

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.

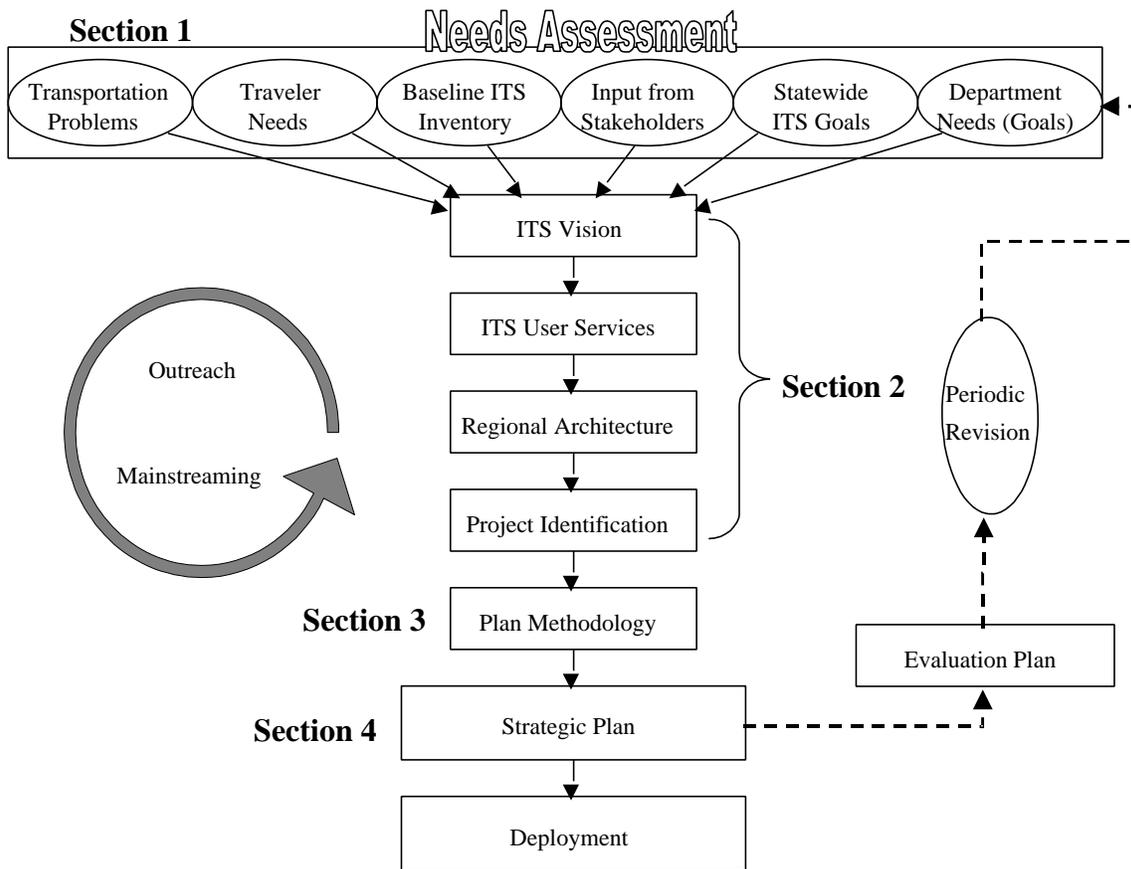
1. Emergency Services:
 - Mayday Systems (Automatic Collision Notification),
 - Advanced dispatching and vehicle-based response systems, and
 - Increased ability of emergency services to find rural locations.
2. Tourism/Traveler Information Services:
 - Increased stewardship for National and State Parks,
 - 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 Paragnet 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 fourth 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 sites 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.

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

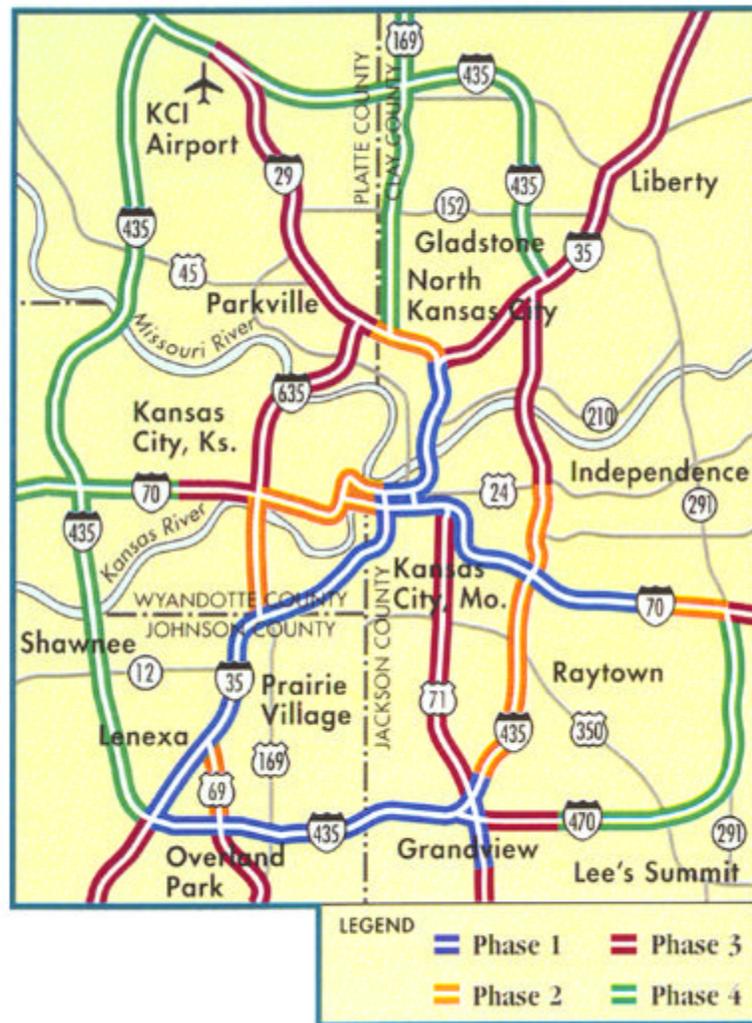
1.1.10 Kansas City Scout Project

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.

