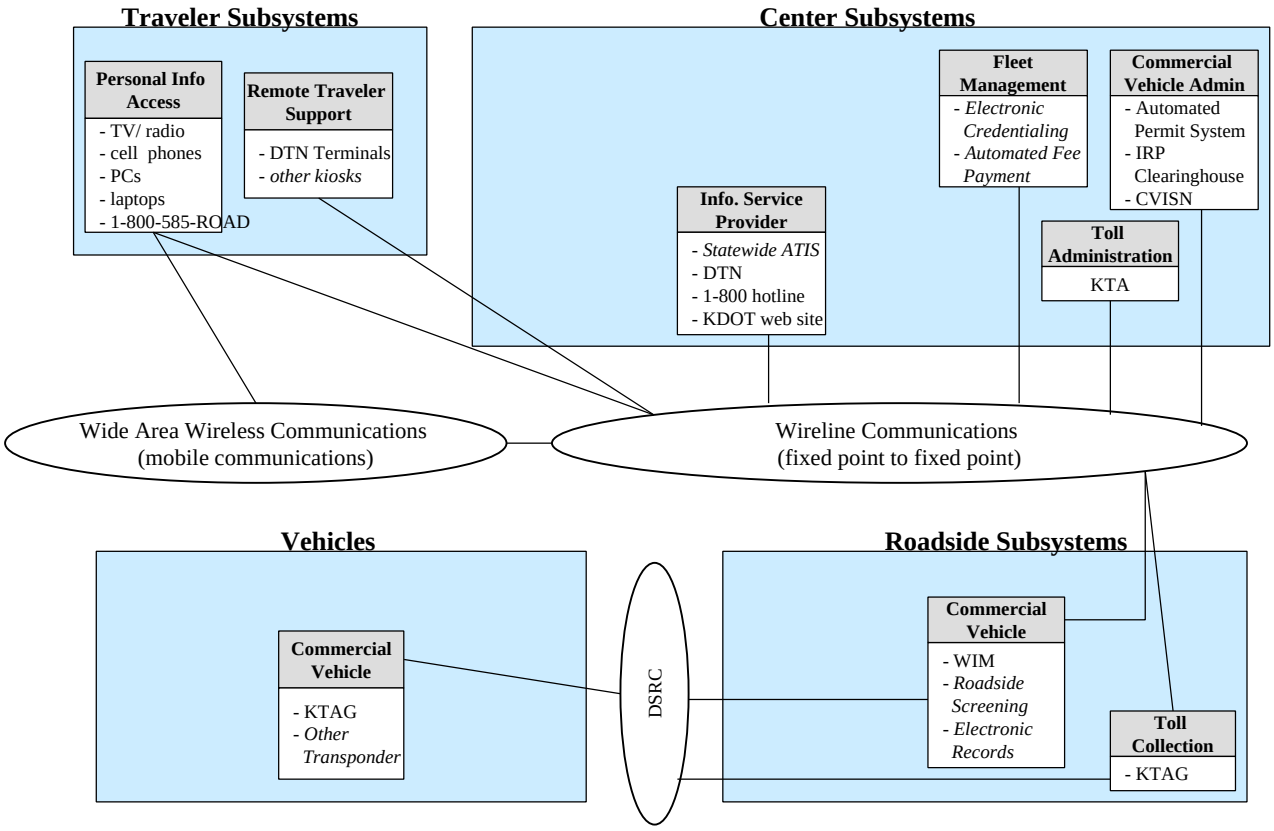
System Architecture Definition

The system architecture for the CVO program area is being developed separately under the Kansas ITS/CVO Business Plan. This architecture is anticipated to contain new deployments to the administrative center, roadside, and vehicle systems that will allow improved CVO processes. These improvements include the following market packages:

- Electronic clearance,
- Commercial vehicle administrative processes,
- Automated roadside safety screening, and
- Weigh in motion.

Figure 2.7 shows a high level depiction of the Kansas CVO Architecture mapped to the National Architecture. This Architecture has been incorporated into the Kansas Statewide Architecture, which is described in section 2.5.

Figure 2.7: Kansas CVO Architecture mapped to National Architecture



Telecommunications Needs

To be determined in the Kansas CVO Business Plan.

Operating Cost Analysis

The deployment of the components in the CVO program area will incur significant deployment costs. However, the ongoing costs required to operate and maintain the systems will be offset by the reduction in processes that must now be performed manually. The planned CVO projects represent improvements in current processes that will provide operating efficiencies for the respective agencies and private sector carriers. These efficiencies should allow the processes to be completed using less labor hours, thus allowing agency staff to focus on more critical tasks.

Some short-term staffing increases may be necessary in order to staff redundant systems until the projects are fully deployed, but no long-term increase in staffing levels is anticipated. Significant levels of initial training may be required to acquaint staff with the new systems and processes. Likewise, the private sector may also incur some short-term costs involved is modifying processes and training staff. Long-term private sector costs would decrease as processes were streamlined.

Cost-benefit Analysis

ITS projects deployed to improve commercial vehicle operations have been estimated as having some of the greatest promised returns on investment of any ITS improvement type. By improving CVO compliance processes, the speed at which goods may be delivered can be increased while improving the safety of those movements. Trucks typically have a much higher value of time associated with their travel than do passenger vehicles due to higher labor and operating costs, and the cost of the goods being delivered. Thus, any savings in the travel time can have a great impact on benefits. Although trucks generally experience a lower crash rate than passenger vehicles, the severity and visibility of truck crashes is often much greater. Therefore, any reduction in the number or severity of truck crashes will result in significant societal benefits.

Many of the ITS/CVO projects being proposed for Kansas are being currently deployed in other states as part of the *Commercial Vehicle Information Systems and Networks* (CVISN) program being conducted by the FHWA. The development of many of the CVISN components is still in its infancy, so few long-term benefit/cost figures are available. Early results from analysis of the initial deployments of ITS/CVO components, however, indicate benefit returns.

Benefits of CVO Deployments – Kansas Example

The CVO deployments under consideration in Kansas can be grouped into two different categories, administrative and roadside. Deployments in both of these categories have the potential to provide benefits to commercial carriers, state agencies, and the traveling public.

The administrative deployments include the linking of various state legacy systems to allow the better sharing and integration of data, and providing the opportunity for carriers to view and update their credentialing information electronically. This will have efficiency benefits for agencies such as KDOT, KHP, Department of Revenue, and the KCC, as data will not need to be entered and maintained in redundant data systems. The burden of compliance will also be reduced for carriers as they will be able to better update and confirm their credential status. Although primarily administrative in nature, these improvements will also have travel safety benefits. The improved sharing and validation of credential and safety data will improve the reliability of the data, reduce evasion, and help identify unsafe carriers.

Some of the roadside CVO deployments being considered in Kansas include such capabilities as electronic screening and clearance, and weigh-in-motion. The combination of these roadside components with the improved data access provided by the administrative deployments will aid enforcement personnel in identifying unsafe or uncredentialed carriers. For example, commercial vehicle inspection stations located near border regions could be equipped with electronic screening systems linked to credentialing databases maintained at headquarters. The improved access to

information and the automation of tedious credentialing checks will improve the efficiency of the state personnel and will allow them to better target their enforcement efforts toward unsafe carriers. The result of this improved efficiency will be safer commercial vehicles and improved safety of travel for all highway travelers. Meanwhile, carriers with a history of good safety and credentialing performance will be rewarded with reduced travel times as they will be able to bypass unnecessary inspection procedures.

As these roadside capabilities are expanded into the mobile enforcement fleet as well as the fixed inspection stations, occurrences of fee and inspection evasion will be further reduced. This will serve to further increase the efficiency of enforcement personnel and improve the highway safety for the road traveling public.

ITS/CVO deployments produce various benefits for different market sectors including the motor carriers, government regulatory agencies, and the traveling public. The different types of benefits that would accrue to these various sectors are presented in table 2.4.

Table 2.4: Benefits of ITS/CVO Deployments

Sector	Benefit
Motor Carriers	• reduced operating costs (reduced travel time) • reduced paperwork/compliance burden • improved safety performance • improved system operating efficiency • better service to customers
Government Agencies	• improved highway and vehicle safety • more efficient administration • reduced fee evasion rates • improved customer service • improved data systems for planning purposes
Public	• lower transportation costs (less travel time) • improved highway safety environment • reduced energy and environment impacts • improved mobility

ITS/CVO deployments similar to the projects being considered for deployment in Kansas have demonstrated favorable benefit/cost ratios in other regions. Table 2.5 provides ranges of benefit/cost ratios estimated in studies conducted by the FHWA and the American Trucking Association for various ITS/CVO deployments.

Table 2.5: Benefit/Cost ratios for ITS/CVO Deployments

ITS/CVO Deployment Type	Range of Benefit/Cost Ratio
Electronic Clearance Projects	1.9 to 6.5
Automated Roadside Inspections	1.3 to 3.4
Credentialing/Administrative Projects	1.4 to 19.8

Public/Private Partnership Opportunities

The involvement of private sector carriers in the commercial vehicle arena provides many tangible opportunities for forging public/private partnerships. The involvement of the private sector in this program area is critical to the success of any ITS/CVO deployments. For example, electronic credentialling systems may require private sector carriers to purchase new systems and software, and conduct training for their staff on how to operate the new system. Therefore, it is critical that the public sector and the carrier industry work together to not only minimize the costs of the deployment, but also coordinate the processes to maximize the utility of the system. The carrier industry is represented on the CVO Executive Working Group in recognition of the need to coordinate the public and private sector efforts in the issues surrounding CVO.

Beside the carrier industry, many other opportunities for public/private partnerships exist in the CVO program area. Several quasi-private entities have been formed in the past decade to provide enhanced ITS processes to CVO regulatory agencies. Organizations such as HELP, Inc. (Pre-Pass) have deployed ITS/CVO capabilities in other states in exchange for the right to charge usage fees for their equipment. Other public/private groups have been formed to manage and serve as clearinghouses for the large amounts of data created by ITS/CVO systems (e.g., IRP, Inc.). Private sector software development and system integration firms may also be encouraged to participate in the development of ITS/CVO systems in exchange for the right to charge for the resulting product.

Maintenance Program Area

The maintenance program area includes potential ITS-related projects that fall under the domain of the KDOT Bureau of Construction and Maintenance. Examples of these projects include road weather information systems (RWIS), the road condition reporting system (RCRS), Construction Detour and Reporting System (CDRS), installation of automatic vehicle location (AVL) and mobile data terminals (MDT) in maintenance vehicles and automated anti-icing systems for bridges.

Interagency Coordination

The majority of information collected and disseminated with these types of maintenance projects will be used internally by the Bureau of Construction and Maintenance. Nevertheless, there may be advantages to coordinating with other agencies with these

projects. Optimally, this information will be coordinated and shared with other agencies/jurisdictions responsible for road maintenance. County and local jurisdictions responsible for snow removal are examples of agencies that would be able to benefit from the information provided by the maintenance systems.

Other agencies responsible for public safety, such as KHP, could also use the information generated by the maintenance systems. Pending the resolution of several legal issues, some of the collected information could eventually be provided to the traveling public through Internet web sites or directly though roadside variable message signs. This would require additional interagency coordination with those entities responsible for disseminating traveler information.

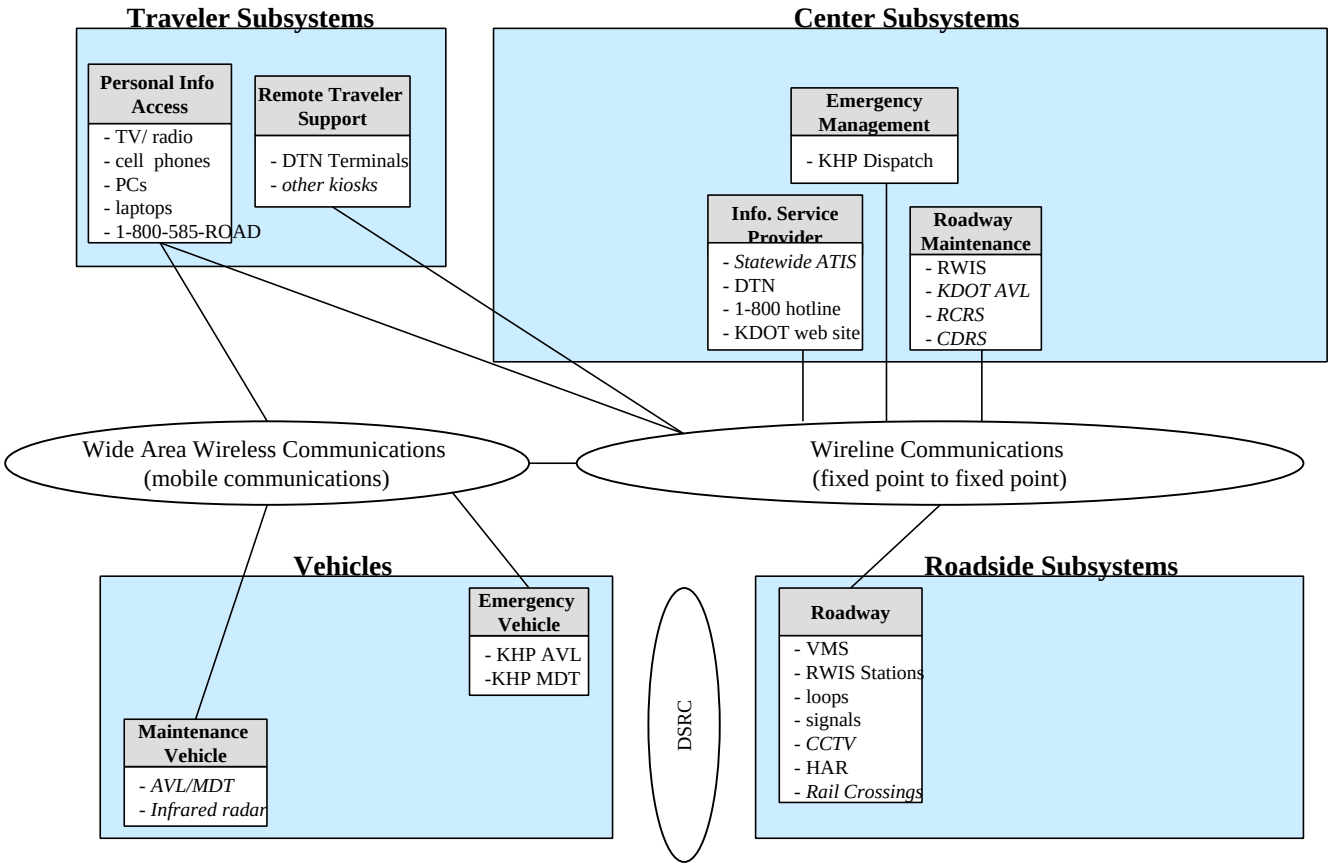
It is anticipated that these maintenance projects will generate significant amounts of data. This comprehensive data may be of great value to various bureaus and agencies for planning and budgeting purposes. Therefore, coordination with the Bureau of Computer Services and planning groups is highly recommended to provide for the archiving and retrieval of planning information.

System Architecture Definition

Mapped to the National Architecture

Figure 2.8 shows the system architecture for the Maintenance Program Area mapped to the National Architecture. Since the National Architecture has not yet defined subsystems for Maintenance Vehicles or Maintenance Center, these subsystems had to be added to the Kansas Architecture. Note that RWIS, RCRS, CDRS and AVL are all elements of the Maintenance Center subsystem. This subsystem, which is controlled by the KDOT Bureau of Construction and Maintenance, receives road condition information from the maintenance vehicle, emergency vehicle and roadway subsystems as shown in figure 2.8. The personal information access, remote traveler support and emergency management subsystems can use the road condition information. Finally, if there were a statewide operations center, it too would use the data from maintenance systems.

Figure 2.8: ITS Architecture for Maintenance Program Area



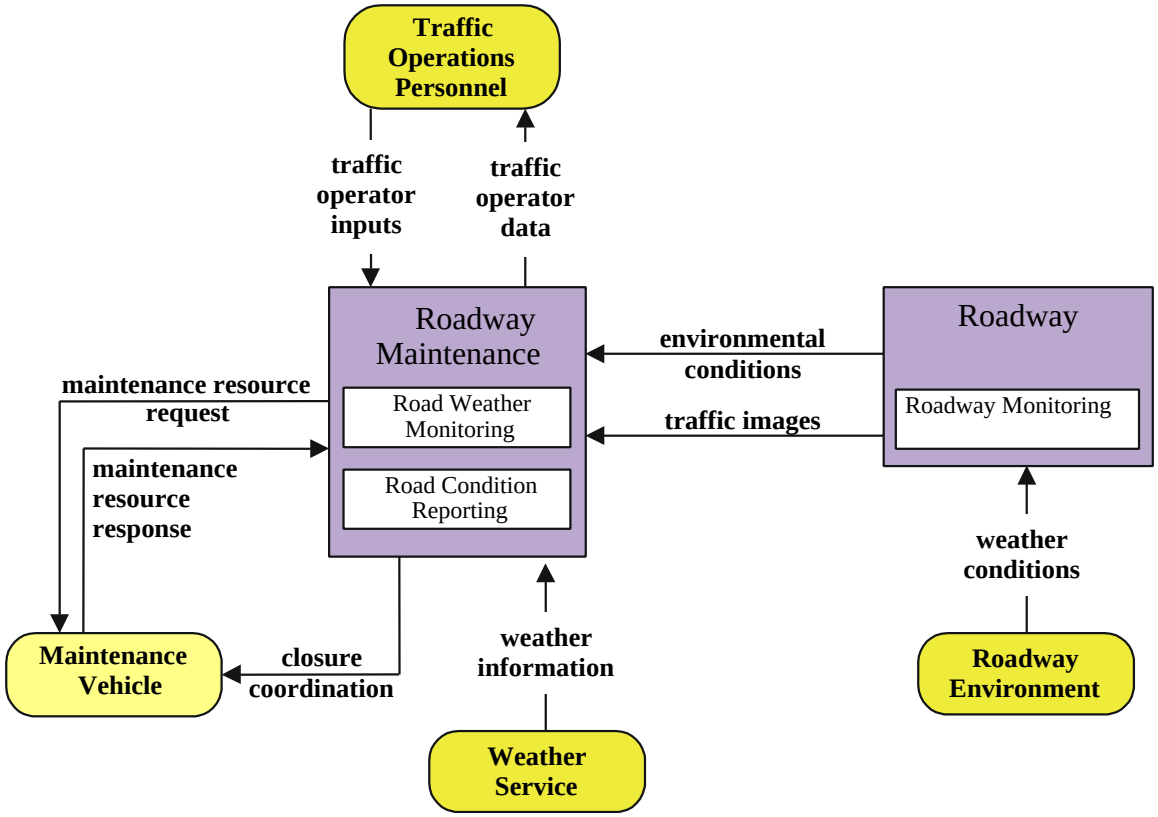
Market Packages and Architecture Flows

There is one market package being considered for implementation in Kansas that falls under the Maintenance Program Area. It is

- Road Weather Information System.

There are other market packages that may cross into the Maintenance Program Area but they have been placed in other program areas such as Priority Corridor and Traffic Operations. Figure 2.9 shows an information flow diagram for the RWIS market package. This diagram illustrates the specific architecture flows between the subsystems indicated in figure 2.8 as relating to RWIS.

Figure 2.9: Road Weather Information System Architecture Flows



Telecommunications Needs

From figure 2.8, it is clear that a number of different telecommunications resources are needed to support the Maintenance Program Area. These telecommunications resources include optical fiber, leased telephone lines, 800 MHz and microwave radio, cellular/PCS, WAN/LAN, and satellite systems. In many cases, these resources will be used in the same manner as they were for the Priority Corridors Program Area. The discussion below highlights the unique telecommunications needs for the Maintenance Program Area.

<u>Optical Fiber</u>
For any fixed endpoint or device, such as RWIS, CCTV or VMS, near a hand hole in the optical fiber backbone route, it may be possible to use the optical fiber for interconnection. Typically, the bandwidth requirement for RWIS or VMS is small, 9.6 - 56 Kbps. These devices would not be taking advantage of the optical fiber's bandwidth; rather using the optical fiber would eliminate a monthly recurring telephone charge. On the other hand, it is becoming increasingly popular to complement RWIS stations with CCTV cameras. For these applications, fiber would be the best mode of communication.

Telephone Lines
Dedicated or dial-up telephone lines would be used for RWIS or VMS applications where the endpoint or device was not near a hand hole in the optical fiber backbone route. The telephone lines would be used for content and control.

800 MHz Radio
Because of the remote nature of the KHP and KDOT maintenance personnel, 800 MHz radio will be the only reliable method of communicating conditions from the field back to the District Offices. Cellular coverage in rural Kansas is spotty at best. Once construction is complete, in June 2002, the 800 MHz radio system will cover the entire state of Kansas.

Both 800 MHz radio and GPS are important components in implementing an AVL system. The 800 MHz system will facilitate voice (and possibly data) communications from KHP troopers, KDOT maintenance personnel and dispatchers. The GPS system is used to locate the vehicle. Ultimately, using AVL will permit scheduling or assigning based in real-time.

Cellular and Satellite
Today, cellular coverage is marginal in rural areas. Satellite coverage is another story. Satellite coverage is available in rural areas. However, the cost of transmitting messages is expensive. As cellular coverage improves in rural areas and the cost of satellite services decreases, it is likely that they will serve as the telecommunications medium for remotely located RWIS, RCRS, or AVL endpoints. Until that time, lease telephone lines provide a realistic choice for transmitting control and content information.

WAN/LAN
It will be necessary to construct a WAN/LAN in order to receive information from RWIS, RCRS, CDRS, and AVL, and make it available to appropriate users (intra-agency, inter-agency, public).

Integration of Maintenance Systems
The use of RCRS to validate RWIS data could be valuable. The 800 MHz radio could be used to dispatch employees to areas of concern. It might also be possible to configure the AVL with sensing equipment so that conditions such as temperature, wind speed, air condition, and precipitation are transmitted automatically along with the accurate position. This sort of system would utilize either satellite or 800 MHz radio for transmission back to the District Office.

Timeline
See Priority Corridors Program Area.

Operating Cost Analysis

Operating costs for the identified maintenance projects will consist primarily of equipment replacement/upkeep and training for maintenance vehicle operators. No additional staff is required to operate the planned systems. The evaluation of technologies will require some staff time during the initial phases of the projects.

The modest operating costs for these projects is partially off-set by the cost efficiencies provided by the automated collection of road maintenance data (i.e., the number of field visits by agency personnel to collect data will be reduced).

Cost-benefit Analysis

The benefits from projects under the Maintenance program area typically accrue to those agencies deploying the projects. These benefits result from more efficient management of resources and labor, and the elimination of redundant processes. Benefits are also experienced by highway users and include improved roadway safety and travel conditions brought about by improved maintenance. Table 2.6 presents some of the benefits enjoyed by these two sectors.

Table 2.6: Benefits of ITS Deployments in the Maintenance Program Area

Sector	Benefit
Government Agencies	• improved highway and vehicle safety • improved monitoring of transportation system • improved transportation system performance • reduced agency costs (reduced need for field data collection, etc.) • improved use of resources • reduced capital and operating costs due to more efficient use of resources • improved communications capabilities • improved safety for agency personnel • improved data availability for planning purposes
Traveling Public	• improved comfort and security of travel • improved highway safety environment • reduced vehicle damage from poorly maintained roadways • improved mobility

Benefits of Maintenance Deployments – Kansas Example

One example of a potential Maintenance deployment in Kansas is the equipping of maintenance vehicles in District 6 with automatic vehicle location (AVL) systems. This type of system would provide benefits to KDOT as well as the traveling public. This AVL system could be used in concert with the existing RWIS installations in District 6. When the RWIS sensors indicate conditions at a certain location are favorable to ice formation, the maintenance dispatcher could locate the nearest maintenance vehicle using the AVL system and dispatch them to that location to apply de-icing chemicals. This would greatly aid the efficiency of these maintenance tasks and ensure the safety of road surface without the inefficient commitment of personnel or maintenance vehicles.

By knowing the location of the maintenance vehicles, the dispatcher would also be able to identify which resources are best equipped for the tasks and could complete de-icing treatment in the most timely manner. Finally, knowing the location and status of all maintenance vehicles will ensure the safety of the drivers as well. If a maintenance vehicle driver were to get stuck in a snowstorm, then the dispatcher would know that vehicle's exact location and could send somebody to rescue the driver in a timely manner.

Few comprehensive evaluations of ITS maintenance deployments have been conducted in the United States. The few deployments that have been evaluated have generally shown significant benefits – particularly in providing agency cost savings. For example, a computer-aided snowplow dispatch system in Indiana was shown to have a $14 million reduction in operating and equipment costs since its deployment. Maintenance programs in Vermont, Minnesota and Colorado have also shown favorable benefits.

Although limited benefit/cost experience with ITS maintenance systems is available from US sources, numerous examples exist in the international arena. The Scandinavian countries and other alpine regions of Western Europe have had a longer history with ITS maintenance systems, and provide more samples of system evaluations. The benefit/cost experiences of these maintenance deployments are presented in table 2.7.

Table 2.7: Benefit/Cost Ratios for ITS Maintenance Systems

ITS Deployment Type	Range of Benefit/Cost Ratio
Infrastructure Maintenance (e.g. RWIS)	1.5 to 5.0
Fleet Maintenance (e.g. AVL for snow plows)	1.1 to 6.9

Public/Private Partnership Opportunities

Few short-term opportunities exist to forge public/private partnerships with the maintenance projects. Legal and institutional issues block the potential to directly provide the collected data to the traveling public. However, the opportunity to share the

collected data with an information service provider remains a narrow possibility. Potential long-term opportunities include equipping private vehicles with the data collection sensors to act as probe vehicles.