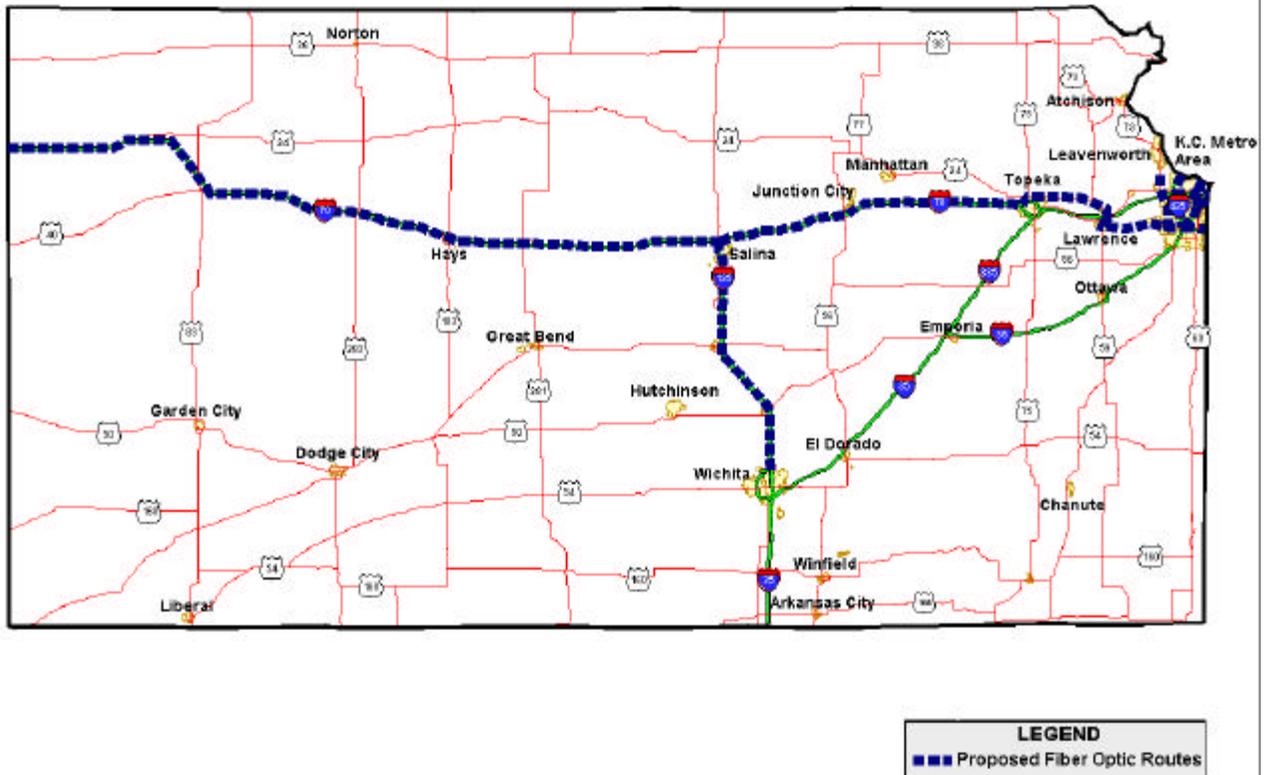
Since these routes carry the most truck traffic in Kansas, they will have the highest priority when considering ITS deployment in the Statewide ITS Plan for Kansas. Kansas routes other than the ones mentioned above will also be considered for ITS deployment when special needs arise.

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
<i>KDOT</i>	
The public information page contains links to news of major construction projects.	http://www.ink.org/public/kdot/pubinfo/
<i>KTA</i>	
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/cnstsched.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.

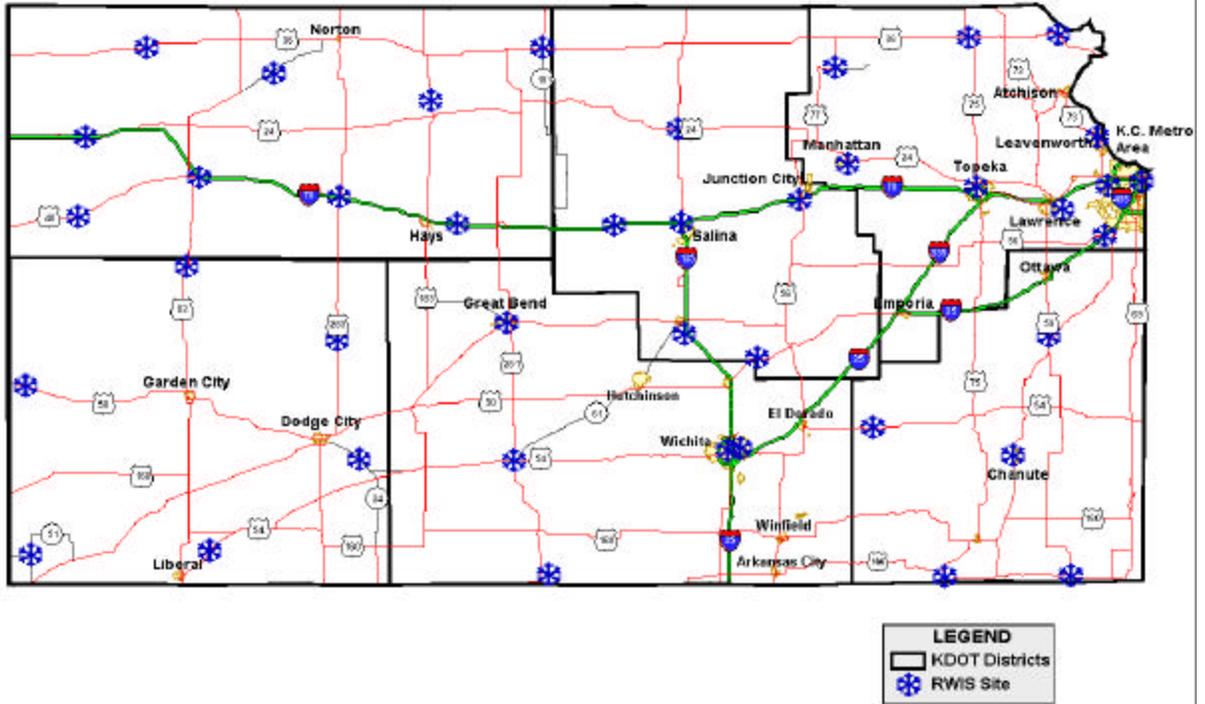
Kansas City Scout and Wichita Early Deployment Study

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



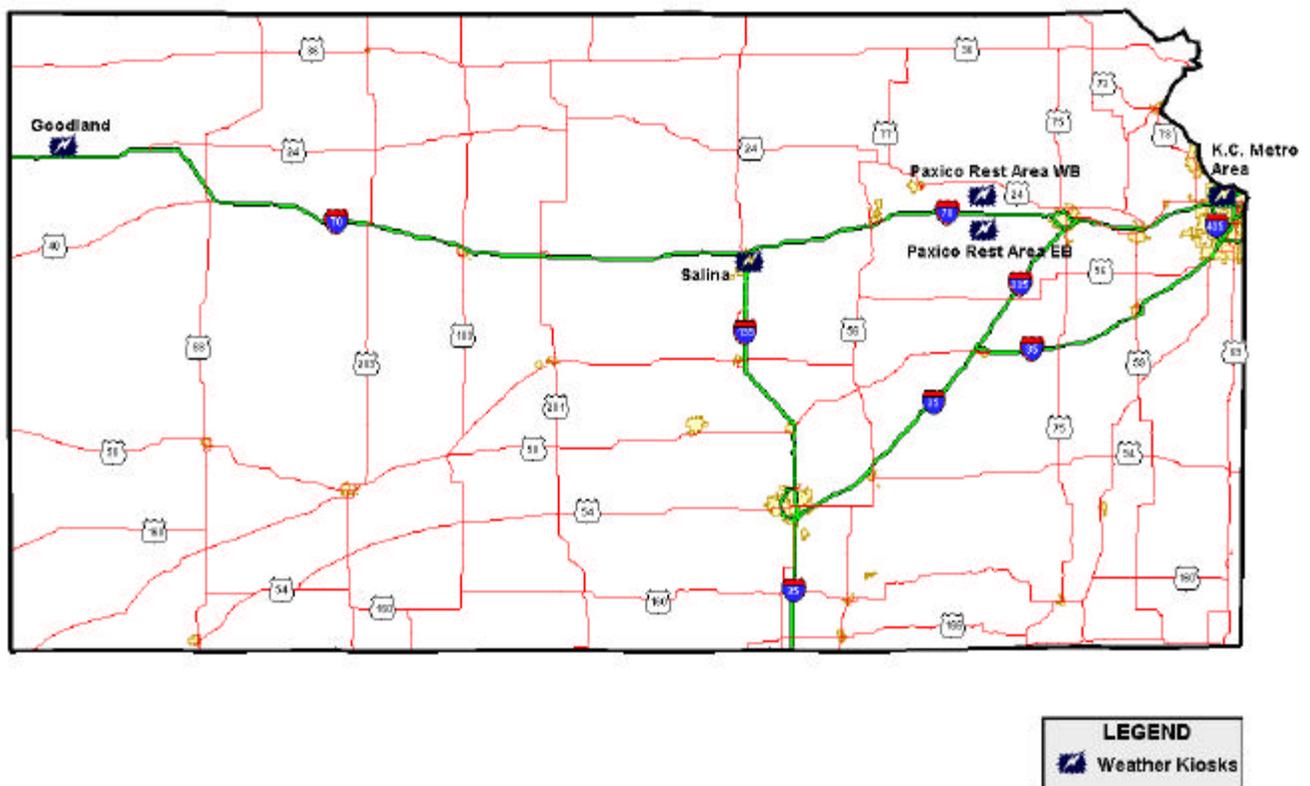
RWIS data has not yet been made available to the public either by means of VMS or the Internet due to liability concerns. However, there is a separate initiative within the Construction and Maintenance Bureau called the Road Reporting System (RCRS) that may eventually provide travel information to the 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 was 16.

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 by 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 were 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 be 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 be 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 losing 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 be 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 be 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 be 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 be 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 sites 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 activities such as 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

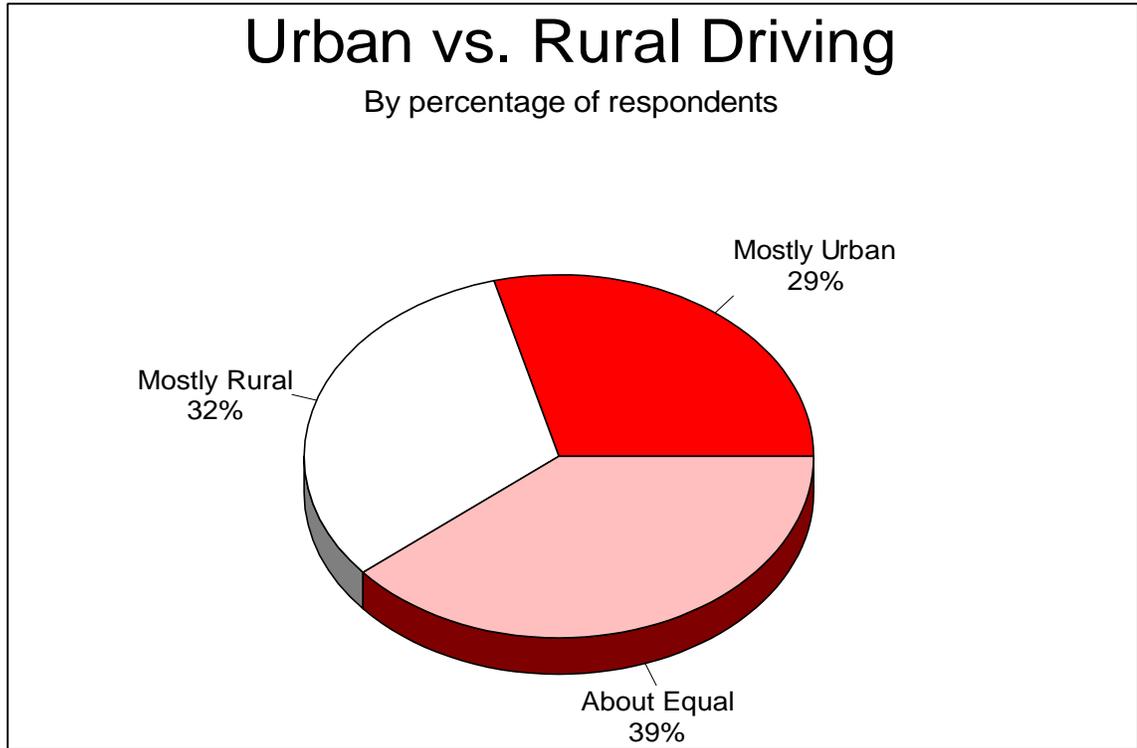
Although each of the studies listed above addressed some ITS applications, the only study that contained useful data that could be further analyzed for the purposes of this project was the Statewide Citizen Satisfaction survey. The following pages contain results of an extensive follow-up analysis that 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.

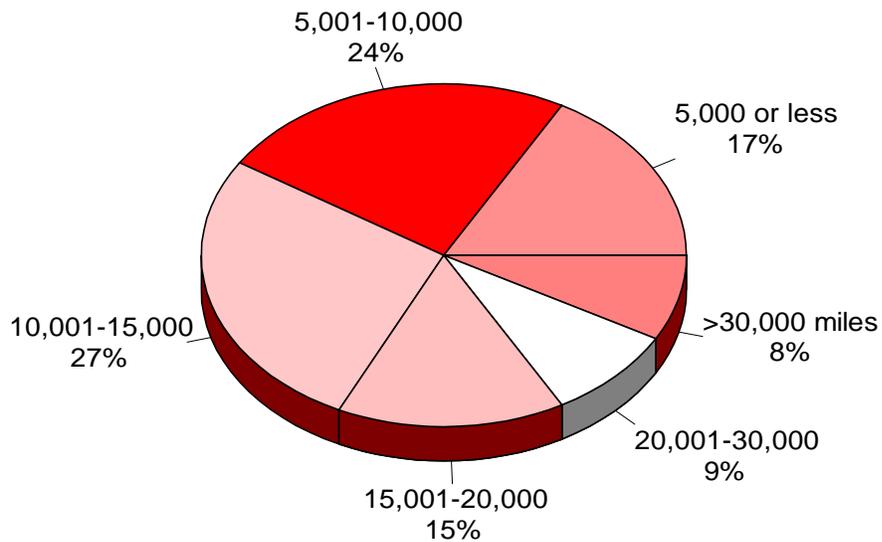
Number of Miles Driven. Based on the mean percentage provided by all respondents, more than half (51%) of the State's residents drive between 5,000 and 15,000 miles per year. One-sixth (17%) drive less than 5,000 miles per year. Another sixth (17%) drive more than 20,000 miles per year.

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.