Traffic Operations Program Area

This program area primarily refers to projects aimed at improving traffic operations in metropolitan areas. Examples include the planning and design of the Wichita Traffic Operations Center (TOC) and the Kansas City Scout Project. This area also includes the planning and design of a statewide operations center that would link the metropolitan TOCs and house a statewide TOC and regional traveler information center.

Interagency Coordination

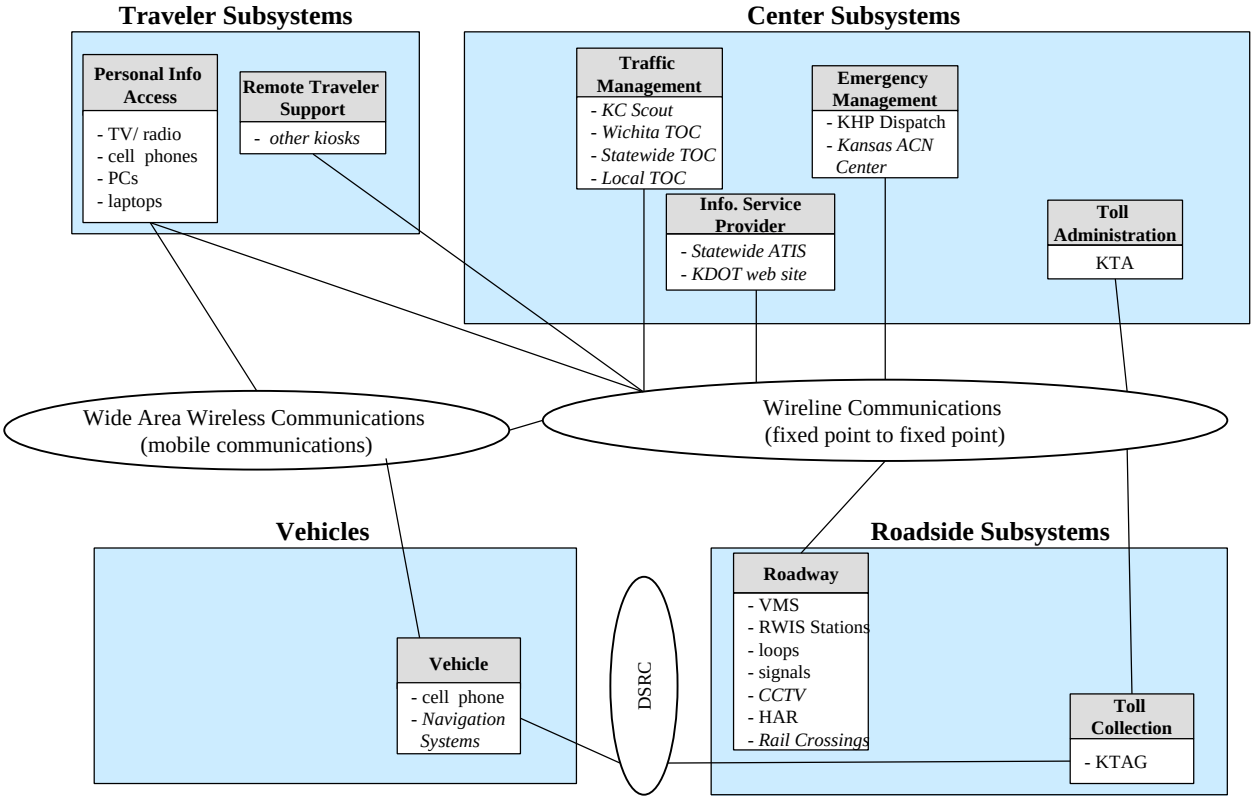
Traffic Operations Centers (TOC) require a great deal of interagency coordination. Large metropolitan areas such as Kansas City and Wichita are currently planning the deployment of TOCs, which will monitor incidents and manage the flow of traffic on freeways. These systems will require coordination between KDOT, KTA, local transportation agencies, KHP, emergency services, transit agencies, and the local media. In the case of the Kansas City TOC, there will be additional coordination required between KDOT and the Missouri DOT and local transportation agencies within Missouri. If there is to be a statewide traffic operations center in Kansas, then there will need to be coordination between each metropolitan area. This may happen in the form of TOC to TOC communications.

System Architecture Definition

Mapped to National Architecture

Figure 2.10 shows the system architecture for the Traffic Operations Program Area mapped to the National Architecture. This architecture is very similar to the ATIS Architecture except that it is more focused on the traffic operations and less on road and weather conditions. The key subsystems in this program area are the traffic management subsystem and the statewide traffic operations center. The other subsystems in the architecture represent the systems that will convert the operations data to traveler information for the public or use the data for planning emergency response routes.

Figure 2.10: ITS Architecture for Traffic Operations Program Area



Market Packages and Architecture Flows

There are four market packages being considered for implementation in Kansas that would fall under the Traffic Operations Program Area. They are

- Network surveillance,
- Regional traffic control,
- Incident Management Systems, and
- Electronic Toll Collection.

Figures 2.11 through 2.14 show information flow diagrams for each of these market packages. These diagrams illustrate the specific architecture flows between the subsystems indicated in figure 2.3.

Figure 2.11: Network Surveillance Architecture Flows

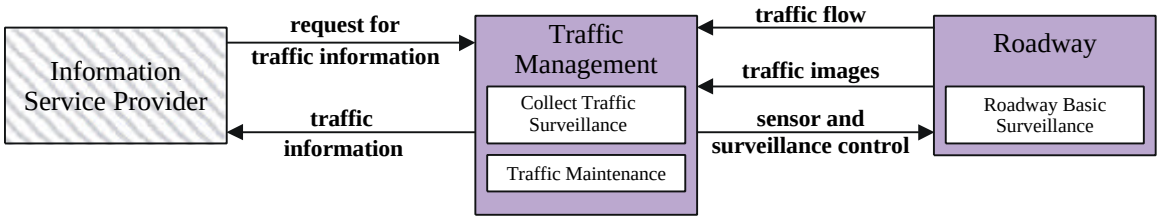


Figure 2.12: Regional Traffic Control Architecture Flows

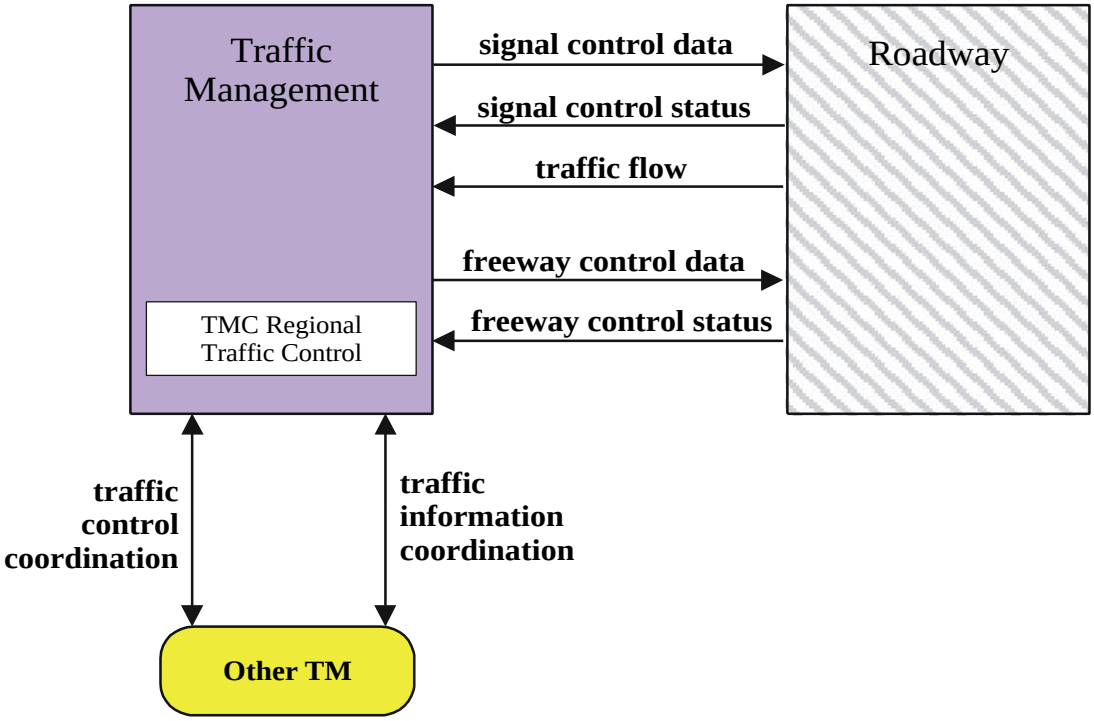


Figure 2.13: Incident Management Systems Architecture Flows

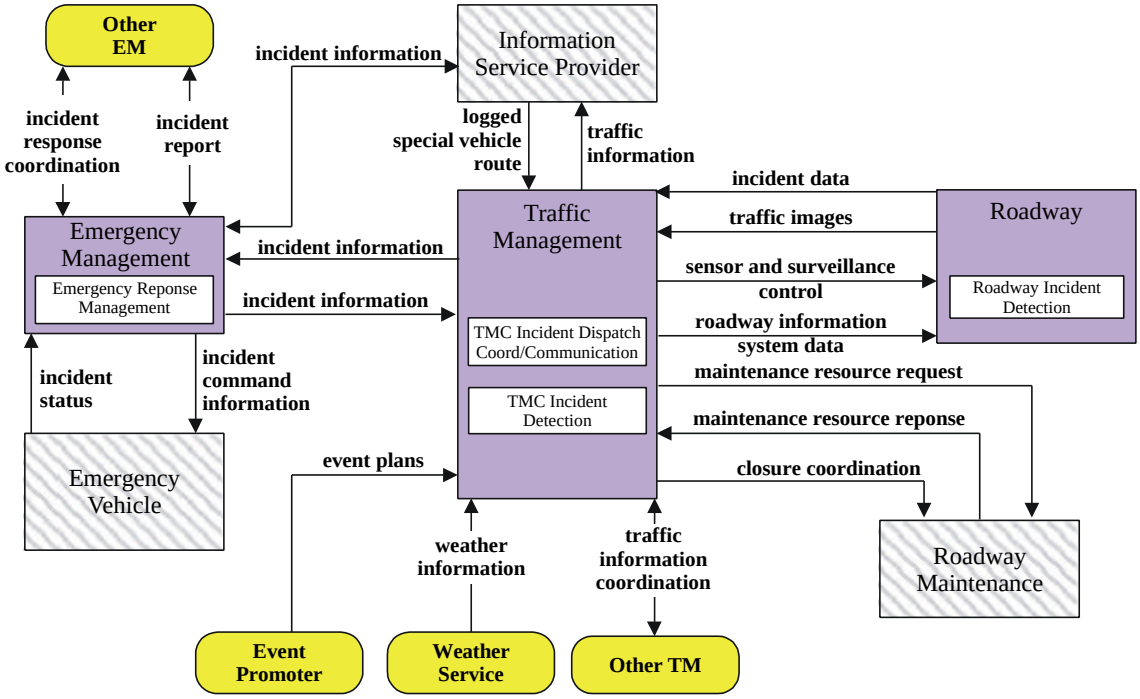
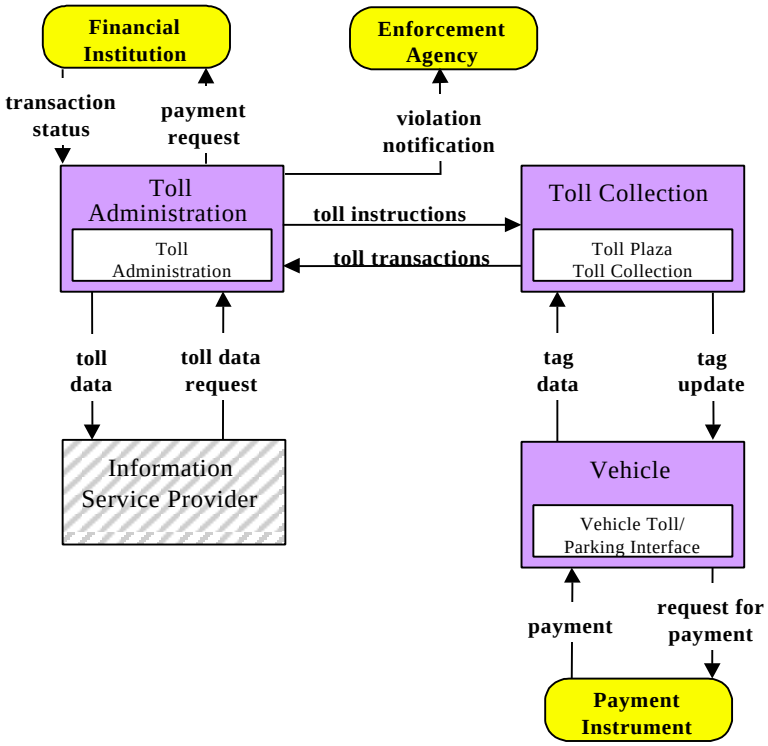


Figure 2.14: Electronic Toll Collection Architecture Flows



Telecommunications Needs

From figure 2.10, it is clear that a number of different telecommunications resources are needed to support the Traffic Operations Program Area. These telecommunications resources include optical fiber, leased telephone lines, 800 MHz and microwave radio, cellular/PCS, WAN/LAN, and satellite systems. In many cases, these resources will be used in the same manner as they were for the Priority Corridors Program Area. The discussion below highlights the unique telecommunications needs for the Traffic Operations Program` Area.

Optical Fiber
Establishing a Wichita TOC and Statewide TOC will require optical fiber connectivity. On a large scale, these TOCs must be connected to the Kansas City TOC and each other via optical fiber, as they will be transferring video images. Video truly drives the need for optical fiber.

On a smaller scale, video images will be arriving from cameras directly to the Wichita or Statewide TOCs. Again, optical fiber is the preferred medium for transmitting these video images.

Telephone Lines
For devices located some distance from the hand holes in the optical fiber backbone, telephone lines or microwave links will be required to transmit the data.

Cellular and Satellite
As cellular coverage becomes more widespread and satellite services become less expensive, it is likely that they may serve as the telecommunications medium for remotely devices gathering information for the TOCs. Until that time, lease telephone lines provide a realistic choice for transmitting control and content information.

WAN/LAN
WAN/LAN network structure will be required for all of the TOCs to gather, transmit, manipulate, and access data from any location.

Timeline
See the Priority Corridors Program Area.

Operating Cost Analysis

Operations projects require substantial expenditures for deployment and operation. The characteristics of these projects can result in the on-going operating costs greatly exceeding the capital deployment costs of the projects. These projects require significant dedication of staff and training. These projects also incur significant costs for the maintenance and operation of various components, such as communication links and field equipment.

Staff with highly specialized skills will be required to operate and maintain these systems. If personnel with these specialized skills are not currently available within the deploying agencies, significant training and/or recruitment costs will be incurred.

Cost-benefit Analysis

The operations improvements that will result from the development of TOCs in Wichita and the Kansas City metropolitan area offer the potential for significant benefits. Similar deployments in various cities such as Houston, San Antonio, Minneapolis, and Atlanta have been evaluated and provide relevant examples of the types and level of benefits that can be anticipated from these types of deployments. Typically, the traffic operations projects have provided benefits for various sectors as presented in table 2.8.

Table 2.8: Benefits of ITS Deployments in the Operations Area

Sector	Benefit
Government Agencies	• improved highway and vehicle safety • improved monitoring of transportation system • improved transportation system performance (increased throughput and speed) • reduced agency costs (improved efficiency) • improved customer service • improved communications capabilities • improved data availability for planning purposes
Roadway Users	• lower transportation costs (less travel time) • improved highway safety environment • improved comfort and security of travel • reduced energy and environment impacts • improved mobility

By providing the basic infrastructure needed to operate many potential future ITS deployments, the TOC project deployments should be able to reduce the incremental costs of adding new components. Thus, the system expansion will result in greater benefits at lower incremental costs, raising the benefit/cost ratio over time.

Benefits of Traffic Operations Deployments – Kansas Example

The deployment of a statewide TOC has many potential benefits for travelers and transportation agencies in Kansas. An integrated center where traffic operations data from many various agencies and sources was compiled, verified, disseminated, and archived could improve travel conditions in metropolitan areas as well as in rural areas of the state. This type of statewide traffic operations center would provide operations personnel in diverse agencies with a single portal for accessing traffic information from across the state. This will allow personnel to better anticipate abnormal conditions and take steps to counteract any negative impacts. For example, if real-time traffic data were available through the statewide TOC, transportation agencies in Topeka or Wichita could better anticipate possible traffic conditions resulting from special events occurring at the new NASCAR race facility in Bonner Springs, Kansas. Likewise, potential delays from construction in one region could be communicated to travelers in other regions via VMS or HAR so that the travelers can alter their travel route well in advance of the construction zone and avoid further contributing to the delay. This system would allow municipalities and the various KDOT districts to obtain real-time data from other regions and use the information to improve conditions in their own jurisdictions.

The archiving and sharing of data through a statewide TOC would have additional benefits to planning and design efforts. Increasing the quantity and access to data will allow planning personnel to better learn the impacts of projects deployed in other regions and make more informed decisions regarding their own planning efforts.

The FHWA has conducted numerous evaluations of ITS traffic operations deployments in various regions. The combined results suggest traffic management systems can reduce the number of crashes by 15 to 62 percent, while allowing the system to handle 8 to 22 percent more traffic at 16 to 62 percent higher speeds. These favorable impacts have produced benefit levels that greatly exceed the costs for the deployments evaluated. The range of the benefit/cost ratios that were estimated in these evaluations are presented in table 2.9.

Table 2.9: Benefit/Cost Ratios for ITS Deployments in the Operations Area

ITS Deployment Type	Range of Benefit/Cost Ratio
Traffic Management Systems (without Incident Management Components)	1.7 to 8.3
Traffic Management Systems (with Incident Management Components)	2.3 to 19.0

As the above table shows, those operations deployments containing an incident management component generally experienced better benefit/cost comparisons than did deployments without these components.

Public/Private Partnership Opportunities

TOCs serve several interrelated functions, one of which is to disseminate information collected from various systems (e.g., traffic detectors, CCTV, and RWIS) to drivers both before they begin their trip and while they are en route. Partnerships with the popular broadcast media could offer an effective means of disseminating this information at little or no cost to KDOT. Certain information is already provided to the media free of charge. However, a partnership could be established with a set of broadcasters—perhaps one radio station and one television station—wherein these entities are provided more detailed information in exchange for more frequent and substantial scheduled air time, as well as additional time in emergency situations. The television media is an effective means of disseminating all manner of pre-trip information, while radio is well suited for en route information.

While this type of partnership is most obviously beneficial in an urban setting, statewide traffic operations can also benefit from partnerships with the popular media, though the use of the media would be slightly different. In a statewide operations context, the information being disseminated would be more focused on weather and might include tourism-related information.

Rural Safety and Mobility Program Area

This program area includes all safety-related projects affecting the rural traveler, as well as rural transit. Examples include projects related to automatic crash notification (also known as Mayday Systems), work zone applications, AVL for rural transit, at-grade rail crossings, and the Intelligent Vehicle Initiative (IVI). This program area has a wide variation in application characteristics among its projects. Automatic crash notification (ACN) is taken as an example in discussing the following issues.

Interagency Coordination

Predominantly rural projects require significant effort be expended in the coordination of multiple agencies and jurisdictions. In the case of ACN, there are two primary areas where the operation of the system depends on the coordination between agencies.

<u>ACN Center with responding agency(s)</u>
The ACN Center receives and routes calls. Location may be transferred digitally whenever the receiving response agency is equipped to receive the data, otherwise, the location is interpreted at the Center and communicated by voice to the response agency.

<u>Responding agency(s) with trauma center</u>
Ideally, the nearest qualified trauma center will be notified simultaneously with the response agency. Once the response is underway, coordination between the response agency and the trauma center will help to minimize delays in treatment once victims arrive at the trauma center.

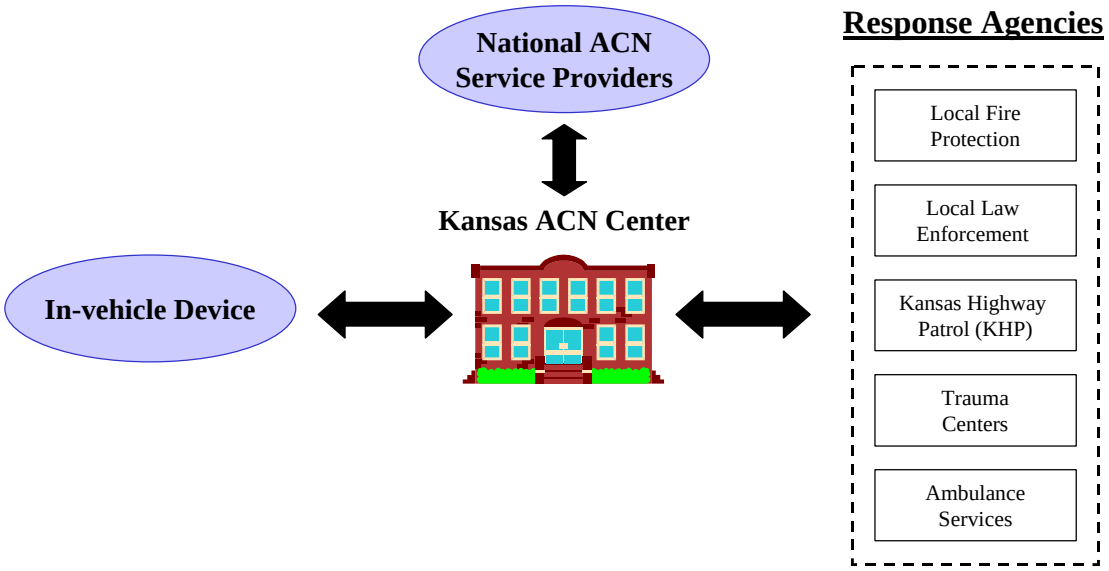
System Architecture Definition

Conceptual Architecture

The system architecture for an ACN system currently includes three entities and two communication paths. An in-vehicle device contacts a national service provider over a wireless telephone link, most commonly analog cellular. The national service provider then interprets the location of the vehicle, determines the appropriate response agency, and contacts that agency directly, communicating all crash information verbally over a landline call.

As ACN systems proliferate and as associated technologies develop, the establishment of a publicly run center for receiving ACN calls will become necessary in order to take full advantage of the new safety benefits afforded by these systems. Once in place, calls from within appropriately equipped jurisdictions (i.e., within jurisdictions with a public ACN center) will be routed directly to the center. Calls from jurisdictions in which no public ACN center is in place will be routed to a national service providers who will identify and contact the appropriate PSAP. The conceptual ACN architecture is shown graphically in figure 2.15

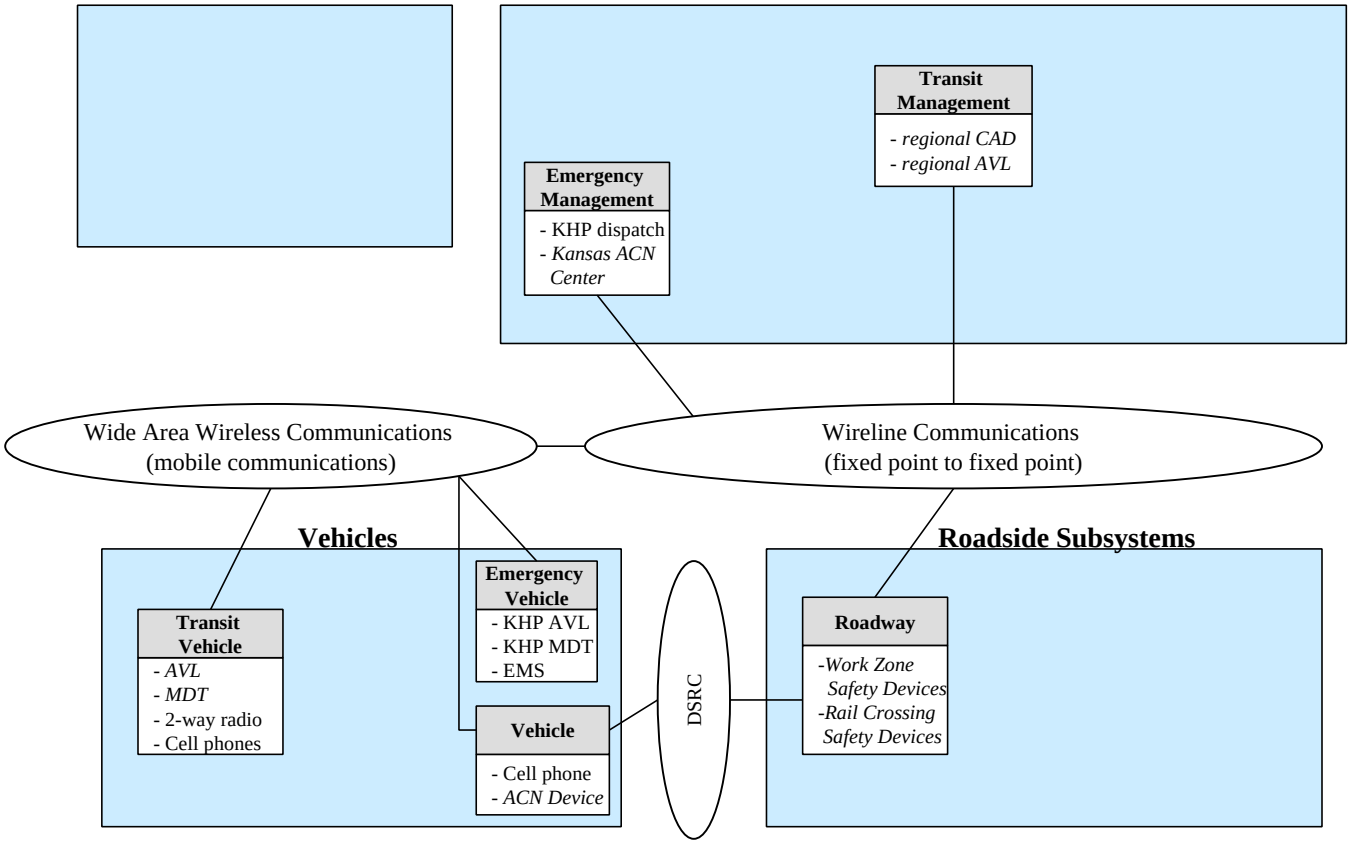
Figure 2.15: ACN System Architecture



Mapped to the National Architecture

The entire architecture for the Rural Safety and Mobility Program Area is shown mapped to the National Architecture in figure 2.16. The architecture depicted in figure 2.16 includes the other elements of the program area as well such as rural transit, work zone safety and at-grade rail crossings.

Figure 2.16: Rural Safety and Mobility mapped to the National Architecture



Market Packages and Architecture Flows

There are six market packages being considered for implementation in Kansas that would fall under the Rural Safety and Mobility Program Area. They are

- Standard railroad grade crossing,
- Emergency response,
- Emergency routing
- Mayday support,
- Transit vehicle tracking, and
- Demand response transit operations.

Figures 2.17 through 2.22 show information flow diagrams for each of these market packages. These diagrams illustrate the specific architecture flows between the subsystems indicated in figure 2-16.

2.17: Standard Railroad Grade Crossing Architecture Flows

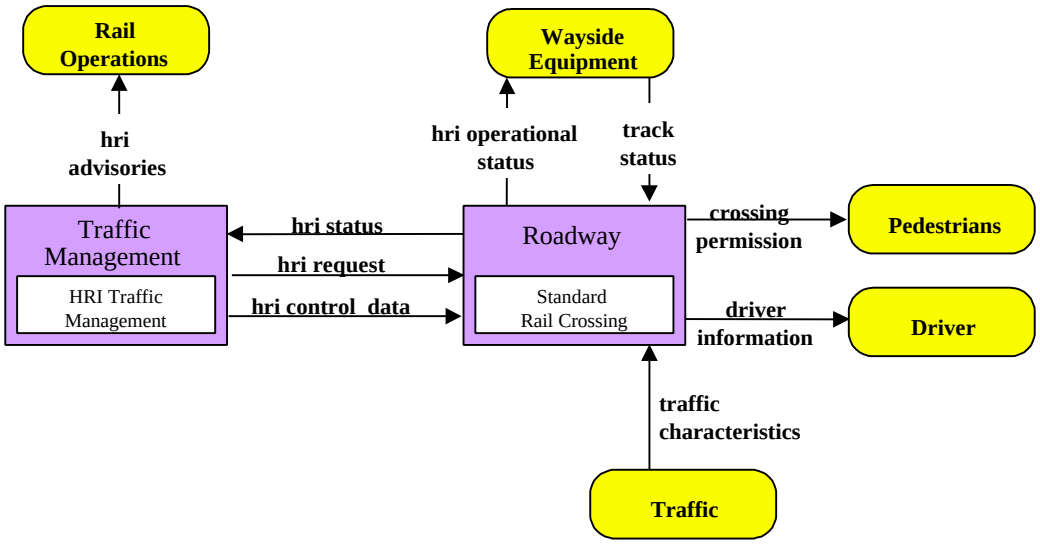


Figure 2.18: Emergency Response Architecture Flows

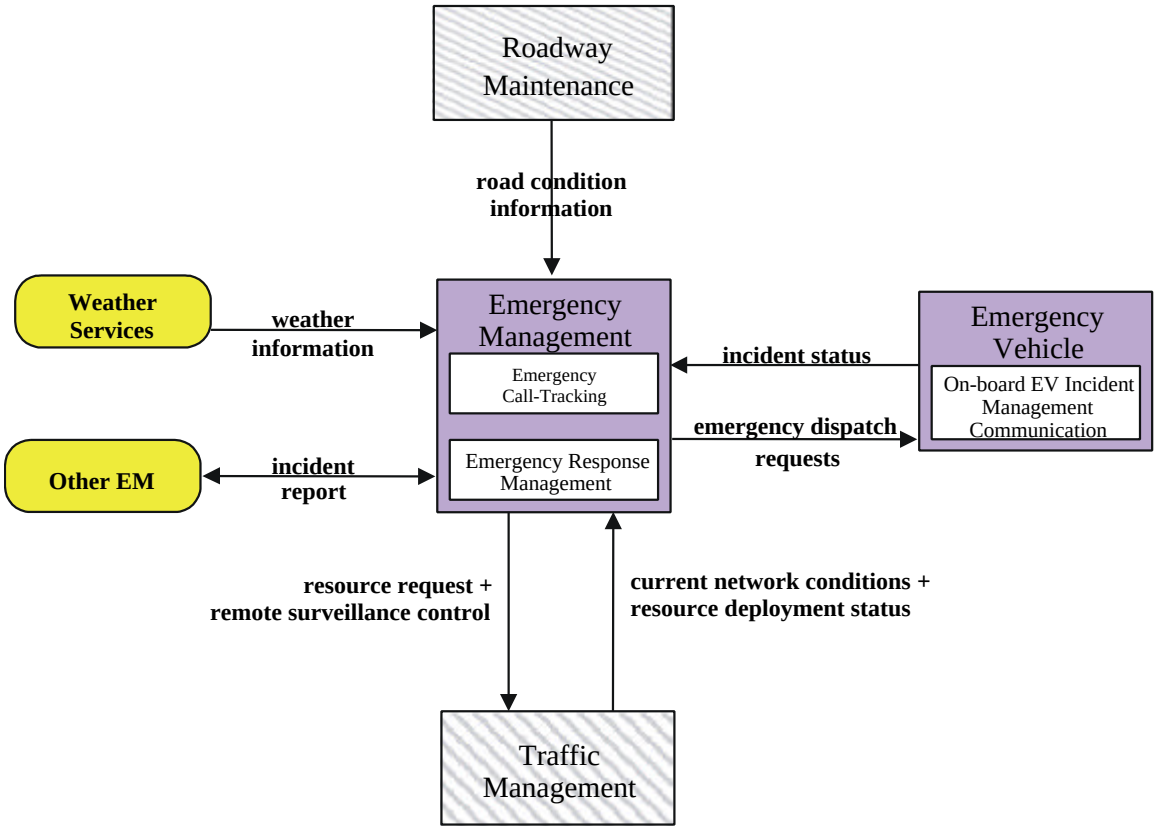


Figure 2.19: Emergency Routing Architecture Flows

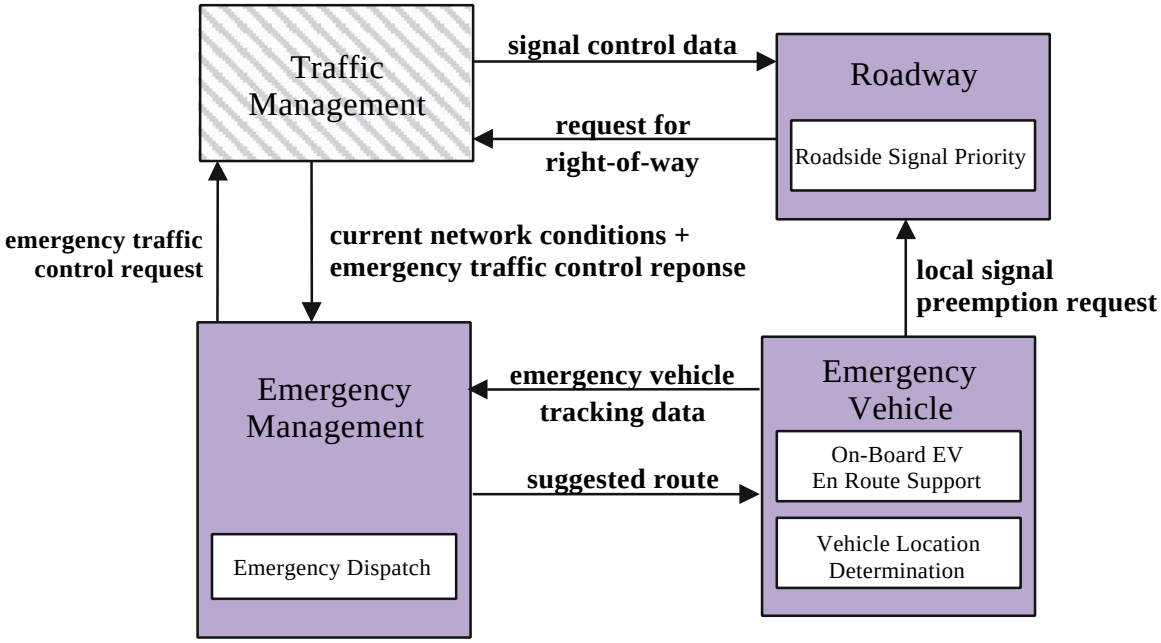


Figure 2.20: Mayday Support Architecture Flows

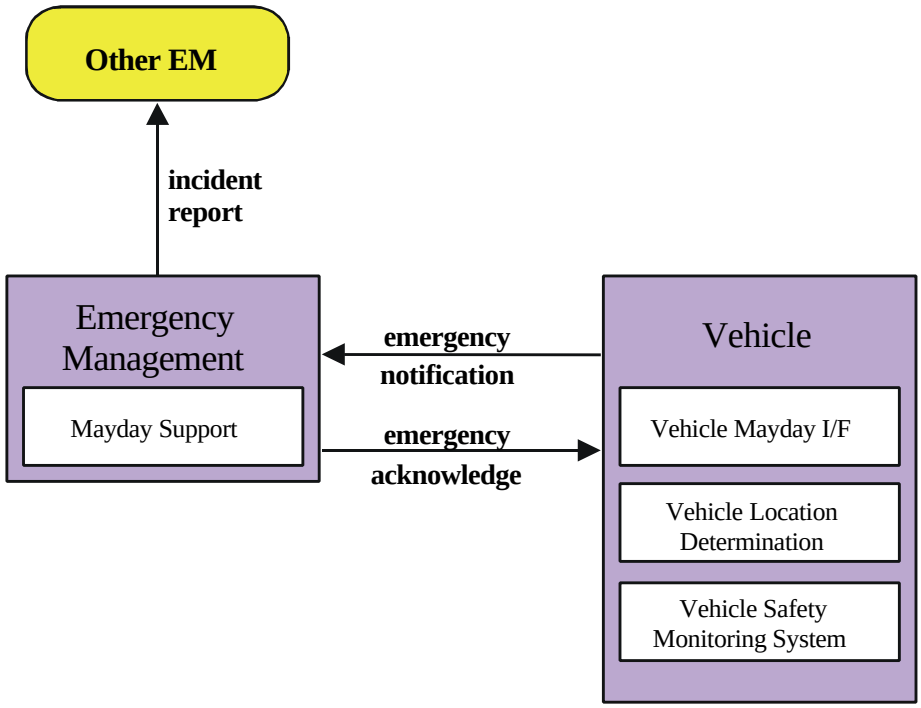


Figure 2.21: Transit Vehicle Tracking Architecture Flows

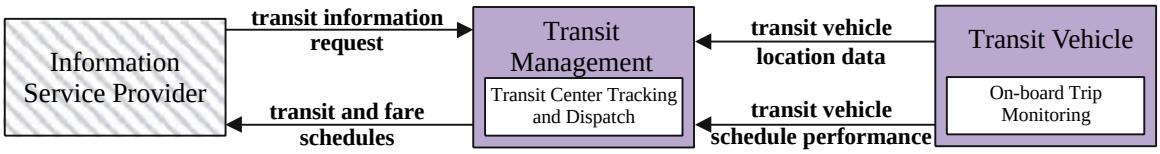
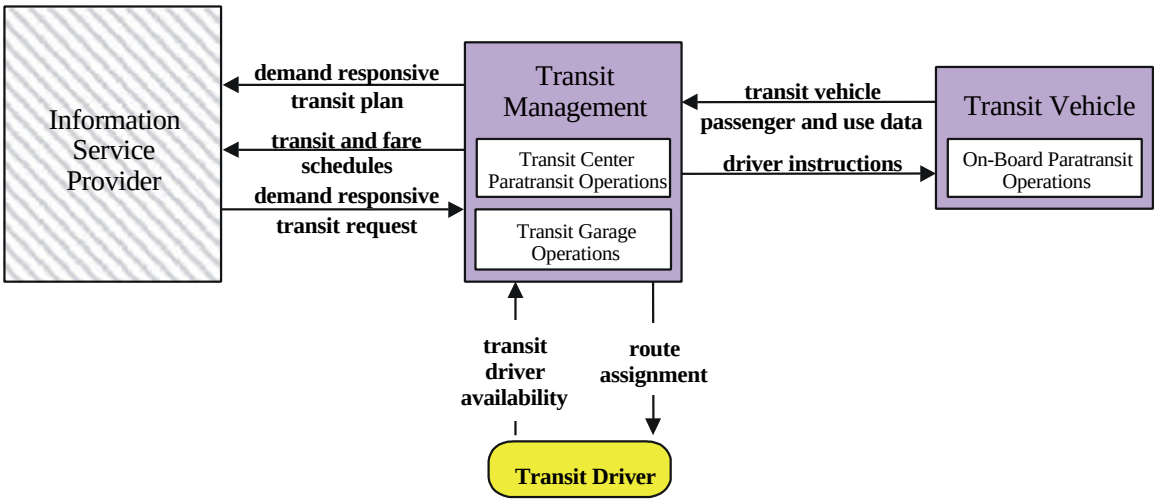


Figure 2.22: Demand Response Transit Operations Architecture Flows



Telecommunications Needs

Current ACN systems utilize analog cellular communications to contact the response center. Current work is underway to analyze the coverage over the state highway system.

Optical Fiber

For any stationary or mobile endpoint or device, such as a work zone or railroad crossing, near a hand hole in the optical fiber backbone, it will be possible to use the optical fiber backbone for transmission. Examples of mobile endpoints would include temporary cameras or VMSs in work zones.

Telephone Lines

Leased telephone lines may be used where the optical fiber is not readily available either by construction schedule or location.

800 MHz Radio

The 800 MHz radio system is a critical link in ACN process. The radio system will be used by emergency personnel, including local fire departments, local law enforcement, KHP, and ambulance services to relay information to the center. As the 800 MHz radio system has been designed to be a point-to-multi point voice communication method, it simultaneously alerts all response personnel within an agency to the incident and the need for their services.

Also, 800 MHz radio system can be used by the ACN center to contact response agency workers in the field in order to speed response time and more directly relay important information.

Cellular and Satellite

Both cellular or satellite service play the other critical role in the deployment of ACN. After an in-vehicle sensor detects an incident, wireless voice communications (cellular or satellite) is required between the vehicle and an ACN Center. Unfortunately, the level of cellular coverage in rural areas is mediocre. In that same vein, with the bankruptcy of Iridium, voice satellite communications are still a long way from realization.

Once CDPD is available in rural areas, it would be possible for response agency vehicles, equipped with digital cameras, to transmit pictures of the scene and victims to the trauma center. The trauma center personnel would not have to waste time questioning the response personnel to ascertain details about the incident. They could be prepared before the victim arrives at the trauma center.

Technology currently is use or development for Telehealth applications (long distance sharing of medical images and data in either real-time or store-and-forward formats) could be melded to this system as part of the standard equipment carried by emergency response crews. These technologies will make use of the CDPD system, and may be further reinforced by other telecommunications links such as transmitting the information to the nearest access node using low-power radio and transmitting it from there across the fiber optic network or through the public telephone network.

Timeline

The construction of the optical fiber backbone plays a limited role in the timeline of deployment for rural safety and mobility projects. The limiting factors for deployment are the completion of the 800 MHz radio system and continued improvement of cellular service in rural areas. See the Priority Corridors Program Area for more information about the timeline of those resources.

Operating Cost Analysis

Currently, ACN calls are handled through the existing emergency response facilities. Thus, there is no incremental operating cost increase (ACN systems enable crashes to be reported more quickly, but do not significantly increase the overall quantity of crashes reported). The establishment of a statewide ACN center would require certain operating costs, including the maintenance of computer hardware and software, ongoing training for operators, and additional staffing.

As the ACN market grows, there will be a need for registration system whereby ACN service providers who meet guidelines (yet to be developed) can be identified. Such a system can be almost entirely automated, allowing vendor qualifications to be entered over the Internet and evaluated by computer. It will, however, require a nominal ongoing investment to verify vendor supplied information. At least random spot checks are needed to prevent irreputable vendors from misrepresenting their qualifications.

Wireless communications are used in several areas within the Department of Transportation, and public-private partnerships are a potential means of leveraging public assets to improve the wireless coverage in remote areas. The nature of the partnerships that might be established would have implications on the magnitude of the ongoing operations costs. If KDOT contributes right of way, allowing a private sector entity to erect a tower on KDOT right-of-way, the private sector is likely to be responsible for the maintenance of the site, and few, if any, ongoing costs would be born by KDOT. However, if KDOT erects the tower to be used for internal purposes, then allows a wireless carrier to mount an antenna on a KDOT-owned structure (presumably in exchange for wireless services), it is likely that KDOT would be responsible for the upkeep of the structure.

Cost-Benefit Analysis

The primary benefit from rural safety systems is that they provide for reduced emergency response times when crashes occur. The reduced response time potentially allows lives to be saved in fatality crashes and the severity of some injury crashes to be reduced. Most of the benefits from these mayday deployments accrue to the traveling public, however, the deploying agencies can also experience significant benefits from the systems, as shown in table 2.10.

Table 2.10: Benefits of Rural Safety Systems

Sector	Benefit
Government Agencies	• improved highway and vehicle safety • improved system throughput due to more efficient removal of disabled vehicles • improved interagency coordination • reduced responder costs (improved resource dispatching) • improved data availability for planning/research purposes
Roadway Users	• reduced number of fatality crashes • reduced severity of injury crashes • improved comfort and security of travel • reduced delay due to disabled vehicles

There are a limited (but growing) number of evaluations of real world rural ITS deployments, however, the benefits of the concept have been vigorously researched. The level of benefits expected of any type of rural safety ITS deployment would vary based on many factors. Two key factors determining the anticipated level of benefits include the market penetration of the in-vehicle devices and the coverage of the service. Benefits vary directly with the market penetration and coverage rates. Another key factor in the determination of benefits is the baseline notification time required to initiate an emergency response. Regions with high cellular phone use and coordinated systems for emergency response (e.g., integrated 9-1-1 system) would likely experience less incremental response time gains from a mayday deployment than a region with little cell phone use and a distributed emergency response system. Other factors influencing benefits include how the system is used (e.g., only used in case of crashes or also used with vehicle disablements) and the type of data that is communicated by the system.

The costs of the system can also vary greatly based on the level of public sector involvement. Current mayday systems rely heavily on private sector service providers for receiving and distributing emergency calls. Government agencies can provide various functions for mayday systems including facilitating the collection and dissemination of information, and the coordinating of emergency response. The incremental costs of these projects vary greatly depending on the specific functions provided by the agency.

Benefits of Rural Safety and Mobility Deployments – Kansas Examples

A great deal of travel in the state occurs in rural environments; therefore, Rural Safety and Mobility deployments have great potential to provide benefits to Kansas travelers and transportation agencies. Rural safety deployments are anticipated to provide enhanced accident and disablement notification (i.e., Mayday systems), while rural mobility deployments will serve to enhance the provision of transportation alternatives available in rural environments.

Mayday systems will provide improved safety and enhanced feelings of security for travelers in the rural areas of Kansas. In the event of an accident or disablement, emergency responders will receive faster notice of the occurrence and location of the event. The resulting decreased response times will reduce the number of fatalities and the severity of injuries for some accidents. Traveler comfort and security will be improved by the knowledge that they will not be stranded or in an accident in a rural area of the state and be unable to find emergency assistance.

These systems also improve the efficiency of the transportation system and the efficiency of the responding agencies. Through the enhanced notification of accidents and disablements, responders are able to more quickly locate and remove any lane blockage or obstacles inhibiting the normal flow of traffic. Also, the information received from the Mayday system better enables emergency responders to determine which agencies and resources are needed to respond to a particular incident and helps the agencies to tailor their response to the incident situation.

Rural mobility deployments, such as AVL and CAD scheduling for rural transit and paratransit fleets, provide transportation alternatives for rural residents. These types of services are currently being considered for North Central Kansas and the Hays area. These systems provide efficiencies for rural transit providers and decrease travel times for patrons. These system efficiency gains also will allow rural transit agencies to provide service to additional regions of the state where it is currently not feasible to provide service.

The variability of the potential costs and benefits of mayday systems results in a wide range of possible benefit/cost comparisons. Sketch planning methods developed by Mitretek Corporation were used to estimate a range of benefits and costs that might be expected for these types of deployments. This range is presented in the table below.

Table 2.11: Benefit/Cost Ratios for Rural Safety Systems

ITS Deployment Type	Range of Benefit/Cost Ratio
Rural ITS Mayday	9 to 30

The range of benefit/cost ratios presented in table 2.11 above only considers the benefits from the reduction in fatality crashes. The additional benefits listed in the preceding table were not considered in estimating this range. This range also does not consider the private sector costs to develop and deploy the mayday infrastructure, nor the cost to consumers of installing and operating the in-vehicle systems.

Public-Private Opportunities

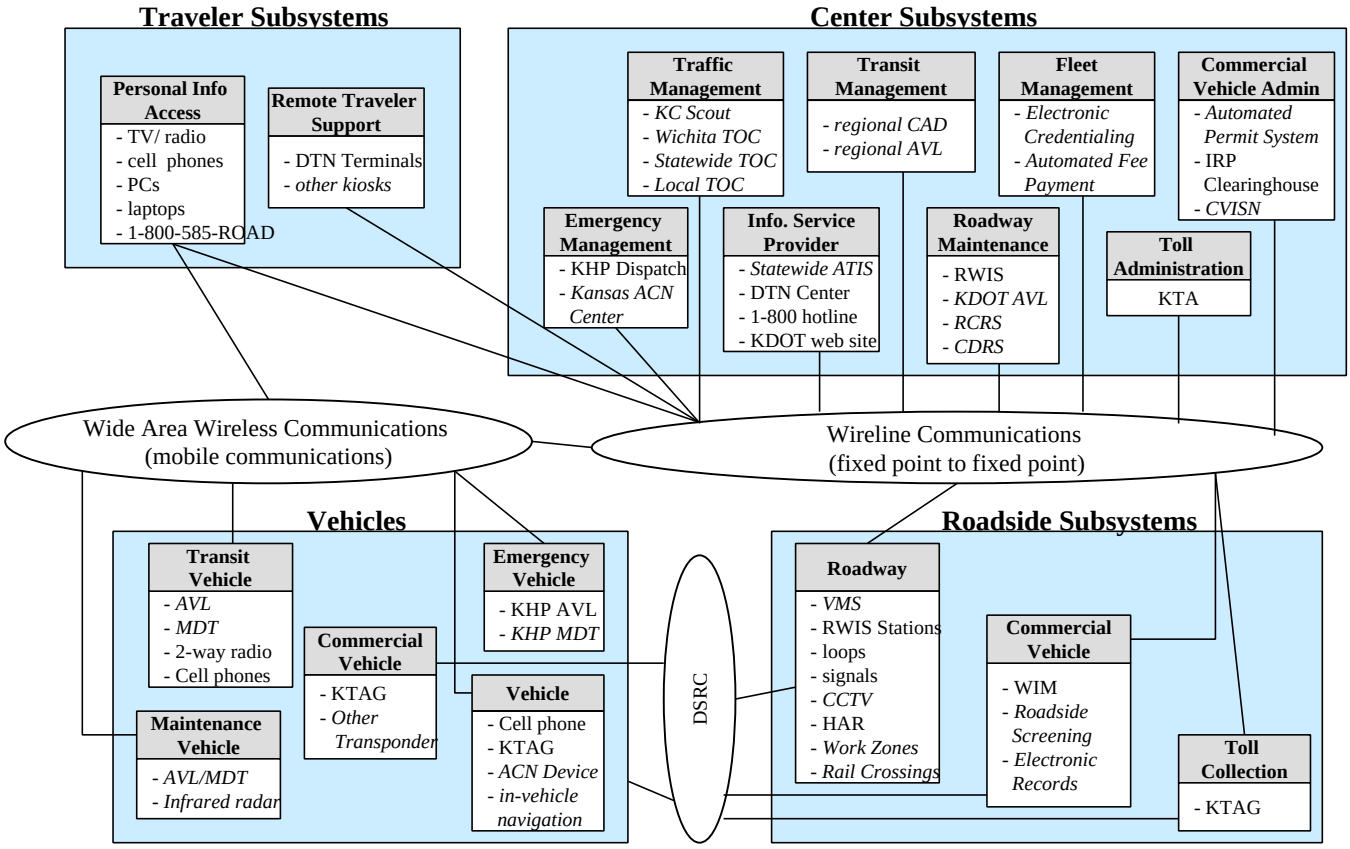
Public-private opportunities fall into two categories. The first is directly related to the establishment of a statewide ACN center. Because of the rapid growth anticipated in the near term in the ACN market, private agencies are likely to be interested in partnerships with states in order to establish their place in the market. Areas of partnership opportunities may include computer software for receiving and dispatching calls at the center.