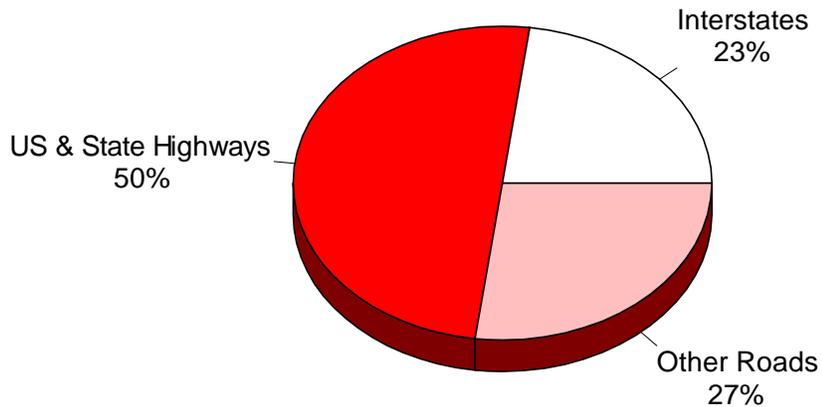
Miles Driven Annually

By percentage of respondents



Percentage of Travel on Various Types of Highways and Roads

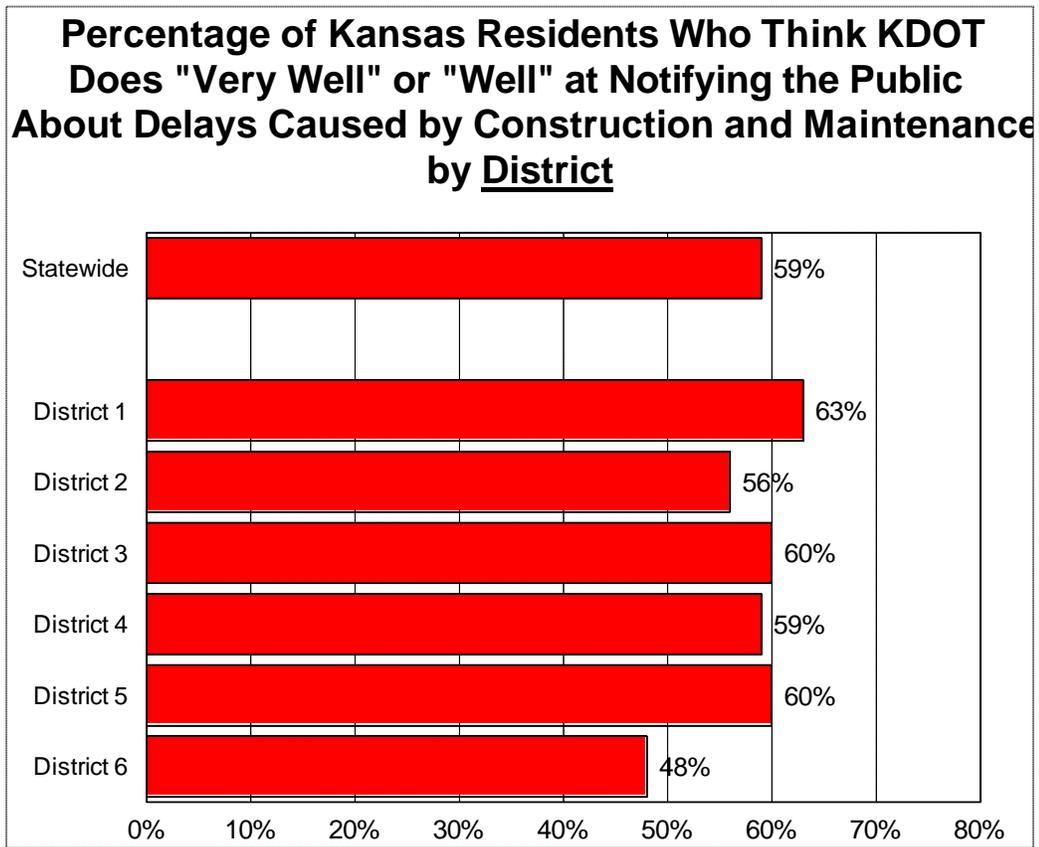
(Results Reflect the Mean Response For Each Type of Highway or Road)



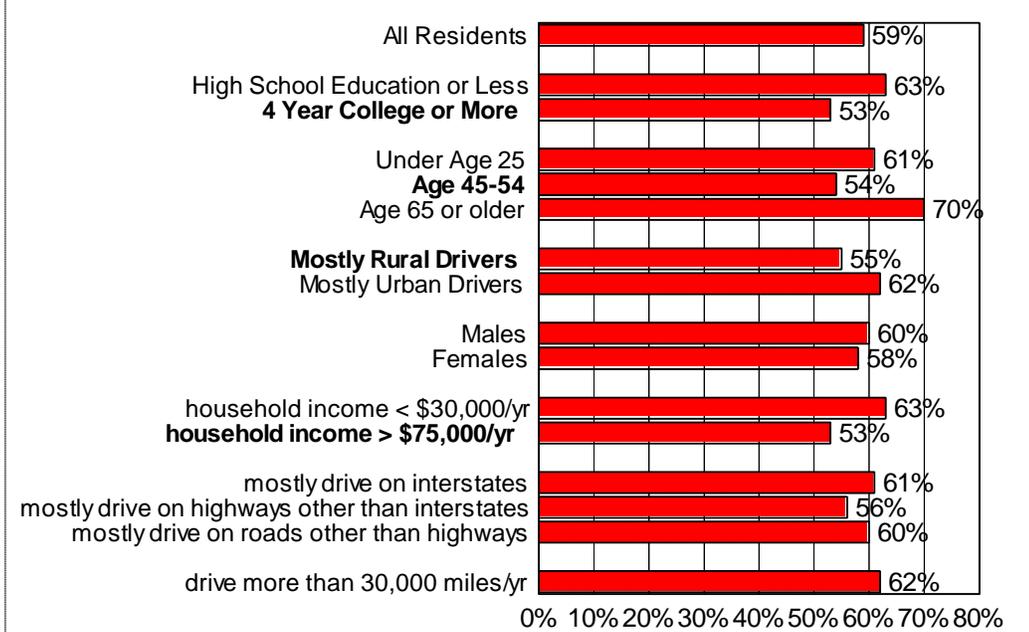
Overall Ratings of the Quality of Information Provided to the Public

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.

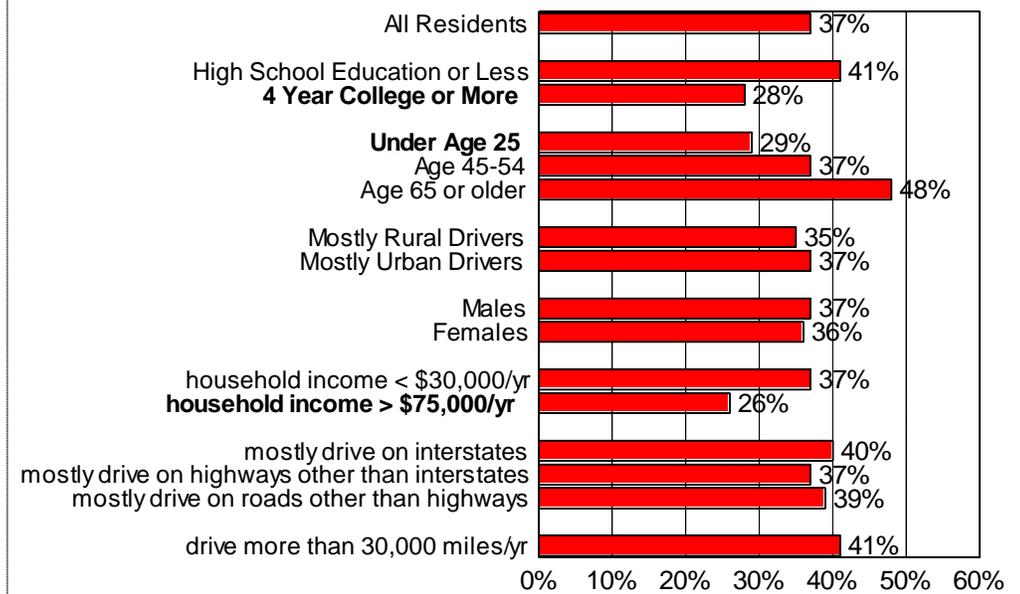


Percentage of Kansas Residents Who Think KDOT Does "Very Well" or "Well" at Notifying the Public About Delays Caused by Construction and Maintenance by Demographic Category



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.