The second area that presents excellent opportunities for public-private partnerships is that of providing wireless communications services to remote areas. Wireless communications can be used for emergency services dispatch, incident management, rural transit operations, and collision notification. While the popularity enjoyed by the wireless communications industry has served to increase the coverage, extending well beyond the metropolitan areas and interstate routes, wireless availability in rural areas is still far from ubiquitous. Many rural areas simply do not have enough potential subscribers to make it economically advantageous for wireless service providers to establish a tower site. However, it is these remote areas where, because of their remote nature, ACN can have the most pronounced effect on notification times. Establishing public private partnerships with wireless providers can make it economically feasible for wireless service to be provided to remote areas where there is currently no service.

2.5 Kansas Statewide Architecture

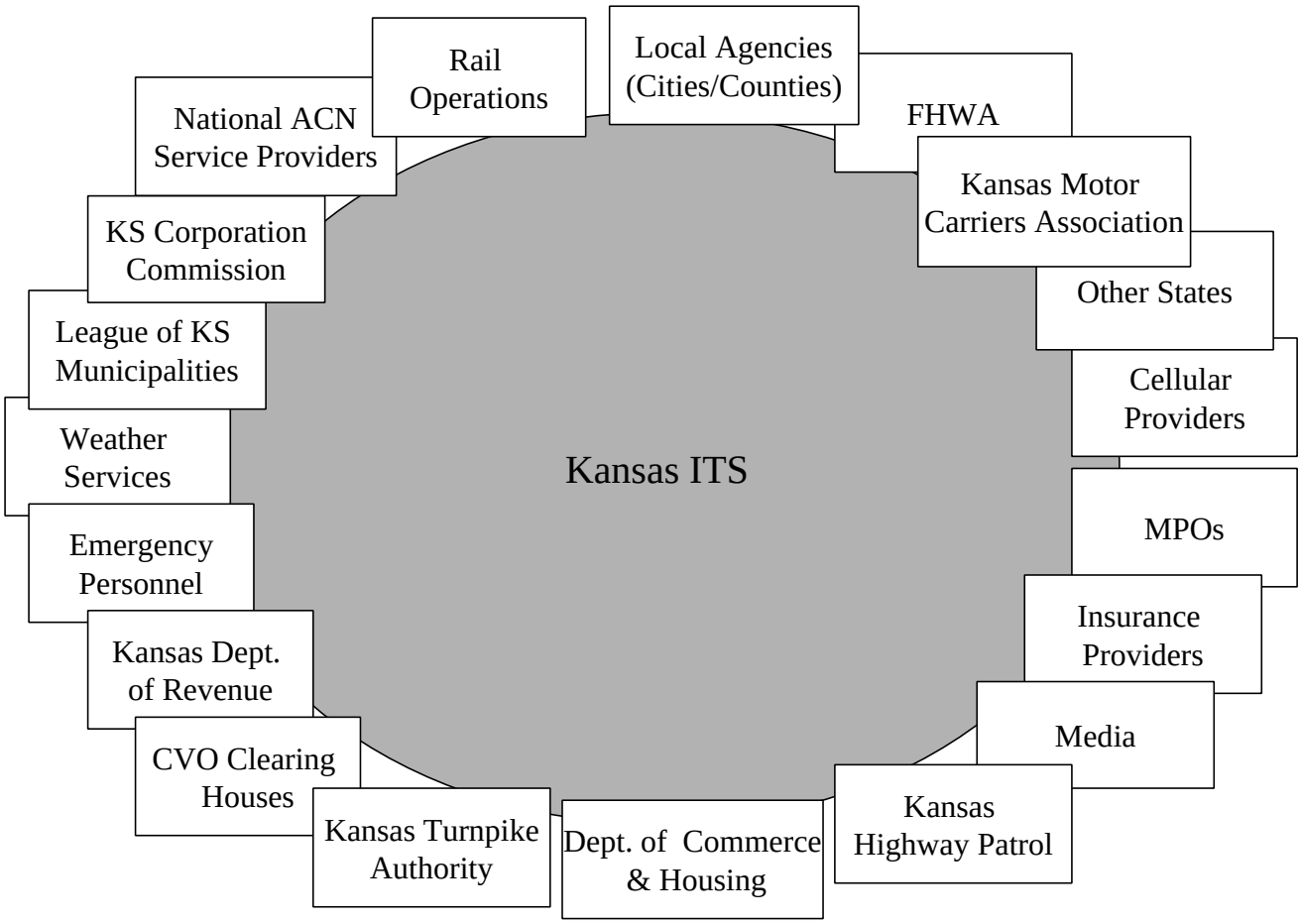
The statewide architecture for Kansas builds on the architectures that were developed for the ITS program areas in section 2.4. The role of the statewide architecture is to tie each of these program areas together and provide a framework for ensuring an interoperable statewide ITS system. The long-term ITS Architecture includes existing and future ITS implementation and is compliant with the National ITS Architecture. Figure 2.23 shows a proposed Kansas ITS Architecture that allows for the expansion of all potential ITS projects in Kansas. The italicized projects in figure 2.23 represent future ITS deployments.

Figure 2.23: Kansas Statewide ITS Architecture



Aside from the subsystems and agencies that are a part of the Statewide Kansas ITS Architecture, there are also a number of external interfaces. External interfaces are related systems and agencies that interface with the Kansas ITS system. These entities, referred to as terminators by the National Architecture, may include end users or agencies that have an interest in the Statewide ITS. Some of the external interfaces (or terminators) in the Kansas ITS system are shown in figure 2.24.

Figure 2.24: Kansas ITS External Interfaces



2.6 Integrating/Mainstreaming ITS

One of the keys to having a successful ITS program in Kansas is integrating or mainstreaming ITS into the KDOT business process. In order for this to happen, funding, contracting, planning, design, operations and maintenance of ITS needs to be a consideration in all bureaus of KDOT. The recently approved Kansas 10-year Comprehensive Transportation Plan (CTP) does not detail an ITS program, hence all ITS projects or ITS elements within larger projects must be mainstreamed into the traditional design and operating process. Although there is no explicit funding for ITS in the 10-year CTP, the ITS Unit has ITS set-aside funding to move forward with many of its initiatives. Therefore, the two most feasible ways to fund ITS projects or ITS elements as part of a larger project are either through the ITS set-aside funds or by mainstreaming ITS into other projects.

Institutional Barriers

Mainstreaming ITS into other projects will require working with institutional barriers within KDOT. One institutional barrier that ITS is new and not a traditional part of day to day business in KDOT. KDOT design projects follow strict guidelines laid out in manuals and standards that have been used for many years. Currently within KDOT, ITS standards do not exist and many of the elements have not yet been defined. Designers need to be encouraged to include ITS as part of their plans if mainstreaming is to happen.

In order to achieve the mainstreaming of ITS into KDOT business, certain KDOT bureaus such as the Bureau of Design and Bureau of Construction and Maintenance, will need to have a good understanding of ITS, how it can be used, and any relevant standards. To facilitate the education and mainstreaming of ITS, this study recommends the following initiatives for KDOT:

- Checklists should be developed for projects and bureaus to help identify ITS elements in KDOT projects. These checklists should be implemented on every project during the discovery phase or scoping.

- Increase the frequency of seminar/training sessions and incorporate monthly newsletters on ITS. The seminars would involve the ITS Unit giving presentations on how ITS fits into its everyday business. The monthly newsletters would highlight recent advancements in ITS as they apply to KDOT.

- Establish informal working groups for interagency coordination. The working groups should be comprised of representatives from each of the agencies involved. An example of a current working group in Kansas is the CVO Executive Working Group, which is comprised of KDOT, KDOR, KCC, KHP and KMCA.

- The ITS Unit should encourage interested KDOT staff to attend ITS-related conferences, seminars and workshops. This will increase ITS awareness within KDOT and facilitate the exchange of ITS information with other agencies.

- The ITS unit should encourage KDOT staff involved with ITS to attend FHWA-sponsored scanning tours, symposiums and workshops. These events should encompass both rural and urban elements of ITS.

- KDOT should have a focus area to mainstream and educate internally. This will require a great deal of work and may justify a full time effort from one person.

- KDOT needs to become more proactive in attending meetings outside of its agency. KDOT usually invites other agencies to attend KDOT meetings without making an effort to attend ITS-related meetings held by other agencies such as emergency response agencies.

- The ITS Unit should contact other states to solicit ITS standards and detail sheets if they are available.

- KDOT bureaus should designate an ITS "champion" to help facilitate the mainstreaming of ITS into their work area.

- Identify those ITS projects that have a high potential for providing substantial benefits or projects with a high-level of visibility to the traveling public. Encourage the rapid deployment of these types of projects. Promote the advantages of these projects through internal and external publicity campaigns, press releases, etc.

It should be noted that the mainstreaming of ITS into KDOT business will not be a simple process and may take years to happen. Therefore, the ITS set-aside funds may be a good interim solution for introducing ITS into KDOT business. One approach could be to use the set-aside funds to initiate high profile projects. These projects should be selected to ensure success of the ITS program and sell the benefits of ITS. By proof of concept, ITS can slowly be mainstreamed into the way KDOT does its business.

Integrating ITS Programs

Another consideration for mainstreaming ITS in Kansas is the integration of rural, urban and CVO ITS programs. These three areas of ITS are often treated separately with the urban focus being on reducing traffic congestion, the rural focus on increasing safety and the CVO focus being on increasing the efficiency of motor carriers. However, it is beneficial for these programs to operate in an integrated manner. For instance, traveler information on the I-70 corridor could be used in urban areas like Kansas City and Topeka for travelers from these cities that are planning a trip along the corridor. Traveler information could also be used by commercial vehicle operators to help them plan their routes. In order for these things to happen, there need to be agreements in place between

the rural, urban and CVO ITS program areas on how the information will be disseminated.

One strategy for integrating the program areas is to establish informal working groups to facilitate coordination between the three programs. The working groups should be comprised of stakeholders from urban, rural and CVO ITS programs. Kansas has already established these types of working groups in other areas such as the CVO Executive Working Group, which is comprised of KDOT, KDOR, KCC, KHP and KMCA. These types of working groups have proven to be very successful.

Another strategy for integrating urban, rural and CVO ITS program areas is to develop a statewide operations center. This operations center could simply be a common system or database where data is shared throughout the state. This system would integrate traffic and traveler information from rural, urban and CVO areas. In order to ensure that urban systems, rural systems and CVO systems are all compatible with each other, the program areas must comply with the National ITS Architecture and Standards when they are deploying ITS systems.

2.7 Summary and Final Recommendations

This summary highlights the key points and recommendations made throughout the document. The recommendations are organized according to the following areas: ITS vision, project development, state to state coordination, ITS Architecture, public/private partnerships, and mainstreaming/integrating ITS. These recommendations will be incorporated into the Strategic Deployment Plan.

ITS Vision

The Kansas ITS Vision defines what the statewide ITS system will look like in 20 years. This system will be an open, integrated and cost effective system that ensures safer, more secure and efficient movement of people and goods across Kansas through the use of advanced technologies and management strategies. This vision will guide the Kansas ITS planning process for the next 20 years.

Project Development

KDOT should continue to update the KITS database as new ITS projects or projects that have ITS elements are identified. The organizational aspects of the database will be useful to track the status of ITS projects and the availability of ITS infrastructure throughout the state. The database can be used as a mechanism for updating potential ITS projects being considered/deployed by all bureaus within KDOT. Also, the database can be used to look for opportunities to integrate related projects. Finally, the project database should be used to evaluate how future projects fit into the Kansas Statewide ITS Architecture.

State to State Coordination

KDOT should encourage the establishment of multi-state working groups to facilitate coordination on projects requiring multi-state involvement (e.g., Scout project). KDOT should encourage the adoption of formal and informal standards in all Kansas deployments to maximize the capability for integration with other state's and national systems. Finally, it is recommended that the ITS Unit actively participate in ITS Heartland. This organization will be useful in aiding multi-state coordination and cooperation.

ITS Architecture

Developing a Kansas Statewide ITS architecture helps to coordinate ITS applications in Kansas and defines their fit within the KDOT project structure and physical infrastructure. Moreover, developing an ITS architecture is helpful in planning for ITS deployment, conserving previous ITS investments, and identifying areas where standards

are needed. It is important that the Kansas Statewide ITS architecture conforms with the National Architecture and that national standards are adopted.

The project database and the architecture should be periodically reviewed to identify areas where redundant systems exist. KDOT should evaluate the potential to combine/coordinate systems to maximize efficiency and minimize redundant operations (e.g., the integration of multiple systems/projects involved in the I-70 Priority Corridor). KDOT should establish a schedule for periodically reviewing and updating the ITS Architecture. Maintaining the architecture will better allow the efficient incorporation of new technologies and projects, and will better insure the relevance of the architecture.

Public/Private Partnerships

KDOT should review the KITS database and the architecture for opportunities for increased private sector involvement. They should forward suggestions to deploying agencies on how these opportunities can be identified and facilitated.

It may also be helpful for KDOT to develop guidelines for agencies considering public/private partnerships. This may involve collecting and distributing sample operating agreements and contracts from existing partnerships to serve as examples for agencies considering partnering opportunities.

Finally, it is recommended that KDOT perform a study to identify state policies that may hinder the development of beneficial public/private partnerships. KDOT should identify possible means for overcoming these barriers.

Mainstreaming/Integrating ITS

KDOT should concentrate on mainstreaming ITS into its business process and educating its internal organization on ITS and its benefits. This will require a great deal of work and may justify hiring additional staff. The ITS Unit should develop checklists for projects and bureaus to help identify ITS elements in KDOT projects. These checklists should be implemented on every design project during the discovery phase.

Some recommended actions that KDOT can take in the short term to help mainstream ITS into its business process include providing seminars, training sessions and monthly newsletters on ITS, establishing informal working groups for interagency coordination, attending ITS-related conferences, seminars and workshops, and continuing its attendance at FHWA-sponsored scanning tours.

KDOT should be proactive in attending meetings outside of its agency. KDOT usually invites other agencies to attend KDOT meetings. KDOT should also place a priority on attending ITS-related meetings held by other agencies such as emergency response agencies. The ITS Unit should contact other states to solicit ITS standards and detail sheets if the are available.

Finally, it would be beneficial for KDOT to identify those ITS projects that have a high potential for providing substantial benefits or projects with a high-level of visibility to the traveling public. They should encourage the rapid deployment of these types of projects and promote the advantages of these projects through internal and external publicity campaigns and press releases.

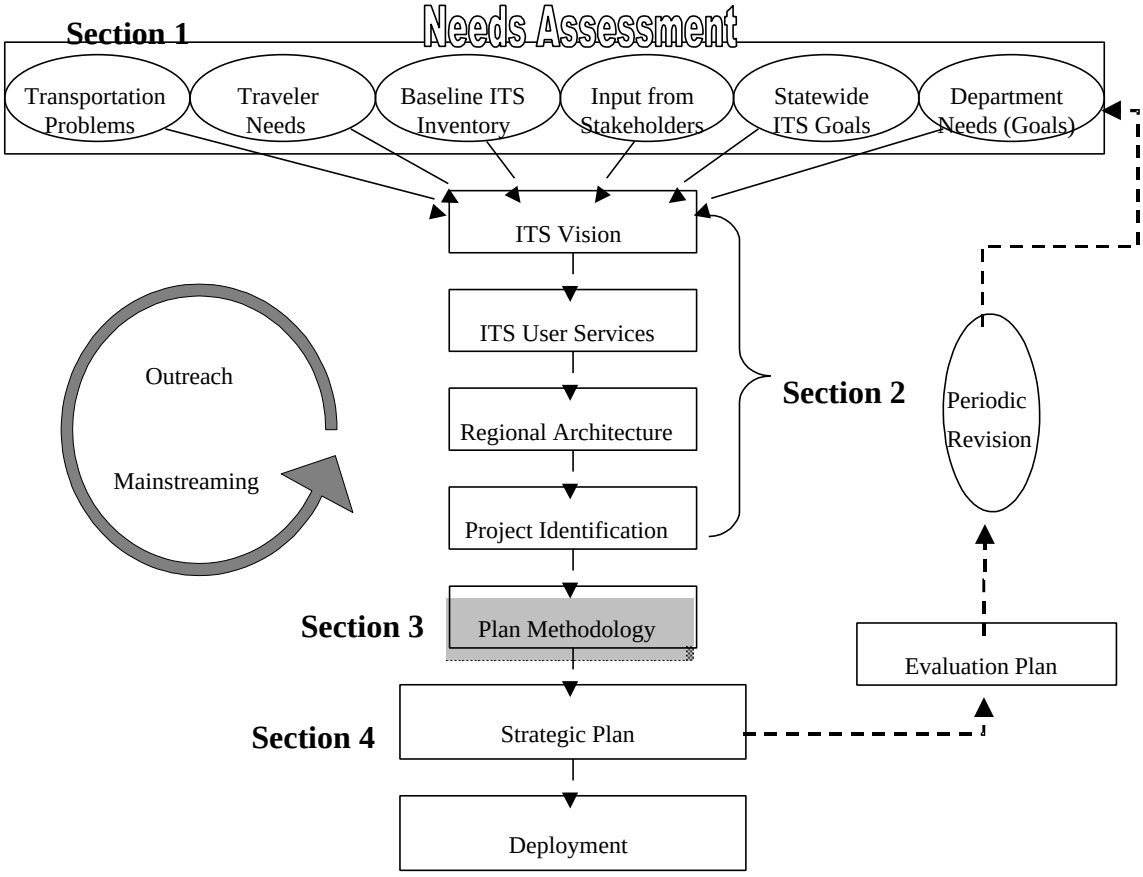
Section 3: Plan Methodology

3.0 Introduction

Objective

The objective of this section is to develop an ITS planning methodology for the KDOT ITS Unit to follow between periodic updates of the Kansas Statewide ITS Plan. The methodology outlined in this section is a continuous process that assists the KDOT ITS Unit in the identification, tracking, ranking and prioritization of ITS projects. Figure 3.1 shows a flow chart that has been used to develop the Statewide ITS Plan for Kansas. The Plan Methodology, shown shaded in figure 3.1, is followed by the Strategic Plan for deploying ITS in Kansas, which is documented in section 4. The rest of section 3 includes the process for identifying and tracking projects involving ITS, the process for ranking and prioritizing projects, and a summary of results from the second round of KDOT district visits in January 2000.

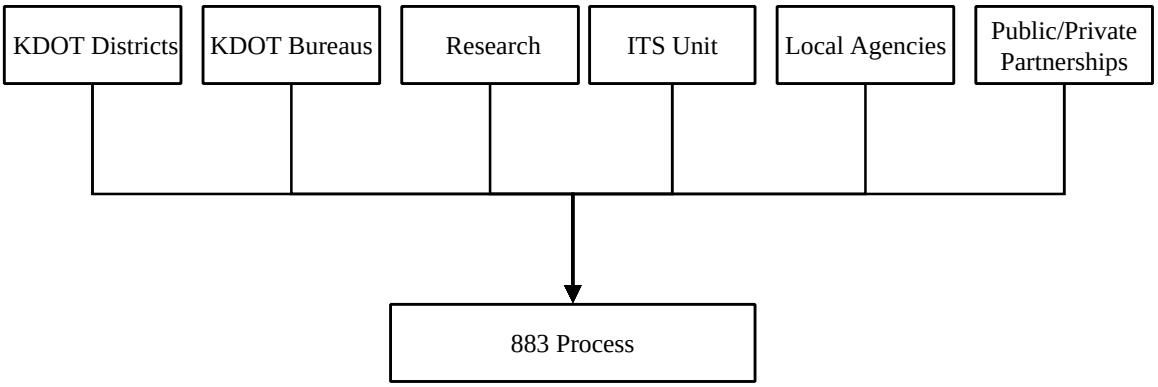
Figure 3.1: Kansas Statewide ITS Plan Flow Chart



3.1 Identifying and Tracking Projects Involving ITS

The first step in the plan methodology is determining a process for identifying and tracking the projects that involve ITS. In this process, ideas for ITS-related projects will come from a number of different sources other than the ITS Unit as shown in figure 3.2. Some of the different sources of ITS projects include the KDOT Bureau of Design, other KDOT Bureaus, KDOT Districts, research, local agencies, and public/private partnerships.

Figure 3.2: Sources of ITS Projects



KDOT follows a formal process, referred to as the 883 process, for each of its projects. This is called the 883 process since it is a requirement that an 883 form be filled out for each design project. A formal procedure for identifying appropriate ITS enhancements to typical design projects is described below. A less formal procedure for identifying ITS projects from sources other than the Bureau of Design is also described.

Process for Design Projects

A key to mainstreaming ITS into KDOT business is providing the KDOT Bureau of Design with a formal procedure to help it identify potential ITS enhancements in its typical design projects. Figure 3.3 shows how ITS can be integrated into the current KDOT Design process. The double-lined boxes in the middle of figure 3.3 represent the traditional design process for KDOT. The single-lined boxes outside of this path represent ITS-related functions being integrated into the process.

The most significant change to the traditional design process is the addition of an ITS Checklist. The ITS checklist will be introduced during the Discovery Phase of the project. This Checklist will be developed by the ITS Unit and will contain criteria that when met would indicate an opportunity for ITS to be added to the project. For example, if a project is located on a priority corridor or in a high accident location, then ITS should be considered for that project. The steps in table 3.1 explain how the ITS-related functions can be integrated into the current Design process.

Figure 3.3: Project Selection and Tracking

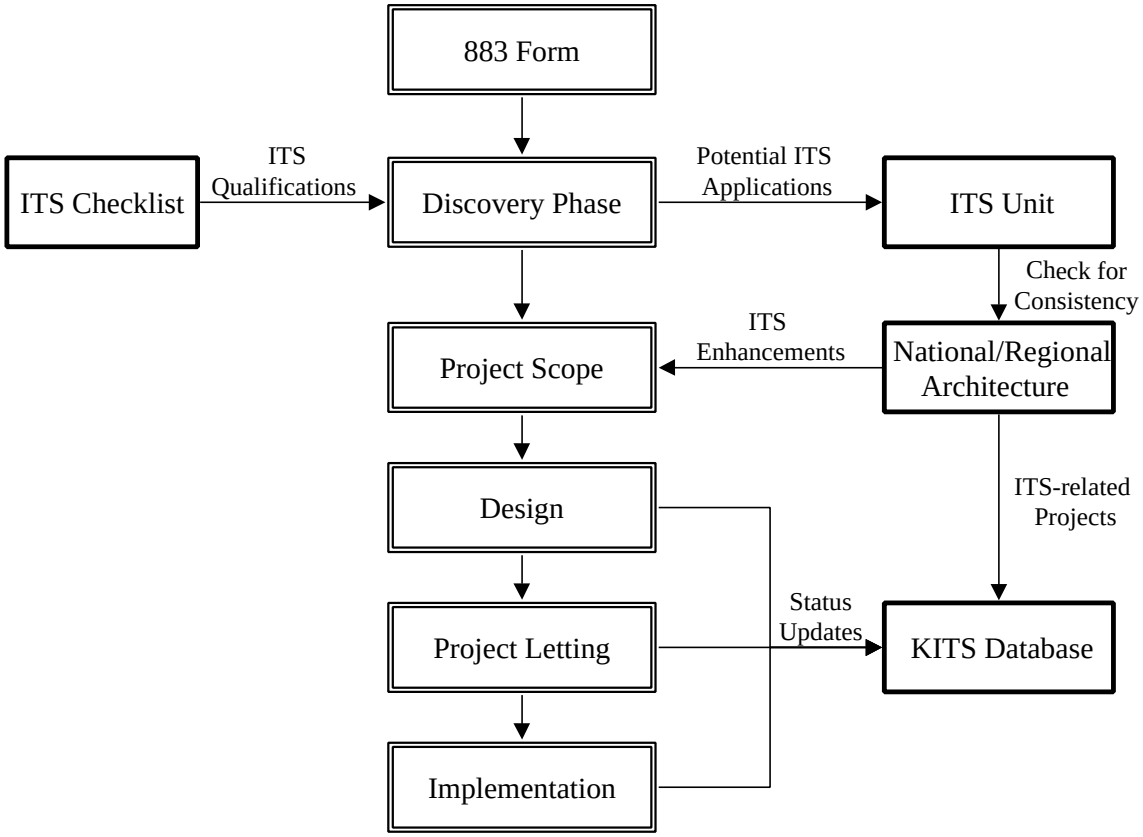


Table 3.1: Integrating ITS into the 883 Process for the Bureau of Design

Integrating ITS into the 883 Process for the Bureau of Design
1. ITS Checklist used by design squad during Discovery Phase. The Checklist contains descriptions of roadway/traffic conditions that provide opportunities for ITS deployments. If these thresholds are met, then the 883 form should be forwarded to the ITS Unit for review.
2. ITS Unit consults with Design Squad on whether project should have ITS in its scope.
3. ITS Unit checks project for consistency with the appropriate regional ITS architecture.
4. If ITS Unit determines that the project warrants ITS enhancements, then ITS is added to project scope and a KITS Project is created and added to KITS database for tracking.
5. The project status is updated in the KITS Database as its status changes from proposed to funded, from funded to ongoing, etc.

Section 3.2 will expand on the duties of the ITS Unit with an emphasis on ranking and prioritizing ITS projects and tracking projects using the Kansas ITS Database and the Kansas Statewide Architecture.

Process for Non-Design Projects

The mainstreaming process described above will work well for integrating ITS into the Design Bureau. However, there are other bureaus within KDOT that do not follow the process depicted in figure 3.3 when developing their projects. For instance, the Division of Operations funds most of its projects from their operating budget and does not go through a formal 883 process. It will be a challenge to define a formal procedure for integrating ITS into the day to day business of these bureaus. One way to do this is by educating KDOT to get them thinking about ITS and its benefits. Another strategy for integrating ITS into the non-design bureaus is to start with a few proof of concept projects to sell the benefits of particular ITS applications (e.g. AVL). Once the bureau and KDOT management see that ITS is beneficial, then they might be willing to increase deployment of the application district wide and eventually statewide.

Ideas for ITS projects may come from sources outside of KDOT as well. For instance, Universities and other research institutions are often a good source of innovative ideas for ITS projects. Likewise, local agencies and the private sector may come up with ideas for new ITS projects. It is important for the ITS Unit to be proactive in soliciting ideas for ITS projects from each of these sources. The project form described in the Analysis of ITS Elements is a good tool for soliciting ideas from these sources.

3.2 Ranking and Prioritizing Projects

Once potential ITS projects are identified, a process is recommended to evaluate, rank and prioritize the various projects. As discussed in Section 3.1, potential projects may be identified from a variety of sources both internal and external to the KDOT ITS Unit. This section provides a framework for the ITS Unit to evaluate and rank the various projects once they have been identified to the staff of the ITS Unit.

A consistent, yet flexible, ranking and prioritization process is necessary to provide a systematic manner for comparing the wide variety of potential ITS projects brought to the attention of the ITS Unit. This framework is recommended in order to:

- Provide the ITS Unit with a consistent format for evaluating projects;
- Ensure consistency with the appropriate regional ITS architectures;
- Provide the ITS Unit with comparable measures to allow comparison and ranking of diverse projects;
- Ensure the identification of critical deployment issues and potential implementation barriers;
- Determine the optimal project phasing strategies; and,
- Ensure the proper tracking and documentation of ITS projects.

The ranking and prioritization process will most likely be performed by the staff of the ITS Unit and the ITS Steering Committee with assistance and consultation with the agencies/bureaus that would be responsible for actual project implementation. Table 3.2 provides a summary of the project ranking and prioritization process that could be followed once projects have been identified. Although the specifics of this process may vary depending on the type of project and the source of project identification, the process provides general guidelines for the proper consideration of potential projects by the ITS Unit. The process described in Table 3.2 provides additional detail to the ITS Unit activities shown in the boxes down the right side of the flow chart presented in Figure 3.3.

Table 3.2: Ranking and Prioritization Process

Ranking and Prioritization Process for ITS Unit
1. Identify and inventory potential ITS project. [See Section 3.1]
2. Consult with project source/owner to discuss project details and offer implementation advice.
3. Explore funding alternatives.
4. Explore opportunities for public/private partnerships.
5. Consult with project source/owner to develop detailed project scope. If ITS project is being integrated into a design project, add ITS to the scope of design project.
6. Check for consistency with appropriate ITS Architecture. If project is not consistent with the architecture, propose either: - a) changes to the project to bring it into conformity, or, - b) variances to the architecture to allow conformity.
7. Enter project into ITS database (Assign KITS ID#)
8. Conduct project screening against project criteria. • Evaluate support for project. • Evaluate telecommunication and special design needs. • Evaluate technical and organizational feasibility. • Evaluate funding source and process to continue operations and maintenance of project. • Evaluate project-phasing issues. • Evaluate project costs and benefits.
9. Identify barriers to project deployment.
10. Compare proposed project with existing projects in the KITS database.
11. Determine appropriate project phasing and status.
12. Consult with project source/owner to obtain feedback.
13. Update KITS database with project information.
14. Conduct agency and public awareness outreach.

This process is intended to first explore various options for implementing the identified project. Then the project is evaluated against several criteria to analyze if the particular project is warranted based on its merits and project characteristics. The next major step in the process compares promising projects with the characteristics of existing projects in the ITS Plan to determine the proper phasing for deployment. The final step is to communicate the goals of the project and lessons learned through outreach activities aimed at both agency staff and the public.

This ranking and prioritization process is recommended to be used internally by the ITS Unit to continually evaluate projects as they are identified. Although much of the analysis will be conducted internally, the input and participation of the ITS project owner is critical to the success of the prioritization process. Ideally, the ITS Unit and the project owner (along with other stakeholders) will meet on a continuing basis to discuss the project during the development phase. This level of interaction may not always be possible, however, due to staff workload and other circumstances. Therefore, the ranking and prioritization process identifies several key junctures in the process where the ITS Unit staff should, at a minimum, consult with the project owners to discuss the proposed project and receive feedback on the proposed deployment.

The ranking and prioritization process is intended to produce several outputs that will be valuable to the ITS Unit staff and the owners of the ITS projects. These outputs include:

1. New project entries in the KITS database describing proposed projects [Step #8];
2. Detailed project scope for Design Squad with description of ITS elements [Step #7];
3. Consistency check with the regional architecture and proposed modifications to subsequent updates of the Kansas Statewide Architecture [Step #4];
4. Identification of significant implementation barriers to overcome [Step #10];
5. Project screening data [Step #9]; and,
6. Proposed project phasing [Step #12].

These outputs should be useful to the ITS Unit in developing and updating short-range plans and in determining the conformity to the longer-range ITS vision. Several outputs, such as number 3 above, have the added benefit of helping to identify when it may be appropriate to modify the long-term vision (as represented in the statewide architecture).

3.3 Results from Second Round of District Visits

The following section documents the Kansas ITS Awareness Seminars that took place between January 18th and January 31st of 2000 as part of the Statewide ITS Plan. This was the second round of district visits. The first round of visits took place in Spring 1999 and is documented in the Baseline Condition Report. The purpose of the first round of visits was to give a brief ITS tutorial and receive input from the districts for the Kansas Statewide ITS Plan. The purpose of the second round of visits was to report on the findings of the Plan and receive comments from the attendees.

This section presents an overview of the entire seminar process and then summarizes the verbal and written feedback from the seminars. Appendices H and I contain the attendance records and the specific comments that were provided by each district, respectively.

Overview of Kansas ITS Awareness Seminars

Six ITS seminars were conducted throughout the state of Kansas between January 18 and January 31, 1999. Seminars took place at KDOT district offices in Chanute, Hutchinson, Norton, Salina, Topeka and Garden City. In total, over 160 individuals attended the six seminars. In addition to KDOT district personnel, non-KDOT attendees included city and county public works officials, transit and paratransit providers as well as EMS, law enforcement, and business interests.

The outreach effort was very successful. Copies of the attendance lists for each seminar are included in Appendix H. Seminars began with a presentation, which included an overview of the Kansas Statewide ITS Plan, an announcement of the ITS Set-Aside Program in Kansas and showing videos demonstrating the use of new ITS technologies. After the presentation, a Draft Report Summary of the Plan was handed out and the seminar participants were invited to comment on the Plan.

Overall, the seminars were well attended, audiences expressed interest in the subject and were engaged in the discussion. Participants provided feedback that will help the project team develop an effective Statewide Plan. Informal discussions and follow-up conversations also indicate that participants left seminars with a deeper understanding of the Kansas Statewide ITS Plan and its effect on their business.

Much of the discussion during the second round of district visits centered on weather-related applications of ITS. Of particular interest to local agencies was the need for sharing RWIS data between KDOT and local agencies. This issue came up again and again at the seminars. Since the conclusion of the seminars, the KDOT Bureau of Construction and Maintenance acknowledged the importance of this issue and has begun investigating ways to share RWIS data between agencies.

Another question that was frequently asked was whether or not the KITS database would be available on the Internet. Following the seminars, it was decided to make the KITS database available first on the KDOT Intranet and then possibly on the Internet.

Many of the attendees, especially those from local agencies, had questions regarding the ITS Set-Aside program. Most of these questions were regarding the types of projects that could be funded and who would be eligible for the funding.

3.4 Conclusion

This summary highlights the key points and recommendations of the Kansas Statewide ITS Plan. The recommendations are organized according to the following areas: identifying and tracking projects, ranking and prioritizing projects and results from the second round of district visits. These recommendations build upon the recommendations introduced in Section 2: Analysis of ITS Elements.

Identifying and Tracking Projects

ITS projects originate from a number of sources including the KDOT Bureau of Design, other KDOT Bureaus, research, local agencies, and public/private partnerships. Projects that originate from the KDOT Bureau of Design must go through a formal 883 process. This plan recommends the addition of an ITS Checklist to supplement the traditional design process. This Checklist will be developed by the ITS Unit and will contain criteria that when met would indicate an opportunity for ITS to be added to the project. When an ITS project has been identified, it should be added to the KITS database. This database should be used to track the status of the project as well.

One way to integrate ITS into non-design bureaus within KDOT is education about ITS and its benefits. Another strategy for integrating ITS into the non-design bureaus is to start with a few proof of concept projects to showcase the benefits of particular ITS applications (e.g. AVL). Once the bureau sees that ITS is beneficial, then they will be willing to increase deployment of the application district-wide and eventually state-wide. Finally, it is important for the ITS Unit to be proactive in soliciting ideas for ITS projects from all available sources.

Ranking and Prioritizing Projects

The ranking and prioritization process provides a systematic manner for comparing the wide variety of ITS projects brought to the attention of the ITS Unit. The ranking and prioritization process will be performed largely by the staff of the ITS Unit with assistance and consultation with the agencies/bureaus that would be responsible for actual project implementation.

The ranking and prioritization process will be valuable to the ITS Unit staff and the owners of the ITS projects by helping them in developing and updating short-range plans and in determining the conformity to the longer-range ITS vision. Several outputs, such as consistency check with the architecture, have the added benefit of helping to identify when it may be appropriate to modify the long-term vision (as represented in the statewide architecture).

Second Round of District Visits

Six awareness seminars were conducted throughout the state. The purpose of the second round of visits was to report on the findings of the Plan and receive comments from the Districts. In total, over 160 individuals attended the six seminars. Participants provided feedback that will help the project team develop an effective Statewide Plan.

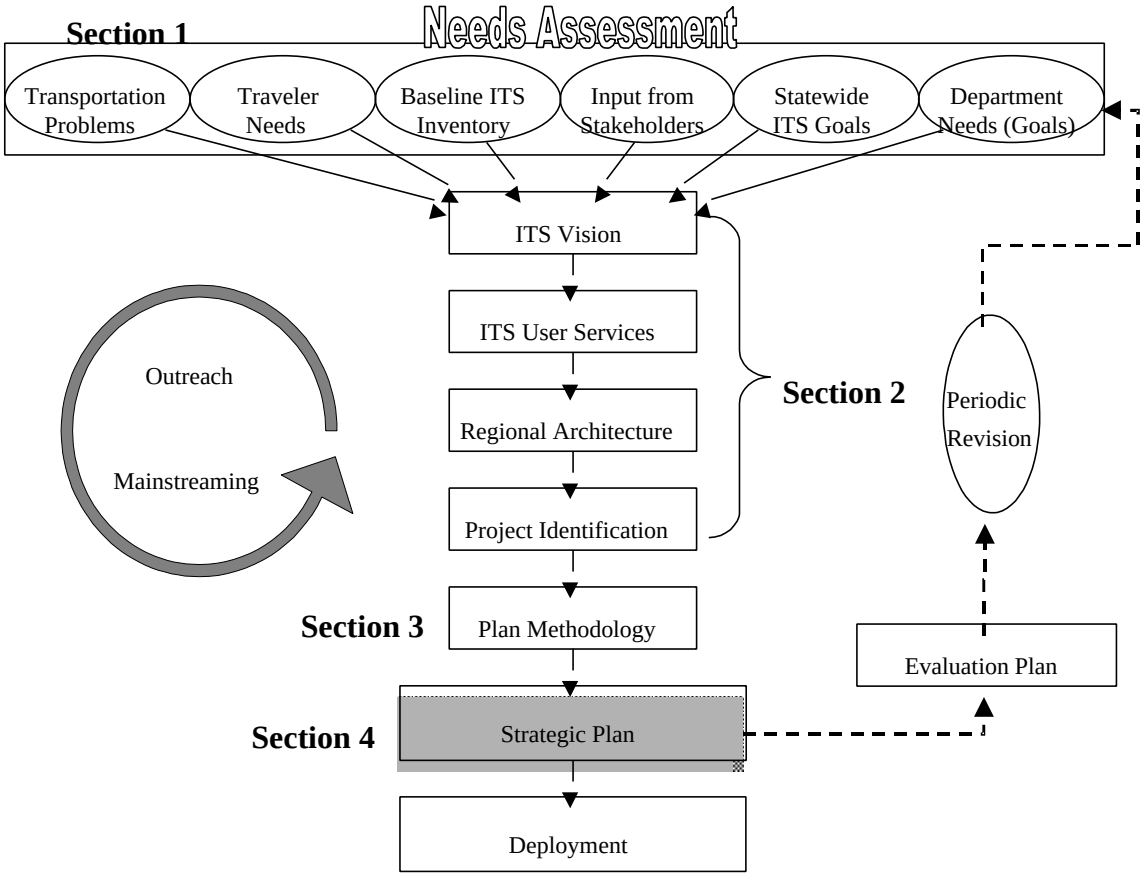
Section 4: Strategic Deployment Plan

4.0 Introduction

Objective

The objective of the Strategic Deployment Plan is to develop implementation strategies and near-, medium- and long-term deployment plans for ITS in Kansas with a focus on rural applications. Figure 4.1 shows a flow chart of the process that has been used to develop the Statewide ITS Plan for Kansas. Sections 1 through 3 of the Statewide Plan have already been completed. Section 4, shown shaded in the figure, presents the Strategic Plan for deploying ITS in Kansas. The Strategic Plan is followed by actual deployment of ITS technologies.

Figure 4.1: Kansas Statewide ITS Plan Methodology



This Strategic Deployment Plan presents both a phasing plan for the ITS projects and recommended strategies for successful ITS deployment. The different types of strategies discussed include funding strategies, implementation strategies and operational strategies. The recommendations given in this document build on the recommendations given in the Analysis of ITS Elements and the Plan Methodology.

The rest of section 4 includes 1) funding, implementation, and ITS Unit management strategies, 2) the project deployment plan, and 3) conclusions and recommendations for the entire Kansas Statewide ITS Plan.

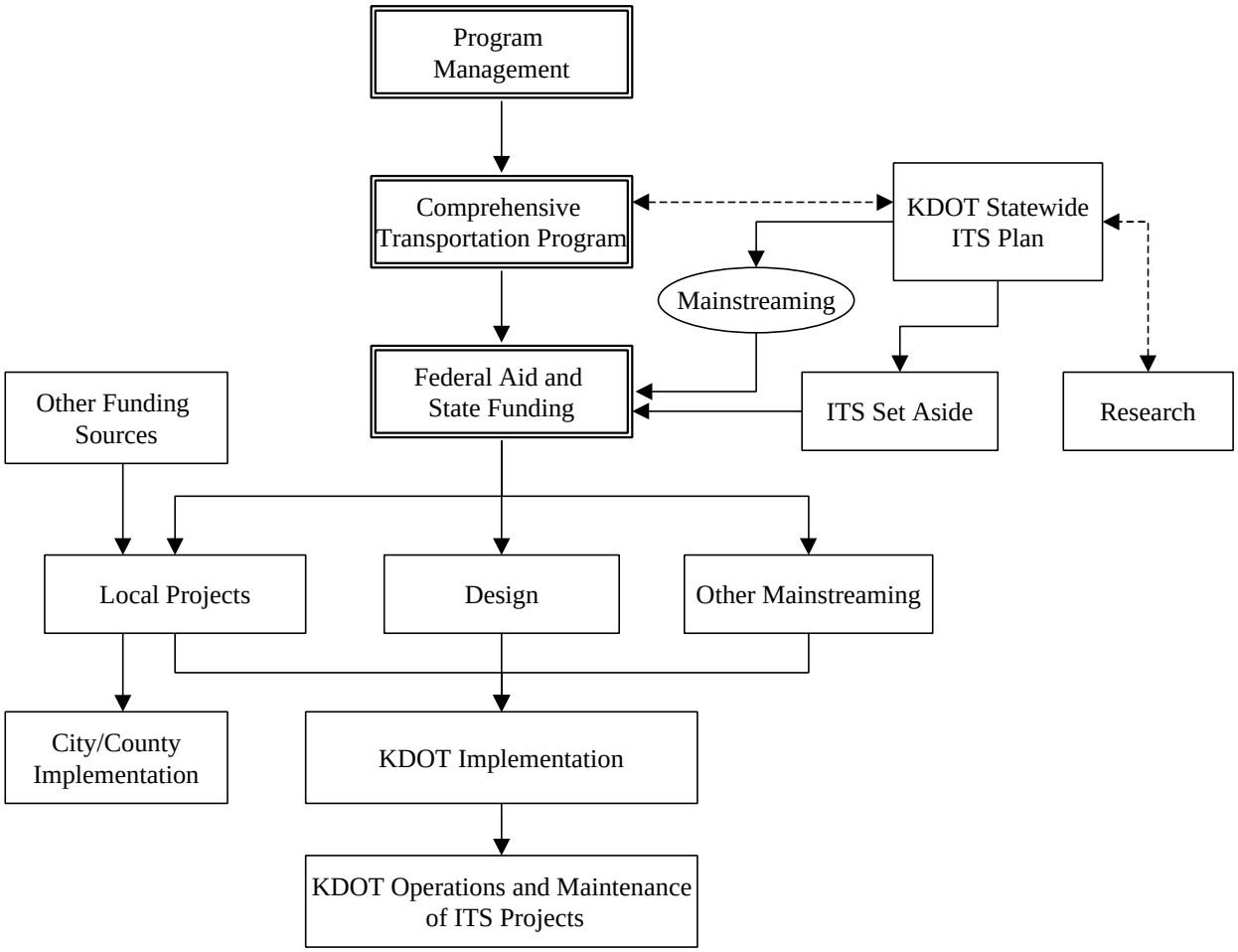
4.1 Deployment Strategies

This section recommends a number of different strategies for the KDOT ITS Unit to consider when deploying ITS. The strategies are grouped into the following three areas: funding strategies, implementation strategies, and operational strategies.

Funding Strategies

As with any crosscutting program, funding for ITS projects will come from a wide variety of sources. The major sources of funding will be federal-aid funds, state funds, ITS set-aside funds, and research funds. Figure 4.2 shows how the funding and project implementation process occurs in Kansas. Note the important role of the Kansas Statewide ITS Plan in the process. Mainstreaming and ITS set-aside funds are two ways to initiate ITS related projects into the process. Another way to get ITS projects started is through research programs such as K-TRAN, ENTERPRISE or other pooled fund studies. Strategies for using these funding sources are given below.

Figure 4.2: Funding and Implementation Process for KDOT Projects



Federal Aid and State Highway Funds

Whenever possible, the cost of roadside ITS elements should be included in budgets for highway maintenance and reconstruction projects. Potential roadside elements include conduit, vehicle detectors, VMS, HAR CCTV, and RWIS stations. The process described in section 3.1 ensures that ITS applications are given consideration during the discovery phase of every project. This will allow for ITS enhancements to be funded as part of typical design projects. ITS applications that are not be eligible for federal aid or state highway funding may be funded with ITS set-aside funds, research funds or public/private partnerships.

ITS Set-Aside Funds

Set-aside funds will be managed by the ITS Unit. Uses of the funding is open to projects that apply technology such as advanced sensor, computer, electronics, and communications and management strategies to increase the safety and efficiency of the transportation system. The funding is available to state agencies in FY 2000 and state and local agencies in FY 2001 and FY 2002. The ITS set-aside funds will be allocated to various projects based on the criteria described in section 3.2. The project selection and fund allocation will be determined by the ITS Unit. It should be noted that projects funded through the ITS set-aside money are still required to go through the 883 process. ITS set-aside funding can be maximized by seeking the alternative funding sources first, and by leveraging the funds to obtain matches from federal sources, local sources, and other areas within KDOT.

Research Funds

Research is an effective method for funding new deployments, especially pilot projects or operational tests. Many ITS applications require changes to the way work is done. Consequently, a deployment is often preceded by an operational test or pilot project in which the application is implemented on a small scale and properly evaluated to determine its merit and to foster support. Studies of this type often do not qualify for funding through the conventional process. However, the evaluations may be funded through KDOT research programs such as K-TRAN, or through external sources such as the ENTERPRISE Consortium, FHWA Priorities Technologies Program, pooled fund studies or the ITS set-aside program.

Other Funding Strategies

An internal process for promoting awareness of ITS issues is a vital part of the ITS funding strategies. As described elsewhere in this document, mainstreaming ITS into KDOT is a process that depends heavily on the knowledge of potential applications extending beyond the ITS unit and throughout the agency. Mainstreaming is essential to maximizing the effectiveness of ITS technologies. Special funding of ITS projects

through mechanisms such as federal discretionary funds or Surface Transportation Plan Safety Funds is appropriate and even necessary in some cases, and an effective awareness process will help to maximize the utility of the available special funding.

Cost-recovery of maintenance and operations expenditures is a key issue. These costs will vary widely from one program area to another, and in some cases from one project to another. Funding the continued maintenance and operation of each ITS project or component should be established prior to deployment. Deploying an application without continued operational funding in place could result in a net loss for the overall ITS program in terms of support within and outside KDOT. Applications that can eventually be self-supporting or else privatized could be given a high priority.

Implementation Strategies

A significant consideration in the implementation of the Statewide ITS Strategic Deployment Plan is that many, if not most, ITS applications are new to KDOT. The newness of ITS in many areas of KDOT may be an obstacle to budgeting ITS into the mainstream funding and to the mainstreaming of ITS in general. The following implementation strategies are suggested for ITS deployment. The strategies are grouped under the following headings:

- scheduling projects,
- evaluating projects,
- integrating ITS into the design process,
- ITS awareness,
- using the ITS architecture,
- telecommunications infrastructure,
- state to state coordination, and
- partnerships.

<u>Scheduling Projects</u>

Schedule projects with critical elements first. This involves identifying those projects which will provide infrastructure necessary for the deployment of further projects. It also involves evaluating the proposed phasing of the projects to identify those that are on the critical path and should be assigned high-priority in their deployment.

Identify related projects and factor them into the schedule. Related projects are those that may influence or be influenced by the deployment schedule of the project being considered. Document these links in the KITS database so the full impact of any future phasing changes can be easily assessed and evaluated.

Take advantage of stepwise deployment whenever practical. In other words, deploy new technologies at a local level first, then expand deployment district-wide and eventually statewide. However, in some cases, it may be necessary to forgo stepwise deployment

such as when a good funding opportunity arises, or when a construction project provides a window for efficient installation of equipment.

Carefully analyze each new project against existing and proposed projects. Seek out integration opportunities and recognize cost sharing opportunities with other projects.

Evaluating Projects

Always evaluate new technologies (unless appropriate evaluation has already occurred, perhaps by other state DOT's). Evaluations will serve to justify future expenditures, garner support for future deployments, and enhance the credibility of the ITS program which, in turn, will help to fuel the mainstreaming process.

Plan for the project evaluations in parallel with the overall project development. Integrating the evaluation into the project design process is a critical element in maintaining the usefulness and relevance of the evaluation.

Use evaluations as an awareness tool. An effective ITS solution will sell itself, if the potential users witness the effectiveness first hand.

Integrating ITS into the Design Process

Integrate ITS checklists into the design process. Evaluate the ITS checklists completed during the 883 process and evaluate the potential for including ITS in the projects. Schedule meetings with the project owners to discuss the application and benefits of including ITS in the project. Conduct follow-up discussions with project owners to ensure that planned ITS elements are properly integrated in the project plans as they develop over time.

Continue to update the mainstreaming process. Develop and periodically review and revise the policies through which ITS applications are introduced into the 883 process. The identification of candidate ITS projects is key.

Develop and adopt design standards and detail sheets for roadside ITS elements as they are being incorporated into design projects. Examples of roadside ITS elements are conduit, vehicle detectors, video cameras, VMS, and RWIS stations. If possible, take advantage of standards that have already been developed in other states. Incorporate the use of ITS design standards and detail sheets in design projects whenever it is appropriate.

ITS Awareness

Develop a continuing process of education for KDOT personnel. Separate plans may be necessary for upper management, middle management, and field personnel. Each of these groups has a valuable perspective on KDOT's responsibilities and operations.

Diverse participation will maximize the effectiveness of the processes through which potential applications are identified.

Involve the media with publicly visible projects (e.g., work zone traffic control applications or web-based traveler information dissemination). Good press will help to generate public support, but perhaps more importantly, it is an effective and efficient means of educating all levels of KDOT personnel.

Obtain buy-in from the ITS Steering Committee on important decisions relating to ITS. Involving the Steering Committee in ITS decisions will help develop ITS champions and spread awareness of ITS projects throughout KDOT.

Using the ITS Architecture

Evaluate how future projects fit into the Statewide ITS Architecture (and also the National Architecture). For projects not complying with the architecture, explore reasons for non-compliance and either suggest changes to projects to provide better conformance or consider updates to the architecture when justified.

Establish a schedule for periodically reviewing and updating the ITS Architecture. Maintaining the architecture will better allow the efficient incorporation of new technologies and projects, and will better insure the relevance of the architecture.

Conform to ITS communications standards. Research each project to ensure that the appropriate standards are considered during the design and implementation process. This evaluation should include a comparison with federal standards as well as informal and local standards, such as the K-Tag DSRC transponder.

Telecommunications Infrastructure

Make efficient use of the fiber resources. The DTI-provided bandwidth, conduit, and dark optical fiber (or optical fiber backbone) will provide the majority of the telecommunications infrastructure KDOT needs to implement its urban ITS projects. When the rural ITS projects will be implemented, the DTI-provided optical fiber backbone will already be installed. This installation is scheduled to be complete by September 2000.

Make efficient use of the 800 MHz and 6 GHz radio networks. Another telecommunications resource is the KDOT 800 MHz radio and associated 6 GHz microwave backbone. This combined system is in the eighth year of a ten-year implementation, and is scheduled to be complete by the end of June 2002. The amount of available resources outside of the radio network will not be known until completion.