Percentage of Kansas Residents Who Think State Highway Signs Guide Do A Very Good Job of Guiding Them Through Construction or Maintenance Areas by Demographic Category

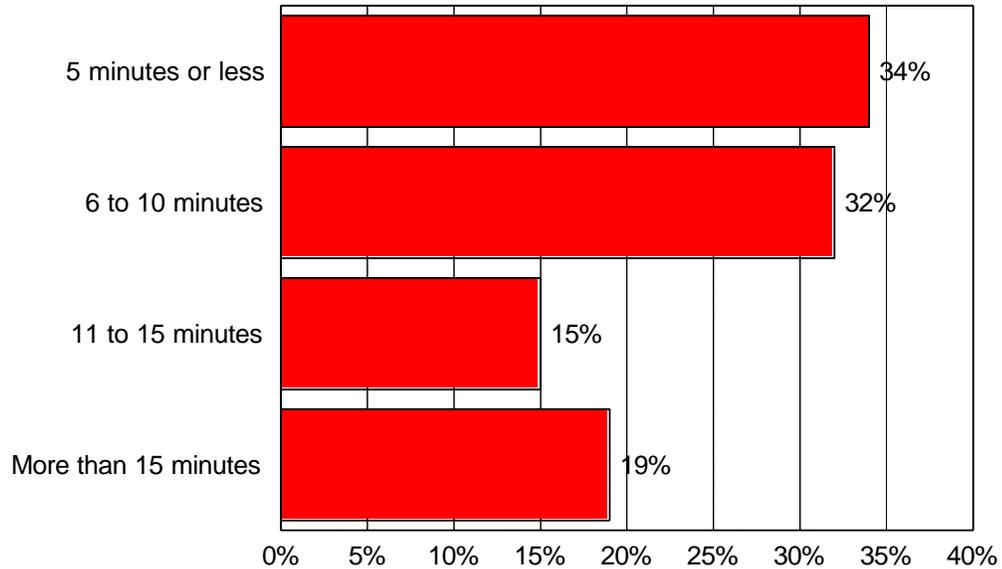


Construction Delays

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.

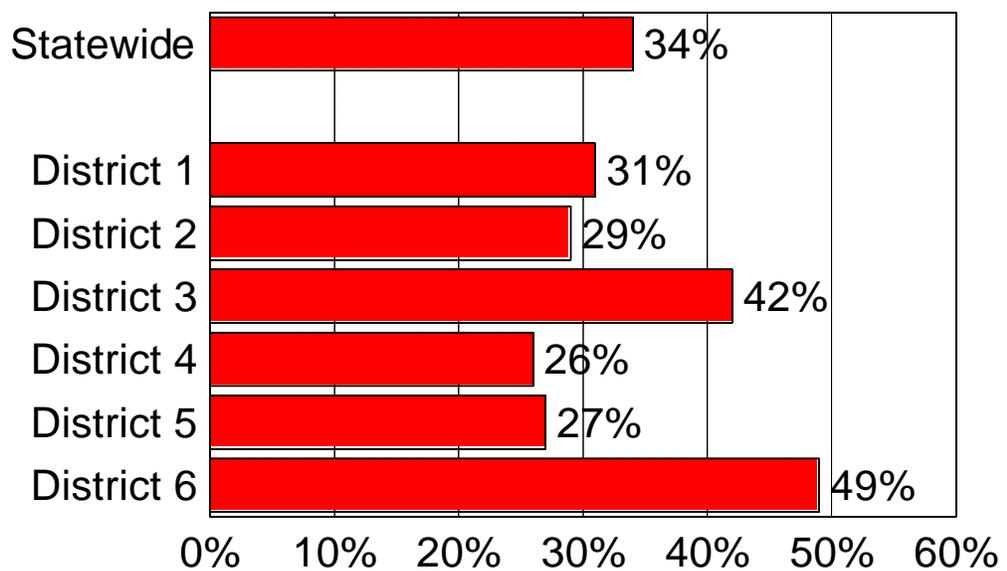
Average Length of Delays in Construction or Maintenance Areas

By percentage of respondents who experienced a delay

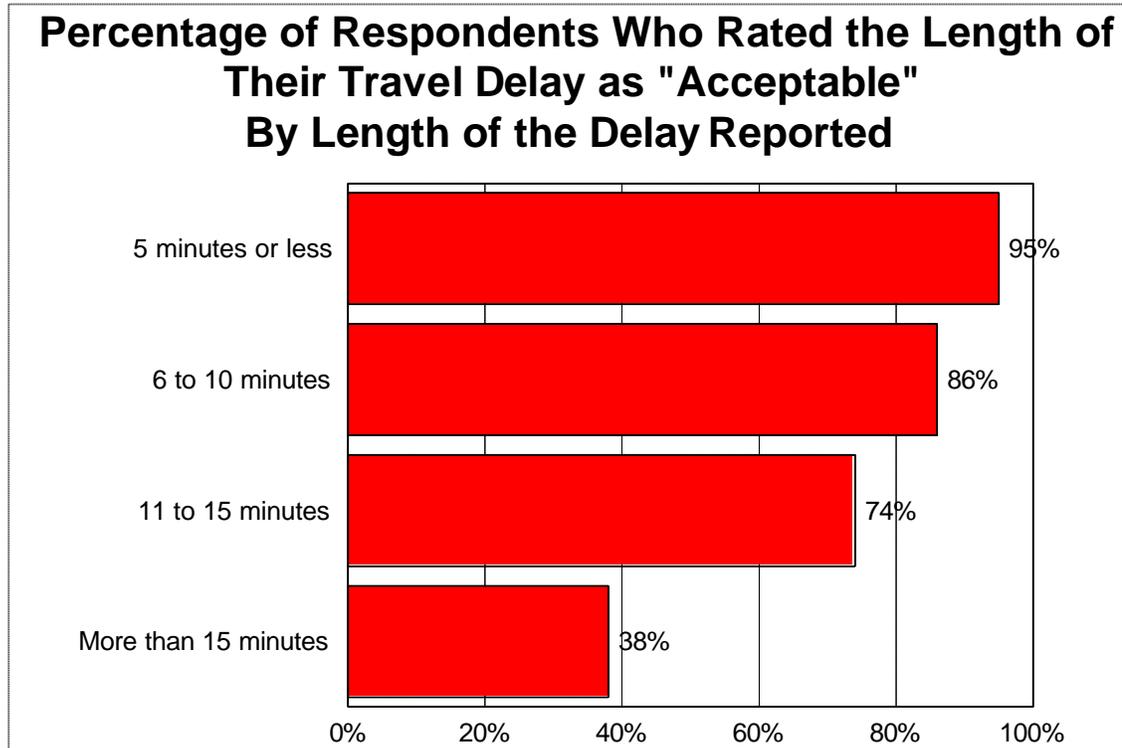


Percentage of Residents Who Indicated That Their Average Travel Delay Caused By Construction or Maintenance Activities Was More than 10 Minutes **by District**

By percentage of respondents who had traveled through a construction or maintenance area during the previous 6 months and experienced a delay



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.



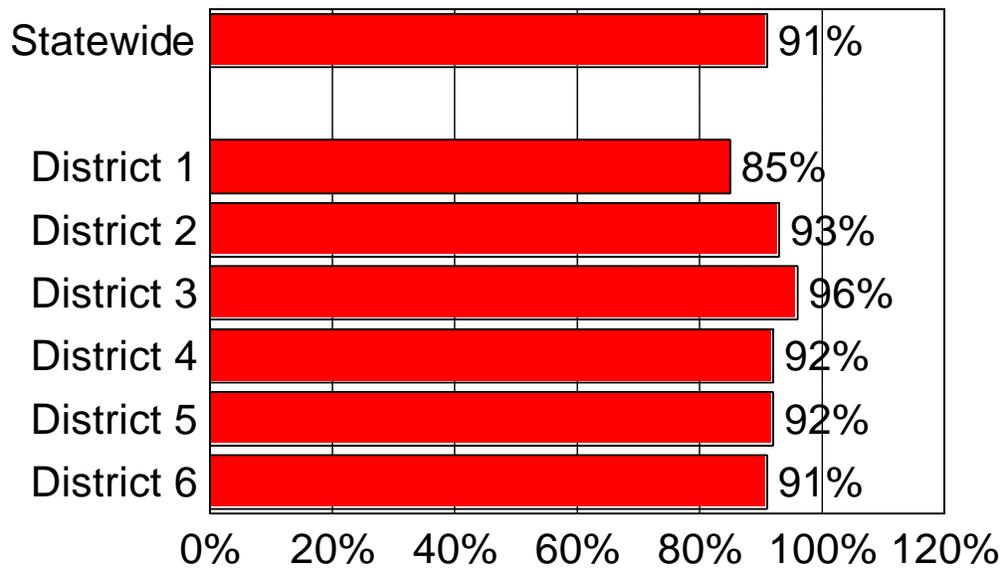
Advance Warning of Construction and Maintenance Projects

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.