Interconnect the fiber network with the microwave network where feasible. There are two locations, Oakley and Salina, where the optical fiber backbone and 6 GHz microwave are physically close enough to one another that interconnection is practical technically and financially. It is in these locations that there may be some co-efficiency

of the two networks. Each network could interface with the other and serve as an extension or a back up to the other.

Expand the optical fiber backbone throughout Kansas. The optical fiber backbone will provide the high bandwidth and/or high speed telecommunications pipeline. Unfortunately, most counties in Kansas are not near the optical fiber backbone. Once the backbone is constructed, it will be important to extend that backbone, whether by laying more optical fiber or installing high bandwidth wireless systems.

State-to-State and State-to-Local Coordination

Learn what other state and local agencies are doing before deploying ITS applications. For instance, contact other agencies to see if they have already established design standards or detail sheets for a particular ITS application.

Encourage the establishment of multi-state working groups. Use these working groups to facilitate coordination on projects requiring multi-state involvement (e.g., Scout project).

Establish a guidebook for facilitating state-to-state and state-to-local coordination. Include samples of working agreements and memoranda of understanding from established multi-state groups that may be used as examples in developing agreements.

Partnerships

Take necessary steps to ensure successful public/private partnerships. In cooperative projects involving entities external to KDOT (public or private), care should be given to ensure that all participants have a vested interest in the successful completion of the project. Participants should make a formal commitment to the project before substantial work is undertaken. In other deployments, informal agreements have allowed participants to withdraw easily causing the project to terminate prematurely.

Clearly define the roles and responsibilities of each partner. Public/private partnerships should be a cooperative effort with clear division of responsibility between public and private sectors for each aspect of the operation. Project costs and revenues should be shared.

Special Considerations for Safety-Oriented Applications

The implementation strategies for this plan with respect to safety-oriented applications mirrors the overall strategies stated above. Two key characteristics of safety-oriented applications are (1) they frequently do not fit cleanly into a typical highway construction project and must be funded separately, and (2) their safety-oriented nature implies the potential for some manner of legal liability. The second of these two characteristics suggests that for any safety-related application careful consideration should be given to liability risk management as early in the project development process as possible.

Many safety-oriented applications will be new to KDOT or will be used as part of a new process. As a result, resistance to change will typically be an obstacle to be overcome. In addition to emphasizing the benefits of a particular application in the continual process of educating KDOT personnel, a pilot project or small-scale deployment will typically be a prudent first step. Allow the technology to be experienced.

If the technology is truly effective, the pilot project will garner support for a wider scale deployment. An example of this strategy is the Midwest Smart Work Zone Deployment Initiative, in which several technologies were deployed, each at only one site, in order to evaluate their effectiveness. The technologies that *are not* effective are dropped. Those that *are* effective are examined more closely to consider their proper uses within KDOT's construction operations.

ITS Unit Management Strategies

Increasing the number of ITS projects and deployments is only one-half of the picture when it comes to creating a successful ITS program. An equal effort must be put forth in operational strategies such as maintaining the efficiency of deployed components, promoting the efficient use of ITS applications, and maintaining conformity with the longer term ITS vision. Failure to incorporate these operational strategies can result in the ineffective deployment of ITS, redundant systems with unnecessary costs, and limited opportunities for interoperability.

The strategies presented in this section are intended to provide guidance in continuing the success of the ITS Unit to promote ITS within and outside of KDOT. The strategies address issues concerning the continued operation and maintenance of the ITS program within the State. The primary function of these strategies is to help KDOT realize its goal of increasing the scope of ITS applications in the State, while simultaneously increasing the level of benefits resulting from existing ITS deployments. A second function served by this set of management strategies is to facilitate the continued updating, and thus relevance, of the Statewide ITS Strategic Plan and ITS Architecture. The following recommendations represent the suggested operational strategies for the KDOT ITS Unit.

Establish a process for maintaining the project database. The KITS database provides a valuable tool for tracking ITS projects and the deployment of ITS infrastructure in the State. Processes are described in earlier sections that will update the database as new projects are identified. Additional effort should be undertaken to update and maintain the database periodically to ensure the status update of existing database projects. This maintenance process should include the following:

1. Identify a secure location for the database.
2. Establish backup procedures for the database. Additionally, mirroring the database on a separate physical drive is recommended. Backup sites and media should also be secure.

3. Identify an existing position to be responsible for inputting and editing project information in the project database.
4. Identify an existing position to be responsible for approving changes to the project database. This should be a permanent position, and may or may not be the same as the individual identified for 3, above.
5. Document procedures used for maintaining the database. Keep the procedure documentation current to provide continuity in the event of staffing changes.
6. Review and update the database at least once quarterly, even if no new projects are to be added. Pay special attention to the status of database projects.

Inventory ITS components as they are deployed in the State. As projects are completed, document the infrastructure deployed and its location. This will allow for the tracking of deployment progress and will provide the improved ability to identify equipment and cost sharing opportunities as additional projects are planned. The KITS database provides a tool for performing this inventory, however, some ITS elements, particularly communication infrastructure, need to be tracked with greater detail than provided by the database. Wireless coverage maps and GIS tracking of telecommunication infrastructure would prove useful tools. These inventory efforts also involve the identification of staff with specialized skills that may be used as resources.

Continue to strengthen the role of the ITS Steering Committee. The authority represented in the members of the committee is an important asset. Involving the committee in the decision-making process will foster a sense of importance in the members, encouraging consistent participation. This forum should be used to garner support from decision-makers.

Continually perform assessment of ITS Unit activities to internally track progress and provide planning data. Performing periodic performance reviews are a useful tool for tracking progress and comparing performance over time. The ITS Unit manager should prepare a quarterly progress report. This report should contain quantitative and qualitative information that may be used for performance tracking and long-term planning. A sample format for the progress report is presented in Appendix J.

Identify and develop design standards for commonly deployed elements. Identify common roadside elements that will likely be deployed as part of ongoing projects identified through the design process. Research the activities of other states regarding the development of design standards (design sheets) for these elements. If warranted, the ITS Unit could initiate the development and approval process for KDOT design standards for these elements to standardize their deployment throughout the state and ease the design burden. Likely candidates for the development of design standards include commonly deployed roadside elements such as:

- Vehicle detectors,
- Surveillance cameras,
- Camera towers,
- Variable message signs,

- Weigh in motion facilities, and
- CVO electronic screening equipment.

Hire additional staff trained to operate, administer, manage, and provide support for ITS field devices and the optical fiber backbone. DTI will be providing some functions for the bandwidth provided under its contract with KDOT, but will not provide support for the conduit or dark optical fiber after installation and acceptance by KDOT. Currently, KDOT is planning to outsource the necessary functions. However, as technology advances and is further deployed along the roadways, KDOT will need additional staff trained specifically to support these technologies.

Provide training for staff who will be involved with ITS deployment and operation. Identify areas where specialized skills need to be enhanced in order to deploy particular ITS technologies. Encourage staff to attend training and educational sessions in order to gain necessary skills/knowledge. Cross-train staff on multiple systems, where applicable, to provide technology coverage in the event of staff changes. In the long term, technology is converging. KDOT should consider establishing a cross-functional technology organization. Currently, each technology specialty (computers, networking, radio, ITS, etc.) operates separately from each other and some stop at District boundaries. As technologies continue to converge, a group of people cross-trained in all of the deployed technologies could run the integrated systems instead of the highly specialized functions they now perform.

Evaluate ITS deployments and disseminate findings. Document and distribute benefits information in the case of successful deployments. For less successful deployments, document the project lessons learned so future projects can avoid the identified pitfalls.

Increase public and agency awareness of ITS projects through outreach campaigns. Promote ITS internally within KDOT through the continued use of seminars, training, and newsletters. Encourage press coverage of high-profile ITS project openings to increase the public's awareness/support of ITS.

Periodically review proposed ITS projects to identify potential cost sharing opportunities and minimize unnecessary system redundancies. Proposed projects should be compared with other proposed projects and existing deployments to identify situations that may allow system integration and cost sharing. The KITS project database provides a useful tool for performing this review.

Update the Kansas Statewide ITS Architecture. Periodically revisit the statewide architecture and assess its ongoing ability to provide suitable guidance. Variances may be granted to individual projects that do not conform to the architecture in the short-term. These identified variances can be used to evaluate deficiencies in the architecture and develop enhancements.

Periodically update the Statewide ITS Plan. This plan is intended to be a living document that is periodically updated. Given the pace at which technology changes in the ITS arena, this is the only way to ensure the continued relevance of the document.

Periodically review proposed ITS projects to identify potential data sharing opportunities. Identify opportunities for sharing data among various agencies and stakeholders. Revisit existing projects to identify opportunities to use archived data for planning purposes. The increased data use will increase the usefulness of the ITS deployment.

Encourage interagency coordination. Support the coordination and cooperation between agencies involved in the deployment of ITS. Form interagency project committees and more permanent working groups, whenever appropriate. The ITS Unit may serve as a liaison between groups to support coordination.

Encourage interstate coordination. Review the list of appropriate contacts in bordering states identified in other sections of this document. Update this list when appropriate to provide a resource for agencies seeking to develop multi-state coordination. Encourage agencies to research other state's ITS activities when considering deployments and investigate interoperability potential.

Develop guidelines for agencies and individuals considering ITS deployments in the state. These guidelines will assist agency staff and local planners in properly considering and planning for ITS. An example of this guidance is a description of roadway/traffic conditions that provide opportunities for ITS deployments. Other useful guidelines might include suggestions for facilitating public/private partnerships, or overcoming legal and institutional barriers.

These operational strategies should be completed a regular frequency whenever possible. Table 4.1 summarizes the operational strategies and presents suggestions for the frequency that the activities should be performed. Those strategies with the frequency of "opportunistic" should be completed whenever the appropriate opportunity presents itself.

Table 4.1: Suggested Frequency of Operational Strategy Performance

Operational Strategy	Frequency
Establish a process for maintaining the project database.	Continuous/Quarterly Review at a Minimum
Inventory ITS components as they are deployed in the State.	Continuous
Continue to strengthen the role of the ITS Steering Committee.	Continuous
Continually perform assessment of ITS Unit activities to internally track progress and provide planning data.	Quarterly Progress Reports
Expand the fiber optic network throughout Kansas	Opportunistic
Consider hiring additional staff trained to operate, administer, manage, and provide the ITS field devices or the optical fiber backbone.	Opportunistic
Provide training for staff who will be involved with ITS deployment and operation.	Opportunistic
Identify and develop design standards for commonly deployed elements	Opportunistic
Evaluate ITS deployments and disseminate findings.	Opportunistic
Increase public and agency awareness of ITS projects through outreach campaigns.	Quarterly Newsletters/Brownbags
Periodically review proposed ITS projects to identify potential cost sharing opportunities and minimize unnecessary system redundancies.	Quarterly
Update the Kansas Statewide ITS Architecture.	Update Annually
Periodically update the Statewide ITS Plan.	Update Every 2 Years
Periodically review proposed ITS projects to identify potential data sharing opportunities.	Quarterly
Encourage interagency coordination.	Opportunistic
Encourage interstate coordination.	Opportunistic
Develop guidelines for agencies and individuals considering ITS deployments in the state.	Update Annually

4.2 Deployment Plan

This section presents the proposed deployment and phasing plan for the projects contained in the KITS project database. The projects were identified by their owners as having **Near-**, **Medium-**, or **Long-term** deployment horizons. These designations are defined below:

- **Near-term** 1 to 5 year deployment schedules
- **Medium-term** 6 to 10 year deployment schedules
- **Long-term** more than 10 year deployment schedules

Additionally, as part of the ITS Statewide Planning effort, each project was assigned a deployment priority of either **High**, **Medium** or **Low**. The purpose of this prioritization was to ensure that the deployment timelines given in the project sheets are consistent with their respective project priorities. For instance, if a high priority project is scheduled for either medium-term or long-term, then there would be a problem. The prioritization process was based on factors described in Section 3.2. The definitions of these prioritization terms are discussed below.

- **High Priority Projects** – These generally are projects that meet many of the following criteria: 1) currently under deployment, 2) provides backbone infrastructure for additional deployments, 3) contains critical path interfaces with other projects, 4) is fully funded in the current plan or has committed locally matched funds, 5) has necessary management support in order to succeed, 6) has high potential as a early deployment winner, 7) meets a critical safety need, or 8) has significant estimated benefits in excess of costs.
- **Medium Priority Projects** – These are projects that meet a few of the above listed criteria, or have other significant merits that warrant the consideration of the project. These could also include projects such as technology assessments that are necessary lead-ins to future deployment expansions.
- **Low Priority Projects** – These are projects that do not demonstrate any of the criteria listed above, but may nevertheless be warranted. These projects may include opportunistic deployments that do not otherwise fit into the step-wise deployment plan.

Table 4.2 summarizes the near-term projects segmented by the different program areas. As expected, most of the near-term projects have been assigned either high or medium priority with only two exceptions. Tables 4.3 and 4.4 present the medium- and long-term projects, respectively. No medium and long-term projects were assigned a high priority, which would indicate the deployment horizons are consistent with their assigned priority. Please refer to the individual project sheets (presented in Appendix G) for a more detailed description of any single project.

Table 4.2: Near-term Deployment Projects (1 to 5 years)

Program Area	KITS #	Project Name	Priority
Priority Corridor	1501-0	VMS on I-70 near Goodland	High
	1501-1	VMS on I-70 near Salina	High
	1501-2	HAR on I-70 west of Goodland and east of Salina	Medium
	1502-0	Kiosk-Based Traveler Information System, Phase I	High
	1502-1	Kiosk-Based Traveler Information System, Phase II	High
	1503-0	Traveler/Tourism Information Web Site	High
CVO	3001-0	Electronic Credentialing (Renewal Processing) for KDOR	High
	3003-0	IRP Clearinghouse Participation	High
	3004-0	Electronic Screening Site Evaluations	High
	3005-0	Electronic Heavy Vehicle Use Tax (HVUT) Reporting	Medium
	3010-0	Document Scanning	Low
	3015-0	Integrated Access to CVO Information/Resources	High
Maintenance	1100-0	Install AVL and MDTs in KDOT winter maintenance fleet, Phase I, District 6	Medium
	1100-1	Expand AVL and MDT Statewide	Medium
	1102-0	Install AVL in KDOT paint trucks	Medium
	1103-0	Install Infrared Radar on Snowplows in a test District	Done
	1200-0	Integration of Weather Sensors on Maintenance Vehicles with RWIS, Phase I	Medium
	1201-0	Pagers for KDOT crews working near railroads	High
	1202-0	Automated Anti- / De-icing System on Bridge in Garden City	High
	4004-0	Conversion of 800 MHz radio system from conventional to trunked	Medium
	4005-0	Implementation of a mobile data channel	Medium
Traffic Operations	2101-0	Wichita Advanced Traffic Management System (ATMS)	High
	2102-0	Ramp Metering on US-54 (Kellogg Blvd.)	Medium
	2103-0	NASCAR ITS	High
	2801-0	Planning Study for Railroad Crossing on Johnson Drive	High
	2801-1	Deploy ITS at Railroad Crossing on Johnson Drive	Medium
	1500-0	Statewide Operations Center, Phase I	High
Rural Safety And Mobility	1001-0	Statewide Mayday System Development Plan	High
	1001-1	Statewide Mayday/ACN Response System	Medium
	1001-2	Mayday/ACN Service Provider Registration System	Medium
	1504-0	Deploy VMS or CCTV at trouble spots throughout Kansas	Medium
	4006-0	Statewide Cellular Coverage Map	High
	1400-0	Implement an AVL/MDT system for transit in North Central Kansas (NCK)	Medium
	1400-1	Implement a Computer Aided Dispatch System in NCK	Medium
	1401-0	Implement an AVL/MDT system for transit in Reno County	Medium
	1401-1	Implement a Computer Aided Dispatch System in Reno County	Medium
Other	4001-0	Last mile connection to District Offices	High
	4002-0	Last mile connection to the Area Offices	High
	4003-0	Barter KDOT's right-of-way to wireless service providers	Low
	4007-0	GIS database of KDOT telecommunications infrastructure	High

Table 4.3: Medium-term Deployment Projects (6 to 10 years)

Program Area	KITS #	Project Name	Priority
Priority Corridor	1502-2	Kiosk-Based Traveler Information System, Phase III	Medium
	1502-3	Kiosk-Based Traveler Information System, Phase IV	Medium
CVO	3012-0	Streamline Property Tax and Insurance Verifications	Medium
	3014-0	Integrated Access to CVO Information/ Resources	Medium
Maintenance	1101-0	Snow Route Design Optimization Software	Medium
	1200-1	Integration of Weather Sensors on Maintenance Vehicles with RWIS (Phase II)	Medium
Traffic Operations	1500-1	Statewide Operations Center, Phase II	Medium
Other	1505-0	Agricultural Harvesting and Migration Information Services	Low

Table 4.4: Long-term Deployment Projects (more than 10 years)

Program Area	KITS #	Project Name	Priority
Rural Safety and Mobility	2300-0	Installing Cameras on the Inside of Rural Transit Vehicles	Low
Other	2104-0	Implementing Condition-based Variable Speed Limit Signs	Low

4.3 Conclusion

This section contains recommendations for the Kansas Statewide ITS Plan. The recommendations are organized according to the final three sections of the report: Analysis of ITS Elements, Plan Methodology, and Strategic Deployment Plan. These recommendations were developed to help the ITS Unit achieve its vision for a statewide ITS program.

Analysis of ITS Elements

The vision for what the Kansas Statewide ITS system will look like in 20 years guides the ITS planning process. In this vision, the system will be an open, integrated and cost effective system that ensures safer, more secure and efficient movement of people and goods across Kansas through the use of advanced technologies and management strategies.

KDOT should encourage the establishment of multi-state working groups to facilitate coordination on projects requiring multi-state involvement (e.g., Scout project). KDOT should encourage the adoption of formal and informal standards in all Kansas deployments to maximize the capability for integration with other state's and national systems. Finally, it is recommended that the ITS Unit actively participate in ITS Heartland. This organization will be useful in aiding multi-state coordination and cooperation.

This Plan has developed a statewide ITS architecture that accurately depicts the various components of the ITS system and its communication links. The Kansas Statewide ITS architecture conforms with the National Architecture. KDOT should establish a schedule for periodically reviewing and updating the ITS Architecture. Maintaining the architecture will allow the efficient incorporation of new technologies and projects, and will insure the relevance of the architecture.

KDOT should review the KITS database and the architecture for opportunities for increased private sector involvement. They should forward suggestions to deploying agencies on how these opportunities can be identified and facilitated. KDOT should identify state policies impacting the development of beneficial public/private partnerships and identify possible means to further develop these partnerships.

KDOT should concentrate on mainstreaming ITS into its business process and educating its internal organization on ITS and its benefits. This will require a great deal of work and may justify hiring additional staff. The ITS Unit should develop checklists for projects and bureaus to help identify ITS elements in KDOT projects. These checklists should be implemented on every design project during the discovery phase.

Finally, it would be beneficial for KDOT to identify those ITS projects that have a high potential for providing substantial benefits or projects with a high-level of visibility to the

traveling public. They should encourage the rapid deployment of these types of projects and promote the advantages of these projects through internal and external publicity campaigns and press releases.

Plan Methodology

A methodology for this Plan is presented here to allow the KDOT ITS Unit to identify, track, rank and prioritize ITS projects. This methodology also helps mainstream ITS into KDOT business. Instrumental to this process is the development of an ITS checklist and the use of the KITS database. This Checklist will be developed by the ITS Unit and will contain criteria that when met would indicate an opportunity for ITS to be added to a given design project. Once an ITS project has been identified, it should immediately be added to the KITS database. This database should be used to track the status of the project as well.

Also key to a successful ITS program in Kansas is to integrate ITS into all bureaus within KDOT by education on ITS and its benefits. One recommended strategy is to start with a few proof of concept projects to showcase the benefits of particular ITS applications (e.g. AVL). Once the bureaus see that ITS is beneficial, then they will be willing to increase deployment of the application district-wide and eventually state-wide. Finally, it is important for the ITS Unit to be proactive in soliciting ideas for ITS projects from all available sources.

The ranking and prioritization process will be valuable to the ITS Unit staff and the owners of the ITS projects by helping them in developing and updating short-range plans and in determining the conformity to the longer-range ITS vision. Several outputs, such as consistency check with the architecture, have the added benefit of helping to identify when it may be appropriate to modify the long-term vision (as represented in the statewide architecture).

Strategic Deployment Plan

There are three different types of deployment strategies discussed in the Strategic Deployment Plan: funding strategies, implementation strategies and ITS Unit Management strategies.

The three main strategies for funding ITS projects are: 1) using the ITS set-aside funds, 2) funding projects through the conventional process and 3) funding projects through research programs like K-TRAN and ENTERPRISE. It should also be noted that promoting ITS awareness is a vital part of all ITS funding strategies.

There are also a number of different strategies for KDOT to consider when implementing ITS projects. Following these strategies will help ensure the future success of the ITS program in Kansas. Many of the strategies focus on gathering support for ITS. These include involving the media and using evaluations of new technologies as awareness tools. Some of the other implementation strategies recommended include developing ITS

design standards, following the National ITS Architecture and making efficient use of telecommunications resources.

The final group of deployment strategies addressed in this report are the strategies for the ITS Unit. These strategies address issues concerning the continued operation and maintenance of the ITS program within Kansas such as maintaining the efficiency of deployed components, promoting the efficient use of ITS applications, and maintaining conformity with the longer term ITS vision. Some of the key strategies recommended include tracking the progress of the ITS Statewide Plan with quarterly progress reports (see Appendix J), encouraging interagency and interstate coordination, providing training for staff who will be involved with ITS deployment and operation, and updating the Kansas ITS Statewide Architecture on a regular basis.

As part of the ITS Statewide Planning effort, each of the existing projects were assigned a deployment priority of either high, medium or low. This prioritization was based on factors described in the ranking and prioritization process presented in Section 3.2.

The telecommunications issues KDOT faces include establishing the last-mile connections, staffing, and preparing for the future. KDOT's optical fiber backbone is just that, a backbone. While necessary to provide the infrastructure for immediate ITS projects, the backbone must be extended to reach into local communities and at specific ITS project sites. This expansion may include burying more conduit with optical fiber cable or installing a wireless system.

KDOT has short-term and long-term staffing requirements. KDOT will need additional staff trained specifically to manage and support advanced technologies. In the long term, a cross-functional technology organization could be established. Currently, each technology specialty (computers, networking, radio, ITS, etc.) operates separately from each other and some stop at District boundaries. As technologies continue to converge, a group cross-trained in all of the deployed technologies could run the integrated systems.

Appendix A: Acronyms

AADT	Annual Average Daily Traffic
ACN	Automatic Collision Notification
ADSL	Asynchronous Digital Service Line
ATIS	Advanced Traveler Information System
ATM	Asynchronous Transfer Mode
ATMS	Advanced Traffic Management System
AVL	Automatic Vehicle Location
CAD	Computer Aided Dispatch
CCTV	Closed Circuit Television
CDRS	Construction Detour Reporting System
CIR	Committed Information Rate
CDPD	Cellular Digital Packet Data
CVISN	Commercial Vehicle Information Systems and Networks
CVO	Commercial Vehicle Operations
DISC	Division of Information Systems and Communications
DSNWK	Development Services of Northwest Kansas
DSRC	Dedicated Short Range Communications
DTI	Digital Teleport, Incorporated
DTN	Data Transmission Network
EMS	Emergency Medical Services
FHWA	Federal Highway Administration
GIS	Geographical Information System
GPS	Global Positioning System
HAR	Highway Advisory Radio
IDAS	ITS Deployment Analysis System
IRP	International Registration Plan
ISDN	Integrated Services Digital Line
ISP	Information Service Provider
IT	Information Technology
ITS	Intelligent Transportation Systems
IVI	Intelligent Vehicle Initiative
KATIE	Kansas Attractions Travel Information and Events
Kbps	Kilobits per second
KCC	Kansas Corporation Commission
KDOR	Kansas Department of Revenue
KDOT	Kansas Department of Transportation
KHP	Kansas Highway Patrol
KITS	Kansas Intelligent Transportation System
KMCA	Kansas Motor Carrier Association
KTA	Kansas Turnpike Authority
LAN	Local Area Network
Mbps	Megabits per second

MCSAP	Motor Carrier Safety Assistance Program
MDT	Mobile Data Terminal
MHz	Megahertz
MoDOT	Missouri Department of Transportation
NWS	National Weather Service
OCCK	Occupational Center of Central Kansas
PC	Personal Computer
PCS	Personal Communications System
PSAP	Public Safety Answering Point
RCRS	Road Condition Reporting System
RWIS	Road/Weather Information System
SHRP	Strategic Highway Research Program
SONET	Synchronous Optical Network
T2000	Transportation 2000
TIC	Traveler Information Center
T/EOC	Traffic/Emergency Operations Center
TOC	Traffic Operations Center
VMS	Variable Message Sign
VPN	Virtual Private Network
WAN	Wide Area Network
WIM	Weigh-in-motion

Appendix B – Letter of Invitation and Invitation Lists

The following letter of invitation was sent on KDOT letterhead to non-KDOT personnel. Letters included scanned signature by James E. Tobaben, Chief of Transportation Planning. Jane Mobley Associates personnel faxed the letters to the invitees and made follow-up phone calls to encourage and verify attendance plans. A copy of the letter that was sent out now follows.

Dear Mr. Harris,

The Kansas Department of Transportation needs your help improving the safety and efficiency of travel in the state.

The department currently is developing the Kansas Intelligent Transportation Systems (ITS) Statewide Plan. As you may know, ITS combines computers, telecommunications and other technologies to increase transportation efficiency, safety and productivity while also addressing energy and environmental concerns. ITS systems will have applications throughout the state. For instance, in rural areas ITS systems may provide traveler information or Mayday (automatic crash notification) services. ITS systems will improve urban transportation efficiency by providing traffic and transit management capabilities.