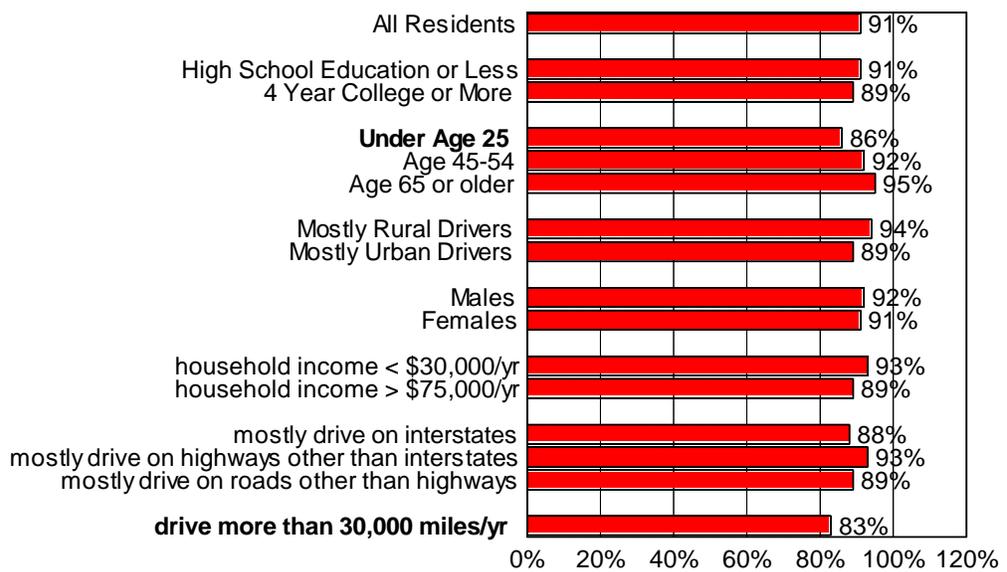
Percentage of Residents Who Thought They Usually Had Enough Advance Warning When Approaching A Construction or Maintenance Area by District

By percentage of respondents who had traveled through a construction or maintenance area during the previous 6 m



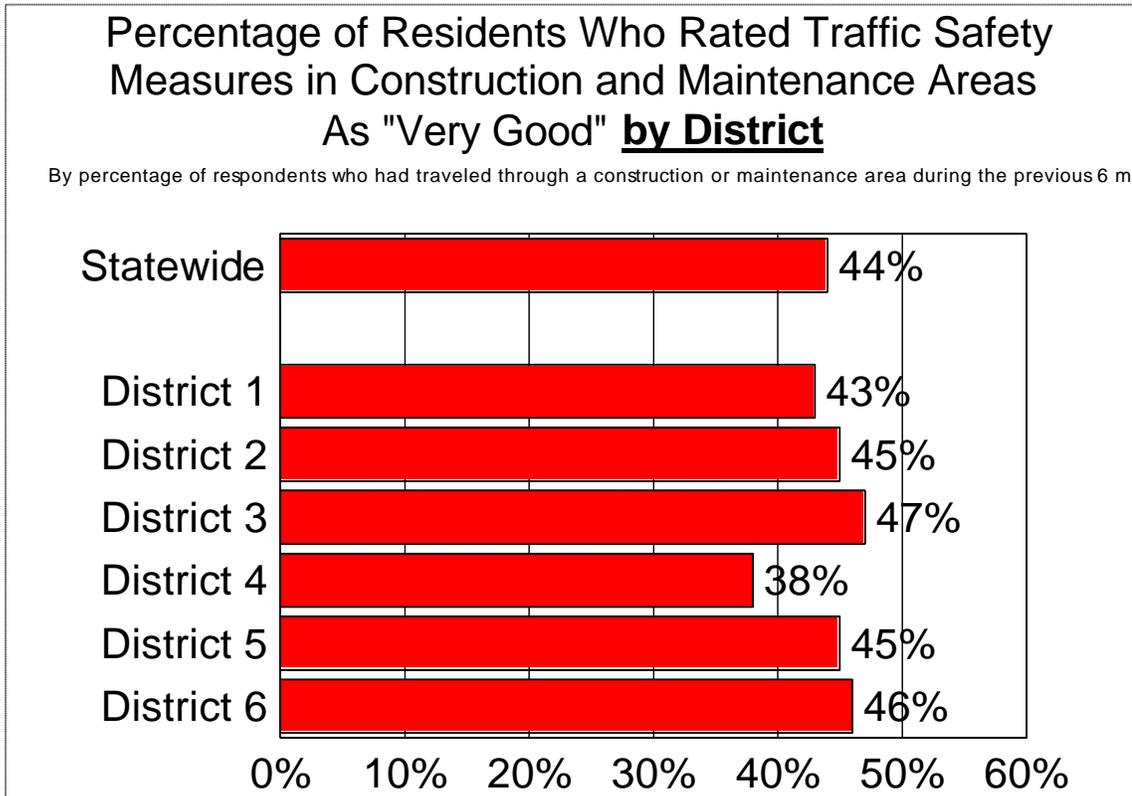
Percentage of Residents Who Thought They Usually Had Enough Advance Warning When Approaching A Construction or Maintenance Area by Demographic Category

By percentage of respondents who had traveled through a construction or maintenance area during the previous 6 m



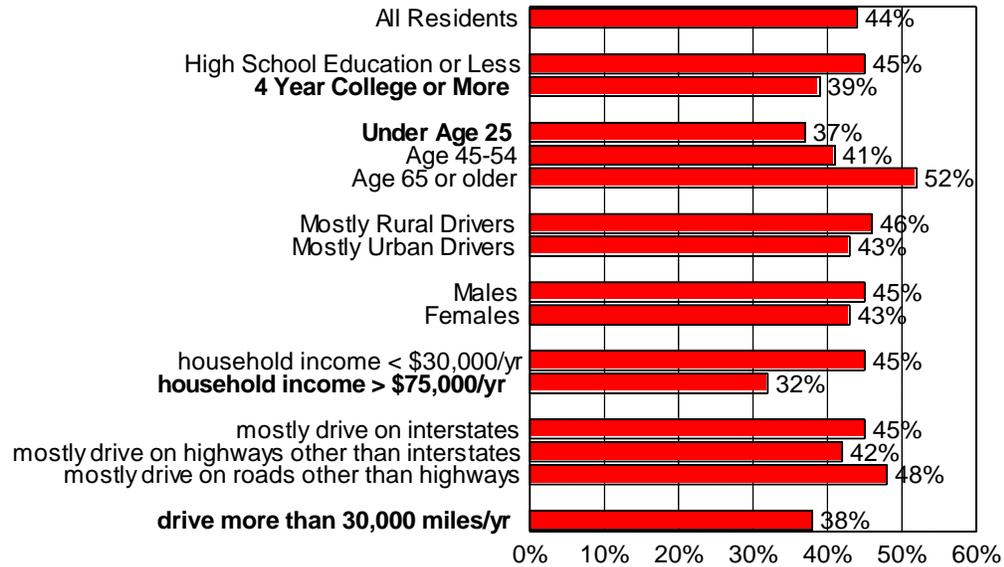
Traffic Safety Measures

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.”