We hope you will help get the planning process started by attending a half-day seminar from 10:30 a.m. to 2:30 p.m., Friday, March 12th at the KDOT District 4 Offices, 411 W. Fourteenth St., in Chanute. The workshop will provide you with an overview of ITS technology and how it might benefit southeast Kansas.

The first hour and a half of the seminar will be devoted to explaining what ITS is and what such a plan will do for Kansas. After a lunch break (lunch will be provided), you will have an opportunity to ask questions and provide feedback. Representatives from KDOT and our consulting engineering firm, TranSystems Corporation, will be in attendance to hear your thoughts and ideas.

Your participation in the March 12th seminar is very important. The program will provide you with an opportunity to learn more about ITS and to be involved in this important process from the very beginning. For KDOT, your attendance will provide an opportunity to gain from your experience and familiarity with the transportation and economic environment in southeastern Kansas. I hope we can count on your help.

Representatives of KDOT will be contacting you in the next few days to discuss the workshop with you further. In the interim, please contact John Leverenz's office at 316-431-1000 to RSVP or if you have any questions.

Thank you and I hope to see you in Chanute.

The lists on the following pages include those individuals who received the letter.

Mailing List
District 1 - Topeka

Organization	First	Last	Department	Location
Anderson County	Hub	Casper	County Engineer	Garnett
Atchison County	Bobby	Jackson	Road & Bridge Supt.	Atchison
Brown County	Grace	Miller	County Clerk	Hiawatha
Doniphan Co. Hwy. Dept.	Martha	Wiedmer	Road & Bridge Supv.	Troy
Douglas County	Keith	Browning	Road & Bridge Supv.	Lawrence
Franklin County	Ray	DeJulio	Road & Bridge Supv.	Ottawa
Jackson County	Edward	Bruns	Road & Bridge Supv.	Holton
Johnson County	Norman	Bowers	Road & Bridge Supv.	Olathe
Leavenworth County	David	Mahoney	Road & Bridge Supv.	Leavenworth
Linn County	Richard	Long	Road & Bridge Supv.	Mound City
Lyon Co. Hwy. Dept.	Warren	Woods	Road & Bridge Supv.	Emporia
Marshall County	Gary	Rosewicz	Road & Bridge Supv.	Marysville
Miami County	Penny	Evans	Road & Bridge Supv.	Paola
Nemaha County Engineers Office	Rita	Haug	Road & Bridge Supv.	Seneca
Osage Co. Hwy. Dept.	Glen	Tyson	Road & Bridge Supv.	Lyndon
Pottawatomie County	Leon	Hobson	Road & Bridge Supv.	Westmoreland
Riley County	Dan	Harden	Road & Bridge Supv.	Manhattan
Shawnee County	Charles	Sease	Road & Bridge Supv.	Topeka
Wabunsee County	Leslie	Schrader	Road & Bridge Supv.	Alma
Wyandotte County	Dennis	Hays	Road & Bridge Supv.	Kansas City
City of Atchison	Charles	Landwehr	Road & Bridge Supv.	Atchison
City of Emporia	Charles	Soules	Road & Bridge Supv.	Emporia
City of Garnett	Richard	Doran	Road & Bridge Supv.	Garnett
City of Holton	Pat	McClintock	Road & Bridge Supv.	Holton
City of Kansas City	Frederick	Backus	Road & Bridge Supv.	Kansas City
City of Lawrence	Terese	Gorman	Road & Bridge Supv.	Lawrence
City of Leavenworth	Michael	McDonald	Road & Bridge Supv.	Leavenworth
City of Lyndon	Tom	Leuszler	Road & Bridge Supv.	Lyndon
City of Manhattan	Jerry	Petty	Road & Bridge Supv.	Manhattan
City of Olathe	Rick	Biery	Road & Bridge Supv.	Olathe
City of Ottawa	Andy	Haney	Road & Bridge Supv.	Ottawa
City of Overland Park	Doug	Brown	Road & Bridge Supv.	Overland Park
City of Topeka	Thomas	Flanagan	Road & Bridge Supv.	Topeka
City of Hiawatha	Dennis	Harter	Street Superintendent	Hiawatha
City of Troy	Danny	King	Working Supervisor	Troy
City of Mound City	Marty	Read	County Comission Chair	Mound City
City of Marysville	Jerry	Gallinger	Street Supervisor	Marysville
City of Paola	Gary	Baugher	Street Superintendent	Paola
City of Seneca	John	Vaughn	City Superintendent	Seneca
City of Westmoreland	Brad	Efurd	Head of Maintenance	Westmoreland
Jefferson County	Richard	Teaford	Road & Bridge Supv.	Oskaloosa
Kansas Farm Bureau	Gary	Hall	President	Manhattan
Kansas Association of Firefighters	Dave	Sturbins	President	Topeka
Kansas Association of Fire Chiefs	John	Lloyd	Vice President	Topeka
Kansas Chamber of Commerce	John	Fowler	President	Topeka
Kansas Motor Carrier's Assoc.	Mike	Kelley	Executive Director	Topeka

Mailing List
District 2 - Salina

Organization	First	Last	Department	Location
Chase County Road & Br.	Paul	Jones	Road & Bridge Supv.	Cottonwood Falls
Clay County	Steve	Liby	Road & Bridge Supv.	Clay Center
Cloud County	Robert	Strait	Road & Bridge Supv.	Concordia
Dickinson Co. Hwy. Dept.	Dale	Curtis	Road & Bridge Supv.	Abilene
Ellsworth Co. Hwy. Dept.	Rick	Nondorf	Road & Bridge Supv.	Ellsworth
Geary County	Dennis	Cox	Road & Bridge Supv.	Junction City
Jewell County	Lyle	Wright	Road & Bridge Supv.	Mankato
Lincoln Co. Hwy. Dept.	Stan	Walker	Road & Bridge Supv.	Lincoln
Marion County	Gerald	Kelsey	Road & Bridge Supv.	Marion
McPherson County Dept. of Public Works	Rodger	Young	Road & Bridge Supv.	McPherson
Mitchell County	Larry	Emerson	Road & Bridge Supv.	Beloit
Morris County	Ed	Teghtmeyer	Road & Bridge Supv.	Council Grove
Ottawa County	Larry	Shea	Road & Bridge Supv.	Minneapolis
Republic County	Charles	Joy	Road & Bridge Supv.	Belleville
Saline County	Jerry	Fowler	Road & Bridge Supv.	Salina
Washington County	Glenn	Larson	Road & Bridge Supv.	Washington
City of Abilene	John	Willey	Road & Bridge Supv.	Abilene
City of Belleville	Gary	Hobbie	Road & Bridge Supv.	Belleville
City of Beloit	Charlene	Abell	Road & Bridge Supv.	Beloit
City of Clay Center	Calvin	Wohler	Road & Bridge Supv.	Clay Center
City of Concordia	Tom	Fischer	Road & Bridge Supv.	Concordia
City of Council Grove	Larry	Bachura	Road & Bridge Supv.	Council Grove
City of Junction City	Thomas	Neal	Road & Bridge Supv.	Junction City
City of Marion	Diane	Hett	Road & Bridge Supv.	Marion
City of McPherson	Melanie	Thrower	Road & Bridge Supv.	McPherson
City of Salina	Shawn	O'Leary	Road & Bridge Supv.	Salina
City of Strong City	Donna	Rettiger	Road & Bridge Supv.	Strong City
City of Cottonwood Falls	Ron	Lake	City Superintendent	Cottonwood Falls
City of Ellsworth	Donna	Bettenbrock	Street Supervisor	Ellsworth
City of Mankato	Bob	Freeman	Street Supervisor	Mankato
City of Lincoln	Ron	Mason	City Superintendent	Lincoln
City of Minneapolis	Leo	Baker	Street Superintendent	Minneapolis
City of Washington	Linus	Linenberger	Street Superintendent	Washington

Mailing List
District 3 – Norton

Organization	First	Last	Department	Location
Cheyenne County	Dave	Flemming	Road & Bridge Supv.	St. Francis
Decatur Co. Hwy. Dept.	Tim	Stallman	Road & Bridge Supv.	Oberlin
Ellis County	Mike	Graf	Road & Bridge Supv.	Hays
Gove Co Rd. & Br. Dept.	Randy	Wittman	Road & Bridge Supv.	Gove
Graham County	Gary	Cameron	Road & Bridge Supv.	Hill City
Logan County	Norman	Boyd	Road & Bridge Supv.	Winona
Norton Co. Rd. & Br. Dept.	Floyd	Richard	Road & Bridge Supv.	Norton
Osborne County	Darrel	Roadhouse	Road & Bridge Supv.	Osborne
Phillips County	Eddy	DeBoer	Road & Bridge Supv.	Phillipsburg
Rawlins County	Marlin	Wahrman	Road & Bridge Supv.	Atwood
Rooks County	Alvin	Perez	Road & Bridge Supv.	Stockton
Russell County	Robert	Hoback	Road & Bridge Supv.	Russell
Sheridan Co. Road & Br.	Troy	Dewey	Road & Bridge Supv.	Hoxie
Sherman Co. Hwy. Dept.	Curtis	Way	Road & Bridge Supv.	Goodland
Smith Co. Hwy. Dept.	Charles	Doyle	Road & Bridge Supv.	Smith Center
Thomas Co. Hwy. Dept.	Chris	Bieker	Road & Bridge Supv.	Colby
Trego Co. Hwy. Dept.	Dale	Pfannenstiel	Road & Bridge Supv.	Wakeeney
Wallace County	Les	Collins	Road & Bridge Supv.	Sharon Springs
City of Atwood	Rick	Kramer	City Superintendent	Atwood
City of Colby	Gerry	Bieker	Road & Bridge Supv.	Colby
City of Goodland	Ed	Wolak	Road & Bridge Supv.	Goodland
City of Hays	Elden	Hammerschmidt	Road & Bridge Supv.	Hays
City of Norton	George	Jones	Road & Bridge Supv.	Norton
City of Oberlin	Victoria	Gordon	Road & Bridge Supv.	Oberlin
City of Osborne	Vicki	Daise	Road & Bridge Supv.	Osborne
City of Phillpsburg	Brenda	Chance	Road & Bridge Supv.	Phillipsburg
City of Russell	Arlyn	Unrein	Road & Bridge Supv.	Russell
City of Sharon Springs	Connie	White	Road & Bridge Supv.	Sharon Springs
City of Smith Center	Bill	Phillips	Road & Bridge Supv.	Smith Center
City of Stockton	Sandi	Rogers	Road & Bridge Supv.	Stockton
City of Wakeeney	Hardy	Howard	Road & Bridge Supv.	Wakeeney
City of St. Francis	Rob	Lawson	City Superintendent	St. Francis
City of Gove	Kenneth	Howard	Road & Bridge Supv.	Gove
City of Hill City	Garland	Scott	Street Supervisor	Hill City
City of Oakley	Jim	Glassman	Street Supervisor	Oakley

Mailing List
District 4 - Chanute

Organization	First	Last	Department	Location
Highway 69 Association	Jim	AuBuchon	President	Pittsburg
Kansas Farm Bureau	Ron	Betzen	District 3 Administrator	Manhattan
Crawford County Farm Bureau	Dan	Harrison	President	Pittsburg
Kansas Farm Bureau	Gary	Hall	President	Manhattan
Kansas Gas and Electric	Don	Hill	Division Manager	Independence
Allen County	Bill	King	Director of Public Works	Iola
Iola - Allen County Seat	Dan	Lesley	Street and Alley Superintendent	Iola
Bourbon County	Jim	Harris	Bourbon County Coordinator	Ft. Scott
Ft. Scott - Bourbon County Seat	Bruce	Taylor	Director of Public Works	Ft. Scott
Wilson County	Larry	Ingstrom	Road and Bridge Supervisor	Fredonia
Fredonia - Wilson County Seat	Eldon	McGinnis	Street and Utility Commissioner	Fredonia
Neosho County	Frank	Young	Director of Public Works	Erie
Erie - Neosho County Seat	Larry	Gates	City Superintendent	Erie
Crawford County	Bob	David	Supervisor, Roads and Bridges	Girard
Girard - Crawford County Seat	Dave	Crumpacker	Supervisor, Public Works	Girard
Pittsburg	John	VanGordon	Director of Public Works	Pittsburg
Mongtomery County	Ron	Bonjour	Director of Public Works	Independence
Independence - Mont. County Seat	Terry	Lybarger	Director of Public Works	Independence
Labette County	Ronny	George	Road Supervisor	Altamont
Parsons	James	Gatewood	Director of Public Works	Parsons
Cherokee County	Leonard	Vanatta	Road Supervisor	Columbus
Yates Center - Woodson County Seat	Jim	Lomon	Director of Public Works	Yates Center
Woodson County	John	Weseloh	Road Supervisor	Yates Center
Columbus - Cherokee County Seat	Rod	Long	City Superintendent	Columbus
Kansas Association of Firefighters	Dave	Sturbins	President	Topeka
Southeast Kansas Assoc. of Fire Chiefs	Tim	Hayes	President	Parsons FD
Kansas Association of Fire Chiefs	John	Lloyd	Vice-President	Topeka
Kansas Association of Sheriffs	Janet	Harrington	President	Elk County
Kansas Association of Police Chiefs	Rex	Taylor	President	Iola
Lakemary Center	Marjie	Dubois		Paola
SEK-CAP	Mike	Swartz		Girard

Mailing List
District 5 - Hutchinson

Organization	First	Last	Department	Location
Barber Co. Hwy. Dept.	Lyle	Keller	Road Supervisor	Medicine Lodge
Barton County	Leu	Lowrey	County Engineer	Great Bend
Butler County	Darryl	Lutz	County Engineer	El Dorado
Comanche County	Jerry	Heft	Road & Bridge Supv.	Coldwater
Cowley County	Ronnie	Thiel	Road & Bridge Supv.	Winfield
Edwards Co. Public Works	Ron	Sitts	Road & Bridge Supv.	Kinsley
Harper County	Michael	Alldritt	Road & Bridge Supv.	Anthony
Harvey County	Craig	Simons	Road & Bridge Supv.	Newton
Kingman County	Charles	Arsendorf	Road & Bridge Supv.	Kingman
Kiowa Co. Hwy. Dept.	Doyle	Conrad	Road & Bridge Supv.	Greensburg
Pawnee County	Gary	Schneiders	Road & Bridge Supv.	Larned
Pratt County	Randy	Phillippi	Road & Bridge Supv.	Pratt
Reno County	George	Sugars	Road & Bridge Supv.	Hutchinson
Rice County	John	Achatz	Road & Bridge Supv.	Lyons
Rush County	Dennis	Elias	Road & Bridge Supv.	La Crosse
Sedgwick County	David	Spears	Road & Bridge Supv.	Wichita
Stafford County	Everett	Hudson	Road & Bridge Supv.	St. Johns
Sumner Co. Hwy. Dept.	Melvin	Matlock	Road & Bridge Supv.	Wellington
City of Anthony	Grant	Sechler, Jr.	Road & Bridge Supv.	Anthony
City of El Dorado	Bruce	Remsberg	Road & Bridge Supv.	El Dorado
City of Great Bend	Charles	Bartlett	Road & Bridge Supv.	Great Bend
City of Greensburg	Clay	Smith	Road & Bridge Supv.	Greensburg
City of Hutchinson	Hal	Munger	Road & Bridge Supv.	Hutchinson
City of Kinsley	Newton	Baker	Road & Bridge Supv.	Kinsley
City of Larned	Pam	Corby	Road & Bridge Supv.	Larned
City of Medicine Lodge	Jerry	Martin	Road & Bridge Supv.	Medicine Lodge
City of Newton	Suzanne	Loomis	Road & Bridge Supv.	Newton
City of Pratt	Larry	Koontz	Road & Bridge Supv.	Pratt
City of Wellington	Larry	Mangan	Road & Bridge Supv.	Wellington
City of Wichita	Mike	Lindebak	Road & Bridge Supv.	Wichita
City of Winfield	Russell	Tomevi	Road & Bridge Supv.	Winfield
City of Coldwater	Danny	Shaw	Road & Bridge Supv.	Coldwater
City of Kingman	Dale	Robinson	Street & Water Supv.	Kingman
City of Lyons	David	Larson	Street Supervisor	Lyons
City of La Crosse	Duane	Moeder	City Manager	LaCrosse
City of St. Johns	Mike	LeRoy	Street Department	St. Johns
Chautauqua Road Dept.	Joseph	Sutton	Road & Bridge Supv.	Sedan
Elk County	Judy	Wiseman	Road & Bridge Supv.	Howard
Greenwood County	Larry	Thurston	Road & Bridge Supv.	Eureka

Mailing List
District 6 – Garden City

Organization	First	Last	Department	Location
Clark Co. Hwy. Dept.	Olen	Whisenhut	Road & Bridge Supv.	Ashland
Finney County	Max	Morgan	Road & Bridge Supv.	Garden City
Ford County	Dean	Chesnut	Road & Bridge Supv.	Dodge City
Grant County	Frank	Goldsby	Road & Bridge Supv.	Ulysses
Gray County	Ken	Campbell	Road & Bridge Supv.	Cimarron
Greeley County	Brock	Sloan	Road & Bridge Supv.	Tribune
Hamilton Co. Road Dept.	Delmar	Hammon	Road & Bridge Supv.	Syracuse
Haskell County	Lot	Taylor	Road & Bridge Supv.	Sublette
Hodgeman County	Ray	Hertel	Road & Bridge Supv.	Jetmore
Kearny County	Gary	Gilbert	Road & Bridge Supv.	Lakin
Lane County	Margaret	Herrman	Road & Bridge Supv.	Dighton
Meade County	Ken	Campbell	Road & Bridge Supv.	Meade
Morton Co. Road Dept.	Don	Swinney	Road & Bridge Supv.	Elkhart
Ness County	Dennis	Langer	Road & Bridge Supv.	Ness City
Scott County Public Works	Rich	Cramer	Road & Bridge Supv.	Scott City
Seward County	Tony	Herrman	Road & Bridge Supv.	Liberal
Stanton County	Curtis	Houser	Road & Bridge Supv.	Johnson
Stevens County	Greg	Post	Road & Bridge Supv.	Hugoton
Wichita County	Doug	Daugherty	Road & Bridge Supv.	Leoti
City of Ashland	Kristi	Lee	Road & Bridge Supv.	Ashland
City of Dodge City	Joseph	Finley	Road & Bridge Supv.	Dodge City
City of Elkhart	Carolea	Wellen	Road & Bridge Supv.	Elkhart
City of Garden City	Steven	Cottrell	Road & Bridge Supv.	Garden City
City of Hugoton	Tom	Hicks	Road & Bridge Supv.	Hugoton
City of Leoti	Charla	Douglas	Road & Bridge Supv.	Leoti
City of Liberal	Joe	Sealey	Road & Bridge Supv.	Liberal
City of Sublette	Stan	Rinchart	Road & Bridge Supv.	Sublette
City of Ulysses	Pete	Earles	Road & Bridge Supv.	Ulysses
City of Cimarron	Don	Ratzlaff	City Superintendent	Cimarron
City of Syracuse	John	Armstrong	City Superintendent	
City of Jetmore	Ray	Burns	City Superintendent	Jetmore
City of Lakin	Louie	Vanover	Street Superintendent	Lakin
City of Dighton	Eugene	Wilson	City Superintendent	Dighton
City of Meade	Myron	Pacha	Road Foreman	Meade
City of Ness City	Jerry	Eckels	City Superintendent	Ness City
City of Scott City	Preston	Stewart	Superintendent of Street, Water and Sewer	
City of Johnson	Alan	Schweitzer	City Superintendent	Johnson

Appendix C – Attendance Lists

The following tables document the complete attendance lists for the ITS Awareness Seminars. The attendance is broken out by district office.

Attendance List
District 1 – Topeka

	First Name	Last Name	Organization
1	Dianna	Bierwirth	P.A. MoDot
2	Sabin	Yanez	KC Scout
3	Rex	Cameron	City of Holton
4	Darrell	Gwaltney	KDOT-Traffic Engineering
5	J. Matthew	Collins	Lyon Co. Hwy Dept.
6	Kent	Schneider	KDOT-Traffic Engineering
7	Jeff	Henry	KDOT-Traffic Engineering
8	Ron	Stansbery	KDOT-District I
9	James	Roudybush	KDOT-Emporia
10	Mark	Krentz	KDOT-District I
11	Roy	Rissky	KDOT-District I
12	Brian	Feldkamp	KDOT-District I
13	Mike	Perkins	KDOT-District I
14	Kent	McKenzie	KDOT-District I
15	James	Williams	KDOT-District I
16	Leroy	Jackson	KDOT-District I
17	Paul	Weimer	KCAT
18	Bob	Bowden	KDOT-District I
19	Sandra	Tommer	KDOT-Wamego-District I
20	Michelle	Anshcutz	KDOT-Horton-District I
21	Ken	Massingill	KDOT-Horton
22	Ken	Gudenkauf	KDOT-Traffic Engineering
23	Albert	Horn	KDOT-HMS KC District I
24	Juanita	Lowe	KDOT-Metro Office
25	Mick	Halter	KDOT
26	J.D.	Heithhoff	KDOT-Gage
27	Todd	Hashemi	KDOT-Gage
28	Abe	Rezayazdi	KDOT-District I
29	Mike	McKenna	KDOT-Traffic Engineering
30	Jaci	Vogel	KDOT
31	James	Van Sickel	KDOT
32	Jeffrey	Frantzea	KDOT
33	Clay	Adams	KDOT
34	David	Mahoney	Leavenworth Co
35	Leslie	Spencer Fowler	KDOT
36	Linda	Voss	KDOT
37	Terese	Gorman	Lawrence
38	Paul	Gripka	KDOT
39	Jerry	Haug	KDOT
40	Jim	Weitierberg	KDOT
41	David	Taggart	KDOT
42	Steve	Schlagel	KDOT
43	David	Northuy	Unified Government of Wyandotte County

44	Paul	Bodner	KDOT
45	Dave	Geiger	FHWA
46	Jerry	Younger	KDOT
47	John	Babcock	KDOT
48	Mary Kay	Robinson	KDOT
49	LuAnn	Roth	KDOT-Traffic Engineering
50	Penny	Evans	Miami County Eng.
51	Ronald	Karn	Jefferson County
52	Hub	Casper	Anderson County Engineer
53	Richard	Teaford	Jefferson County Engineer
54	Bill	Kalt	FTA

Attendance List
District 2 – Salina

	First Name	Last Name	Organization
1	Linus	Linenberger	City of Washington
2	Mike	Clark	City of Beloit
3	Fred	Sikley	City of Beloit
4	Jerry	Fowler	Salina Co. PW
5	Don	Driked	KDOT
6	Michael	Renk	City of Salina
7	David	Boyle	KDOT
8	Roger	Alexander	KDOT
9	Dale	Hershberger	KDOT
10	Marvin	Wagner	KDOT
11	Leland	Tice	KDOT
12	Rick	Nondorf	Ellsworth Co
13	Greg	Adams	Junction City
14	Tom	Neal	City of Junction City
15	Mustafa	Sadeq	McPherson County
16	Robert	Strait	Cloud County Highway

Attendance List
District 3 – Norton

	First	Last	Organization
1	John	Woodyard	KDOT
2	Deb	Wotman	KDOT
3	Chriss	McDiffett	KDOT
4	Bob	Weiss	KDOT
5	Ray	Draper	KDOT
6	Wes	Moore	KDOT
7	Dave	Flemming	Cheyenne Co
8	Alvin	Pevec	Rooks County
9	Randy	Wittman	Gove County
10	Kathy	Headek	Trego Co.
11	Craig	Dewell	KHP
12	Tod	Hileman	KHP
13	Dan	Gifford	KHP
14	Larry	Jumper	City of Colby
15	Leslie	Cullens	Wallace Co.
16	Wilbur	Henry	KDOT
17	Eric	Oelschleyur	KDOT
18	Jerry	Moritz	KDOT
19	Chuck	Wanamaker	KHP
20	Elden	Hammerschmidt	City of Hays
21	Mike	Graf	Ellis County
22	Scott	Robertson	City of Phillipsbury
23	Kirk	Fredrichs	FHWA
24	Bruce	Baldwin	FHWA
25	Bob	Armstrong	KDOT
26	Dave	Griffiths	KHP
27	Kevin	Winston	KHP
28	Robert	Symns	KHP

Attendance List
District 4 – Chanute

	First Name	Last Name	Organization
1	Charles	Blackburn	City of Parsons
2	Hershel	McElfresh	City of Parsons
3	Ron	Betzen	Kansas Farm Bureau
4	Albert	Runni	KDOT
5	Ray	DeJulio	Fr. Co. Pub. Works
6	Jon	Evans	KDOT
7	Ron	BonJour, PE	DPE, Montgomery Co
8	Frank	Tichenor	KDOT
9	Priscilla	Peterson	KDOT
10	Bev	Roecker	KDOT
11	Gerry	Montgomery	KDOT
12	George	Dockery	KDOT
13	Joe	Minelli	KDOT
14	John	Weselch	Woodson Co.
15	Fred	Graham	Cherokee
16	Leonard	Vanatra	Cherokee
17	Joe	Herridge	Kansas Highway Patrol
18	Sheldon	Coudell	KDOT
19	Wesley	Roecker	KDOT
20	James	Barnes	KDOT
21	John	Hrenak	KDOT
22	Robert	Jack	KDOT
23	John	Lloyd	KSAFC
24	Tim	Hay	City of Parsons
25	Bruce	Taylor	City of Fort Scott
26	Rusty	Ratzlaff	City of Fredonia
27	Wayne	Blackbourn	KDOT
28	Frank	Young	Neosho
29	Gary	Plumb	KDOT
30	Albert	Dickens	KDOT
31	Bill	Ellis	KDOT
32	Bob	Gudgen	KDOT
33	Hugh	Bogle	KDOT