Percentage of Residents Who Rated Traffic Safety Measures in Construction and Maintenance Areas As "Very Good" by Demographic Category

By percentage of respondents who had traveled through a construction or maintenance area during the previous 6 m



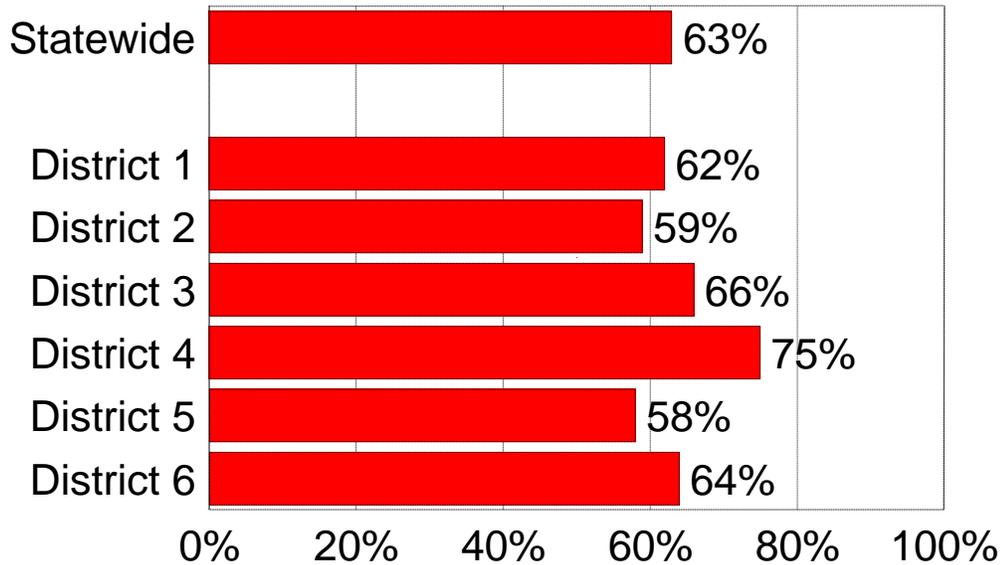
Detours

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.”

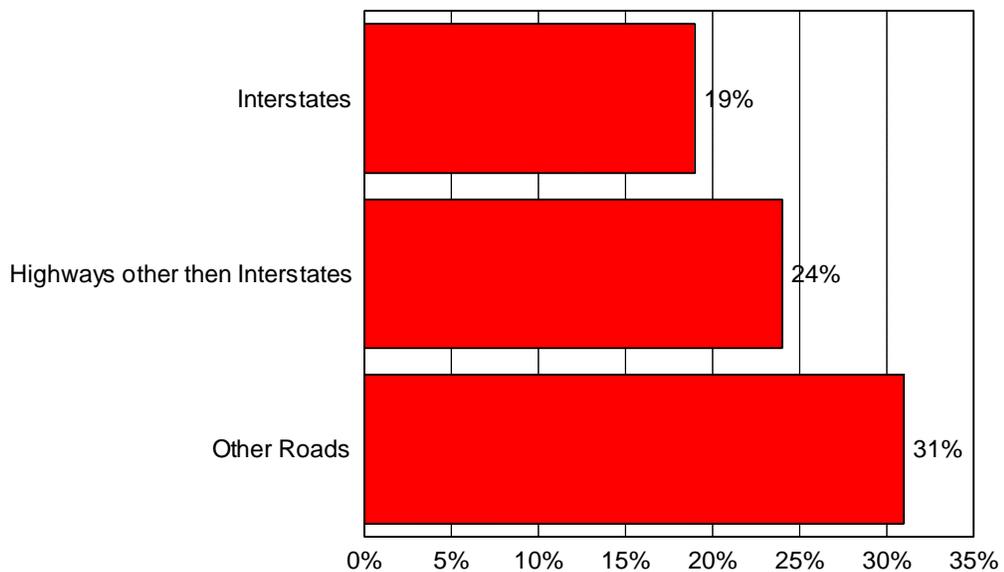
Percentage of Residents Who Thought Detours Were "Very Easy" or "Easy" to Follow by District

By percentage of respondents who had traveled through a detour during the previous 6 months



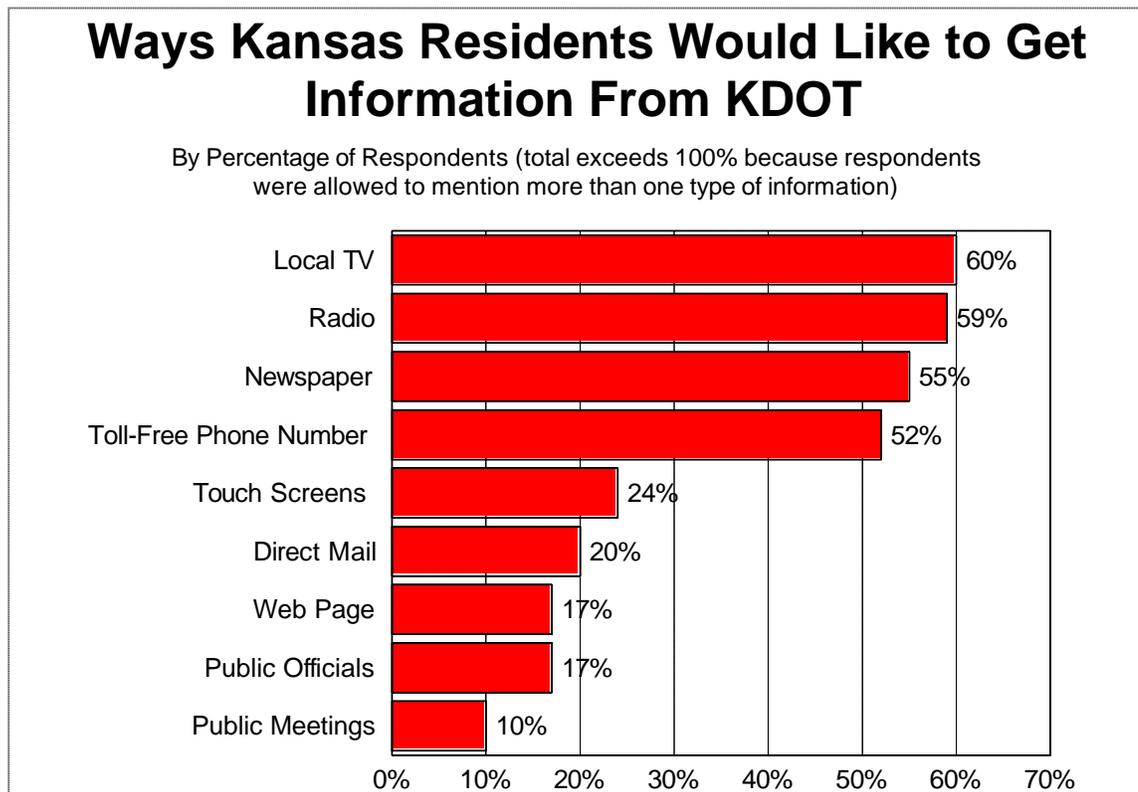
Percentage of Residents Who Rated Detour Signage As "Very Good" By Type of Road Most Frequently Traveled

By percentage of respondents who had traveled through a detour during the previous 6 months



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.