Attendance List
District 5 – Hutchinson

	First	Last	Organization
1	Jerry	Heft	Comanche Co
2	David	Fosberg	KDOT
3	Bruce	Remsberg	City of El Dorado
4	Warren	Stanton	KDOT
5	Harvey	Ulmer	Kiowa
6	Doyle	Conrad, Sr.	Kiowa
7	Martin	Miller	KDOT
8	Bob	Cook	KDOT
9	John	Wiens	KDOT
10	Kathy	Wickman	KDOT
11	Richard	Sizna	KDOT
12	Mike	Herzog	KDOT
13	Larry	Koontz	City of Pratt
14	Dennis	Hermanson	KDOT
15	Richard	Henning	KDOT
16	Charles	Luedders	KDOT
17	Barry	McManaman	KDOT
18	Scott	Mullen	KDOT
19	Lyle	Keller	Barber County
20	Randy	Phillippi	Pratt County
21	Everett	Hudson	Stafford Co.
22	Phillip	Nusser	Stafford Co.
23	John	Achatz	Rice County
24	Gary	Schnkilers	Pawnee County
25	Kurt	Demel	Pawnee County
26	Jerry	Martin	City of Medicine Lodge
27	Scott	Koopmann	KDOT
28	Benny	Tarverdi	KDOT
29	Terry	Oneslayer	KDOT
30	Loren	Snell	KDOT
31	Randy	Hoskins	City of Wichita
32	Paul	Gunzelman	City of Wichita
33	Mark	Borst	SG Co Public Works

Attendance List
District 6 – Garden City

	First Name	Last Name	Organization
1	Maureen	Yardley	Garden City, PD
2	Sandy	Stoecklein	Garden City, PD
3	Beverly	Hall	Garden City, PD
4	Delmer	Dunham, PE	Lance Co. EP
5	Jon	Halbgewachs	KDOT-Dodge City
6	Larry	Thompson	KDOT- Garden City
7	Keith	Henderson	FC Emergency MCMG
8	Dave	Jones	Finney County Emergency Management
9	Kent	Newport	KHP
10	Jesse	Baldwin	KHP
11	David	Ploutz	KHP
12	Mark	Crump	KHP
13	Randy	Mosher	KHP
14	Robert	Maier	KHP
15	Chuck	Oldaker	KDOT
16	Larry	Scheuchzer	KDOT
17	Steve	Webb	TranSystems
18	Kent	Parks	Taylor & Assoc.
19	Kevin	Bascue	Finney County Sheriff
20	Bob	Prewitt	Finey County EMS
21	Ron	Hall	KDOT
22	Johnnie	Lira	KDON
23	Ralph	Hicks	KDOT
24	Larry	Meyer	KDOT
25	Arnold	Lennington	KDOT
26	Jennifer	Radlliff	Ford County
27	Joe	Finley	City of Dodge City
28	Brock	Sloan	Greenley County
29	John	Ellermann	Finney County
30	Rich	Cramer	Scott County
31	Mike	Longshaw	KDOT
32	Ron	Berglund	KDOT
33	Mike	Pittman	KDOT
34	Gerry	Pearson	KDOT
35	Mark	Davis	KDOT
36	Kerry	Zimmerman	KHP
37	Justin	Bramlett	KHP

Appendix D – ITS Awareness Seminar Presentation Slides

Appendix E – ITS Awareness Seminar Questionnaire

Kansas Statewide ITS Plan

ITS Awareness Seminar Questionnaire

Road Weather Information Systems - RWIS

Winter Travel - How do you prepare for a trip (over 3 hours drive time) during the winter?_____

_____

_____

Where do you go for weather / travel information?_____

_____

_____

_____

KDOT Winter Maintenance- How are winter maintenance activities scheduled?_____

_____

_____

_____

Is pre-treating pavements part of rural maintenance activities?_____

_____

_____

_____

Is overtime a concern in scheduling winter maintenance activities?_____

_____

_____

_____

Kansas Highway Patrol (KHP) - How are winter storms handled?_____

_____

_____

_____

What is the main source of information for KHP weather forecasting needs?_____

_____

_____

_____

Commercial Vehicle Operations (CVO)

Travel Needs - Can you name three major shippers or trucking companies in the area?

_____

_____

_____

Do you feel that there are too many trucks on the roads?

_____

_____

_____

Does truck traffic impact your decision on routes, or time of day travel?

_____

_____

_____

Operator Needs – Could you save time and/or reduce costs if your state paperwork was submitted electronically? _____

_____

_____

Advanced Rural Transportation Systems (ARTS)

Travel Needs- Have you heard of Mayday Systems or Cadillac's On-Star for accident notification? _____

_____

_____

If you were in accident in a rural area - what would you do to get help?_____

_____

_____

_____

Advanced Traveler Information Systems (ATIS)

Traveler Needs - How much time do you allow for a trip from Chanute to Kansas City - on a Saturday morning? On a Friday afternoon? _____

_____

_____

Where do you go for information regarding congestion or construction for such a trip?

Before the trip? During the trip?

_____

_____

_____

Railroad Crossings

Is your travel often disrupted because of railroad crossings?_____

_____

_____

_____

Do you see vehicles violate crossing gates and warnings?_____

_____

_____

_____

_____

Are you concerned about unguarded crossings in your area?_____

_____

_____

_____

Electronic Toll Collection (ETC)

Do you use a K-Tag? _____

_____

_____

_____

If so, do you feel it saves time?_____

_____

_____

Rural Transit

If you were without a car (or a ride) and had a medical appointment, how would you get there? _____

_____

_____

Appendix H: Second Round of District Visits Attendance Lists

The following tables document the complete attendance lists for the second round of ITS seminars given at the KDOT Districts, which took place in January 2000. The attendance is broken out by district office.

Attendance List
District 1 – Topeka, January 31, 2000

	First Name	Last Name	Organization
1	Sandra	Tommer	KDOT
2	Jerry	Younger	KDOT
3	Clay	Adams	KDOT
4	Augie	Svatek	NET
5	Mick	Halter	KDOT
6	Jaci	Vogel	KDOT
7	Scott	Crain	City of Manhattan
8	Kurt	Dunn	FHWA
9	Dave	Geiger	FHWA
10	John	Rohlf	FHWA
11	David	Comstock	KDOT
12	Mike	Perkins	KDOT
13	Brian	Feldkamp	KDOT
14	Joel	Breakstone	KDOT
15	John	Babcock	KDOT
16	Steve	Baalman	KDOT
17	Todd	Hashemi	KDOT
18	Jim	Wetierberg	KDOT
19	Terese	Gorman	City of Lawrence
20	Keith	Browning	Douglas County P.W.
21	Dan	Harden	Riley County
22	Rex	Camden	City of Holton
23	Ron	Stanberry	KDOT District I
24	Roy	Rissky	KDOT District I
25	Ken	McKenzie	KDOT District I
26	Mike	McDonald	City of Leavenworth
27	J. D.	Heithoff	KDOT – Gage
28	Ken	Gudenkauf	KDOT Traffic
29	Linda	Voss	KDOT Traffic
30	Kirk	Fredrichs	FHWA – Topeka
31	Susan	Barker	KDOT
32	Bob	Bowden	KDOT District I, Area 2
33	Jeff	Frantzen	KDOT
34	James	Williams	KDOT
35	Brad	Efurd	City of Westmoreland
36	Paul	Gripka	KDOT
37	Steve	Schlagel	KDOT
38	Michelle	Anschutz	KDOT
39	Rusty	Simerl	FHWA
40	Richard	Teaford	Jefferson County
41	Glen	Tyson	Osage County

	First Name	Last Name	Organization
42	Carl	Meyer	Osage County
43	Kerry	Kanatzar	City of Atchison
44	Mike	Krentz	KDOT District I
45	James	Raudybush	KDOT Emporia
46	Jerry	Haug	KDOT Wamego
47	Chris	Tatham	ETC Institute
48	Leslee	Spencer Fowler	KDOT Chief Counsel Office
49	Glenda	Brown	KDOT OCC
50	Oscar	Hamilton	KDOT
51	Brian D.	Gower	KDOT

Attendance List
District 2 – Salina, January 25, 2000

	First Name	Last Name	Organization
1	Mike	Clark	City of Beloit Street Dept.
2	Ken	Tatro	City Beloit Street Dept.
3	Gerald	Kelsey	Marion County
4	Dennis	Nicholo	City of Marion
5	David	Sites	Dickinson County
6	Jerry	Fowler	Saline Co. Public Works
7	Charles	Joy	Republic Co. Hwy. Admin.
8	Bob	Harder	City of McPherson
9	Bill	Goering	City of McPherson
10	Shawn	O'Leary	City of Salina
11	Roger	Alexander	KDOT
12	Dale E.	Hershberger	KDOT
13	Don	Drickey	KDOT

Attendance List
District 3 – Norton, January 20, 2000

	First	Last	Organization
1	Jerry	Moritz	KDOT
2	Floyd	Mckie	KDOT
3	Wilbur	Henry	KDOT
4	Alvin	Perez	Rooks County
5	Kristen	Brandt	KDOT
6	Bob	Armstrong	KDOT
7	Bob	Horack	Russell County
8	Eric	Oelschlager	KDOT
9	Robert	Weiss	KDOT
10	Carla	Mumma	KDOT
11	Wes	Moore	KDOT
12	John	Woodyard	KDOT
13	Chriss	McDiffett	KDOT
14	Doug	Griffiths	KHP
15	Robert	Symns	KHP
16	Travis	Scott	KDOT
17	Jerry	Glassman	KDOT

Attendance List
District 4 – Chanute, January 26, 2000

	First Name	Last Name	Organization
1	Richard A.	Wiley	City of Coffeyville
2	Raymond	Deek	City of Coffeyville
3	Jim	Barnett	City of Coffeyville
4	Hub	Caspar	Anderson/Coffey Counties
5	Sandy	Krider	Labetle County
6	Jerry L.	Hallbauer	City of Chanute
7	Pricilla	Peterson	KDOT
8	Bill	Ellis	KDOT
9	John	Weselch	Woodson County
10	Gary	Plumb	KDOT
11	Bob	Gudgen	KDOT
12	Charles	Mills	KDOT
13	George	Dockery	KDOT
14	Jon	Evans	KDOT
15	Frank	Tichenor	KDOT
16	Niel	Spillman	KDOT
17	Fred	Hummer	KDOT
18	Joe	Shipley	KDOT
19	Darrell	Moyer	City of Parsons
20	Martha	Walters	City of Parsons
21	Doug	Sevart	KDOT
22	Gerry	Montgomery	KDOT
23	Elwyn E.	Johnston	KDOT
24	Mike	Priest	TranSystems
25	E. Dale	McBride	Labette County
26	Lonie R.	Addis	Labette County
27	Hugh	Bogle	KDOT
28	Wayne R.	Gudmonson	KDOT
29	Jim	Metcalfe	KDOT
30	Robert	Jack	KDOT
31	John	Hrenak	KDOT
32	Bev	Roecker	KDOT
33	Bob	Dickens	KDOT
34	John	VanGorden	City of Attsbury
35	Larry	Stevens	City of Attsbury
36	Douglas	Vogel	KDOT
37	Mike	Stringer	KDOT
38	Sheldon	Caudell	KDOT
39	Jim	Barnes	KDOT
40	John	Leverenz	KDOT

Attendance List
District 5 – Hutchinson, January 18, 2000

	First	Last	Organization
1	David	Fosberg	KDOT – Pratt
2	Scott	Mullen	KDOT – Great Bend
3	Barry	McManaman	KDOT – Great Bend
4	Mark	Borst	Sedgwick County
5	Benny	Tarverdi	KDOT
6	Warren	Stanton	KDOT
7	Erik	Anderson	KDOT
8	Lott	Metzler	KDOT
9	Dennis	Elias	Rush County
10	Lyle	Keller	Barber County
11	Dale	Phillips	Barton County
12	Scott	Koopmann	KDOT
13	Martin	Miller	KDOT
14	Bret	Letkowski	TranSystems
15	Brooke	Brandenburg	City of Wellington

Attendance List
District 6 – Garden City, January 19, 2000

	First Name	Last Name	Organization
1	Charla	Douglass	City of Leoti
2	Eugene	Wilson	City of Dighton
3	Brent	Duboit	City of Dighton
4	Keith	Henderson	F.C. Emergency Management
5	Dale	Urban	KHP
6	Richard	Coghill	KDOT
7	Casey	Bieker	KDOT
8	Arn	Lennington	KDOT
9	Dale	Atkinson	KDOT
10	Leroy	Koehn	KDOT
11	Ron	Berglund	KDOT
12	Ron	Hall	KDOT
13	Johnie	Lira	KDOT
14	Bill	Squire	KDOT
15	Maureen	Hardley	Garden City Police
16	Beverly	Hall	Garden City Police
17	Brad	Johnson	TranSystems
18	Ray	Slatterly	City of Dodge City
19	Jon	Halbgewachs	KDOT
20	Larry	Thompson	KDOT
21	Kirk	Hutchinson	KDOT
22	Chuck	Oldaker	KDOT
23	Ken	Parks	Taylor & Assoc.
24	Lennon	Bogart	Ford County

Appendix I: Second Round of District Visits
Meeting Notes

Date: January 18, 2000 **Location**: Hutchinson District Office #5 **Number of Attendees**: 16

Verbal Comments and Questions from Attendees

- Following the presentation of the videotape showing use of ITS technology in MN, one person commented that since KS seldom experiences 'white out' conditions during snow storms, the technology shown in the videotape would not produce much benefit in this state.
- *Re: RWIS*
  Are local and state government agencies able to communicate with each other so that weather data can be shared in a timely manner?
- *Re: Fiber Optic Network*
  How much data can be carried by a fiber optic cable?
- *Re: KDOT Set-aside funds for ITS Projects*
  Two people asked whether AVL projects are eligible for set-aside funding. They mentioned an instance where a snowplow was stuck on I-135 near Newton for 4 hours. This could be a potential project in District 5.
- *Re: Funding For ITS Projects*
  Can local governments use federal safety funds for their ITS projects?
- *Re: Table 1 of the Executive Summary*
  Does technology now exist to integrate existing RWIS systems?
  The accuracy of information is currently a major legal obstacle. Various government organizations are reluctant now to share their information. If inaccurate data are included in an integrated RWIS system, who will be responsible for any inaccuracies?
- *Re: Open Architecture and Standards*
  Will the standards require equipment that is unaffordable by small, rural local governments?
  The standards should allow low cost equipment to meet the standards.
- *Re: KITS Database*
  Will the KITS database be available to read by non-KDOT government organizations?
  Will the KITS database be available on the Internet?
- *Re: ITS Funding*
  How are other states funding their ITS projects?
  Has anyone thought of finding ways to get money from insurance companies and car manufacturers to combine with government funding sources so that more money would be available for ITS projects?

- There was a general discussion involving multiple people about the existing RWIS system, including the conditions under which government organizations now use RWIS data, the accuracy of the data, length of forecast period, and geographic area covered.

Written Comments and Questions from Attendees

- There was a request from a county person for a copy of the snowplow video. He said he could get a "lot of mileage" showing it to his people to show them one area of ITS.
- One person commented that the second seminar was much more informative than the first because it focused on specifics to show how ITS can benefit them.

Date: January 19, 2000 **Location**:Garden City District Office #6 **Number of Attendees**: 24

Verbal Comments and Questions from Attendees

- *Re: Speed Display Trailer Shown in Videotape*
  Did KDOT get any data from MODOT about the effectiveness of their effort to control vehicle speed on I-70 in Kansas City using speed displays?
- One person described equipment they had seen on I-70 in CO that might have been used to either monitor vehicle speed or enforce speed limits. No one was familiar with the equipment that was described.
- *Re: Table 1 of the Executive Summary*
  What is the current status of the NASCAR racetrack project in Kansas City?
- *Re: Table 2 of the Executive Summary*
  One person asked for clarification of one listed project.
- *Re: The Driving Public*
  One person commented that the presentation did not address an important factor: the "idiocy" of the driving public.
- Does KDOT share ITS information with other states or countries?

Written Comments and Questions from Attendees

- One commented that their maintenance personnel would be excited to try the new technology shown in the snowplow video. He also recommended pursuing more funding from FHWA in the interest of safety.
- One expressed concern about the road condition hotline and its need to be updated in a timely manner. He elaborates that nobody makes this task his or her primary responsibility.
- ITS needs in SW Kansas are centered on road condition reports, road closures, and alternate route advisories.
- Compatibility of data is in issue, especially with motor carriers since they cross over state lines. District 6 needs some pilot or test projects. WIM should be a priority since truck traffic is high in SW Kansas.
- ITS is great but it is still the responsibility of drivers to drive safely. ITS is not the cure all but it is a step in the right direction.

Date: January 20, 2000 **Location**: Norton District Office #3 **Number of Attendees**: 17

Verbal Comments and Questions from Attendees

- *Re: GPS Technology Shown on Videotape*
  What is the cost of a GPS system?
- Will the ITS data that KDOT eventually has be released to the public, or somehow protected from public access?
- If magnetic tape is installed on roads and car manufacturers then install equipment on cars that reads the tape, then when roads are officially closed due to snow, will people with such cars complain that "I can see the road, so why can't I drive on it?"
- Can a GPS system support several different applications?
- Do the fiber optic cables in KS now cross state lines into MO, CO, OK, and NE?
- Will any of the ITS projects listed in the Executive Summary be federally funded?
- What kinds of people should be the 'champions' of an ITS project?
- Are the projects listed in the Executive Summary going to compete with new projects for KDOT's ITS Set-aside funds?
- Is the $40 M cost of the Kansas City ITS project going to be funded from KDOT's ITS Set-aside fund?
- Will our new projects duplicate projects already listed in the Table in the Executive Summary?
- Is the ITS database now on intra- or inter- net?
- How will you combine new ITS communications with Kansas Highway Patrol's central communications and dispatch center in Salina?
- If a project approved on KDOT Form 883 includes ITS, does the ITS part get funded through that project or from the KDOT ITS Set Aside fund?
- Can federal safety funds be used for ITS projects?
- Where does passenger car Mayday equipment fit into the KS state architecture for ITS?
- Is Mike Floberg's email address on the Groupwise system?
- What is the status of getting more cellular phones for use by KDOT Area personnel?
- Is it possible for cellular phone companies to use KDOT radio towers in exchange for no cost/low cost cellular phone service for state employees?
- Can ITS funds be used to buy cellular phones?

Written Comments and Questions from Attendees

- One person gave a list of projects on I-70 where ITS implementation should be considered. These projects have not yet been let. He would also like to see interactive kiosks at rest areas that survey travelers for their opinion on the rest area and the highway system.
- It will be exiting to see how KDOT can utilize the fiber optic network and VMS applications.

Date: January 25, 2000 **Location**: Salina District Office #2 **Number of Attendees**: 13

Verbal Comments and Questions from Attendees

- *Re: RWIS*
  Why can't RWIS data be shared between state sites and local sites?
- *Re: ITS Set-aside funds*
  What kind of projects are we looking for from local agencies?
- *Re: CVO Projects*
  What was the WIM site in Wabunsee County used for?
  Are there plans for having enforcement applications in the ITS/CVO area?
- One person suggested having some sort of traveler information on the Kansas Turnpike before entering the turnpike? The congestion gets bad going to Chiefs games and once you get on the turnpike you are stuck. The person acknowledged that KTA may not want to cooperate though since that would mean less revenue.
- *Re: Near-term Projects*
  What are phase 1 and phase 2 of the I-70 Traveler Information projects?

Written Comments and Questions from Attendees

- A lot of the Plan does not apply to the Counties.
- The Architecture diagram provides a good visual concept of overall ITS system. Include a glossary of acronyms in the Plan. Provide a Table of Contents in the final Plan.
- RWIS interface for cities and counties could become an excellent tool to promote ITS with local governments.

Date: January 26, 2000 **Location**: Chanute District Office #4 **Number of Attendees**: 40

Verbal Comments and Questions from Attendees

- *Re: Snowplow Video*
  Why is the magnetic tape black? Can it be other colors?
  What is the cost of the GPS installed on the snowplow in the video? (asked by Fireman)
- *Re: Project List*
  Why are there no projects for Southeastern Kansas?
- *Re: Need for projects in District 4*
  What about possibility of moving a kiosk from Paxico (when it closes) to District 4? (Matt's suggestion)
  We should try to have projects for each District in our project list. (Matt)
- What are the Last Mile Connection Projects? Connecting District offices to the fiber backbone.

Written Comments and Questions from Attendees

- We need to implement motor carrier inspection stations and WIM on US-75 near OK border. Compatibility with OK CVO system is also important.

Date: January 31, 2000 **Location**: Topeka District Office #1 **Number of Attendees**: 51

Verbal Comments and Questions from Attendees

- *Re: Snowplow Video*
  What is the cost of the 3M magnetic tape and how long is the warrantee?
- *Re: Implementation Strategies*
  You mentioned conforming to federal standards. What does this mean?
- What does the "Install AVL in Paint Trucks" project entail? It would be helpful if maintenance had a map showing where durable marking is and isn't. Could ITS help with this?
- *Re: ITS Set-aside funding*
  What kind of projects can the locals apply for?
  Can the local agencies apply for FY 2000 funding?
- *Re: Red light running enforcement*
  What is its status in Kansas?
  Answer from audience: There is an evaluation project going on in Overland Park right now. This concept is going to be proposed to the Kansas Legislature in 2002.
- *Re: Traveler Information kiosks*
  How do the traveler information systems work (kiosks)?
  What are the costs for the kiosks?
- What sources of funding are available for signal improvements; ITS set-aside or conventional?
- *Re: Mainstreaming Strategies:*
  Does mainstreaming include educating the KDOT headquarters on ITS? That is very important for ITS to work in Kansas.
  Mainstreaming can be as simple as putting in conduit into a design project for future ITS expansion. It doesn't have to be complicated.

Verbal Comments and Questions from Attendees

- One requested VMS to tell drivers not to drive on shoulders to make right turns.
- One suggested using an off road guidance system (i.e. GPS) for guiding snow plows instead of the magnetic tape.
- It does not make sense to have AVL in paint trucks. It would be better to have a database of pavement markings so that maintenance personnel know where markings are. It would be good to have AVL in snowplows to help them see the road better.
- KDOT should install hard conduit in new construction projects. This conduit should be large enough to accommodate many cables and it could be leased on a first come-first serve basis.

Appendix J: Quarterly Progress Report

Kansas Statewide ITS Plan

Date of Progress Report: _____
Report Completed By: _____

Identification of Projects

1. How many new ITS projects were identified during the last quarter through the following sources?
   ____ Design Process (883 Process)
   ____ ITS Unit
   ____ Other KDOT Bureaus (list)_____
   ____ Other State Agencies (list)_____
   ____ Local/Regional Agencies (list)_____
   ____ Private Sector (list)_____
   ____ Other (list) _____
   ____ *Total*

2. How many "ITS Checklists" were completed during the last quarter as part of the 883 Process? _____ #

3. How many of these checklists indicated that ITS could be a viable addition to the project? _____ #

4. Any suggestions for improving the ITS checklist to provide better analysis of ITS potential?_____
   _____
   _____

Maintenance of the KITS Database

5. Were all of the new ITS projects identified in Q1 added to the KITS database?
   ____ Y ____ N

6. Were the current database entries reviewed during the month and status changes noted? ____ Y ____ N

7. In what other ways was the database updated during the last quarter?
   _____
   _____

8. What additional features/information would be useful in maintaining and using the database?_____
   _____

Appendix J: Quarterly Progress Report
Kansas Statewide ITS Plan

Ranking and Prioritization of Projects

9. How many projects were evaluated using the *Project Screening Criteria Sheet* during the last quarter? _____

10. What changes/additions (if any) should be made to the *Project Screening Criteria Sheet*?
_____
_____

Evaluation

11. Are ongoing projects being evaluated? ____ Y ____ N

12. Are the results of the evaluations being disseminated? ____ Y ____ N

13. What steps could be taken to improve the evaluation of projects and dissemination of information?_____
_____
_____

General

14. Are interagency coordination issues being considered in ITS projects? ____Y ____N

15. Are potential public/private partnerships being considered in planning for ITS projects? ___ Y ___ N

    If yes, which projects? _____

16. Have any informal working groups been formed? ____ Y ____ N
    If yes, list the working groups? _____

17. What (if any) significant issues were encountered during the last quarter that may serve as barriers to the expansion of ITS deployments in the State?
_____
_____
_____

18. What were the significant lessons learned during the last quarter?
_____
_____
_____

Appendix J: Quarterly Progress Report

Kansas Statewide ITS Plan

ITS Awareness

Quarterly ITS Steering Committee Meeting
Date Held: _____
Number of Attendees: _____
Bureaus and Agencies Represented: _____
Major Outcomes from Meeting: _____
_____

ITS Heartland Meeting(s)
Date Held: _____
Number of Attendees: _____
Organizations/Consultants/Universities Represented: _____
_____
Major Outcomes from Meeting: _____
_____

FHWA Scanning Tours/Training Courses
Name of Tour/Course: _____
Date Held: _____
Number of Attendees: _____
Bureaus and Agencies Represented: _____

Name of Tour/Course: _____
Date Held: _____
Number of Attendees: _____
Bureaus and Agencies Represented: _____

ITS Conferences
Local Conference(s) Attended: _____
Number of Attendees: _____
Presentations Made: _____

National Conference(s) Attended: _____
Number of Attendees: _____
Presentations Made: _____

ITS Brownbags
Number Held: _____
Number of Attendees: _____
Presentations Made: _____

ITS Newsletters
Number of Issues: _____
Articles Written: _____