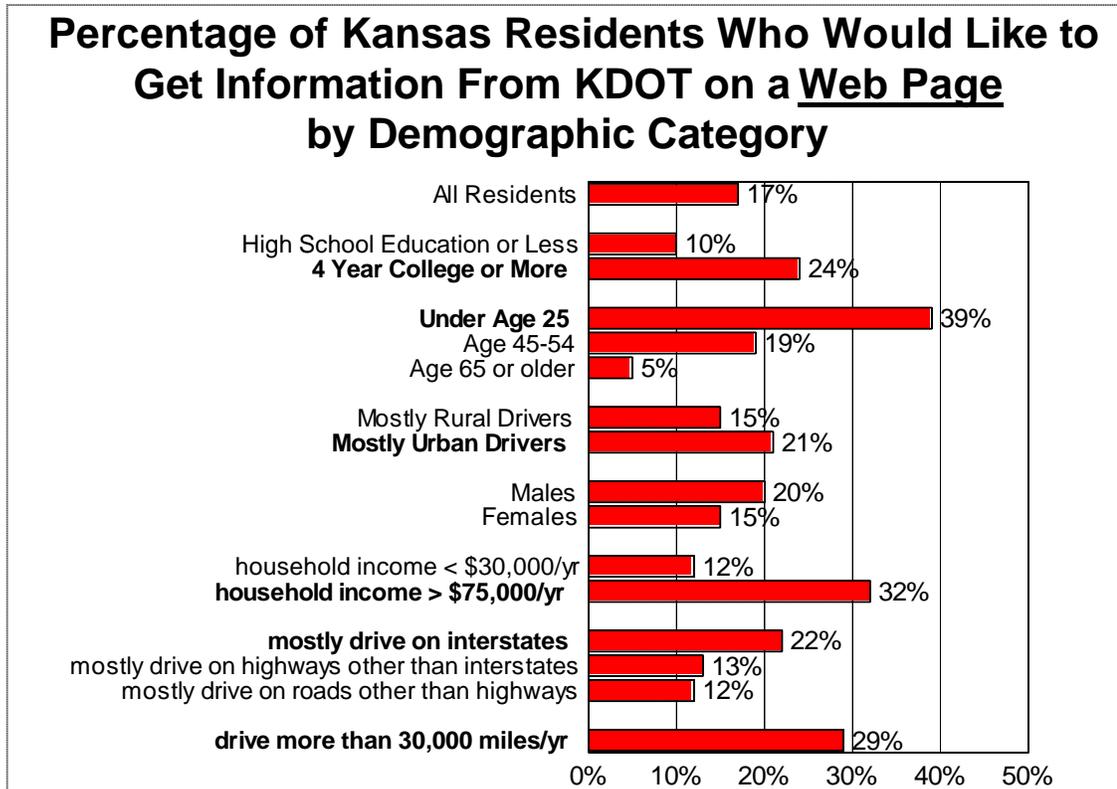


Interest in Receiving Information on a WEB PAGE

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.

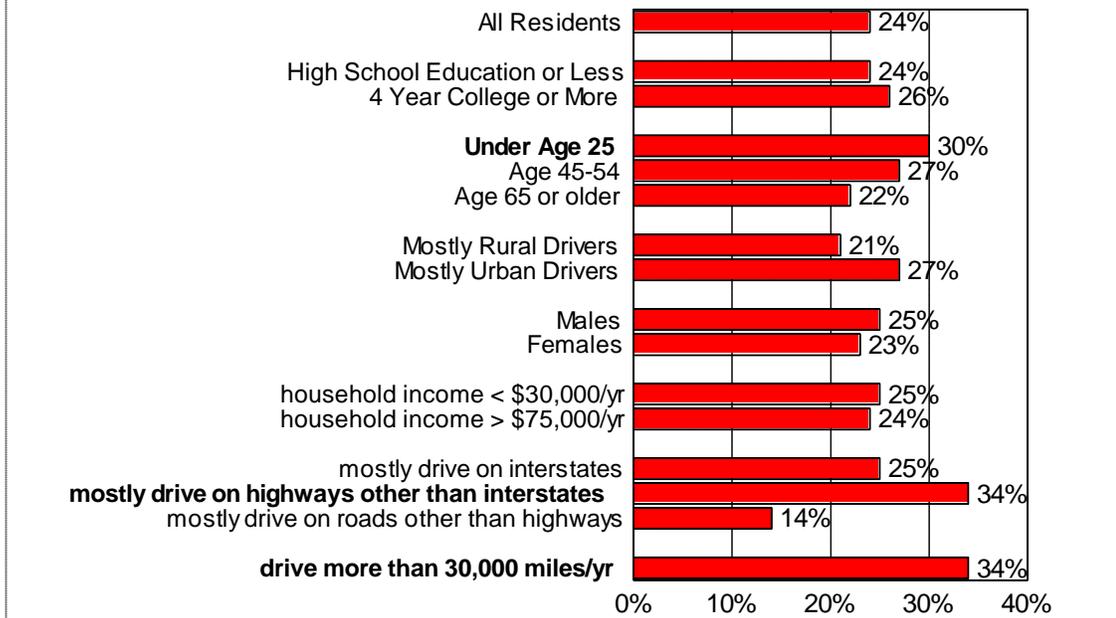


Interest in Receiving Information on a TOUCH SCREENS

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.

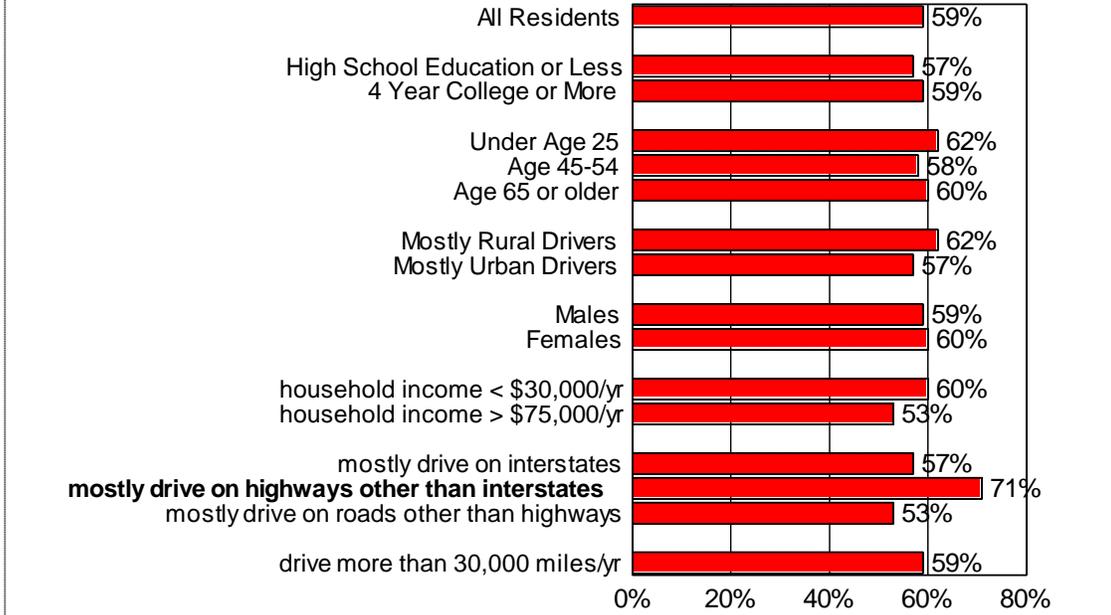
Percentage of Kansas Residents Who Would Like to Get Information From KDOT on Touch Screens by Demographic Category



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.

Percentage of Kansas Residents Who Would Like to Get Information From KDOT on the Radio by Demographic Category

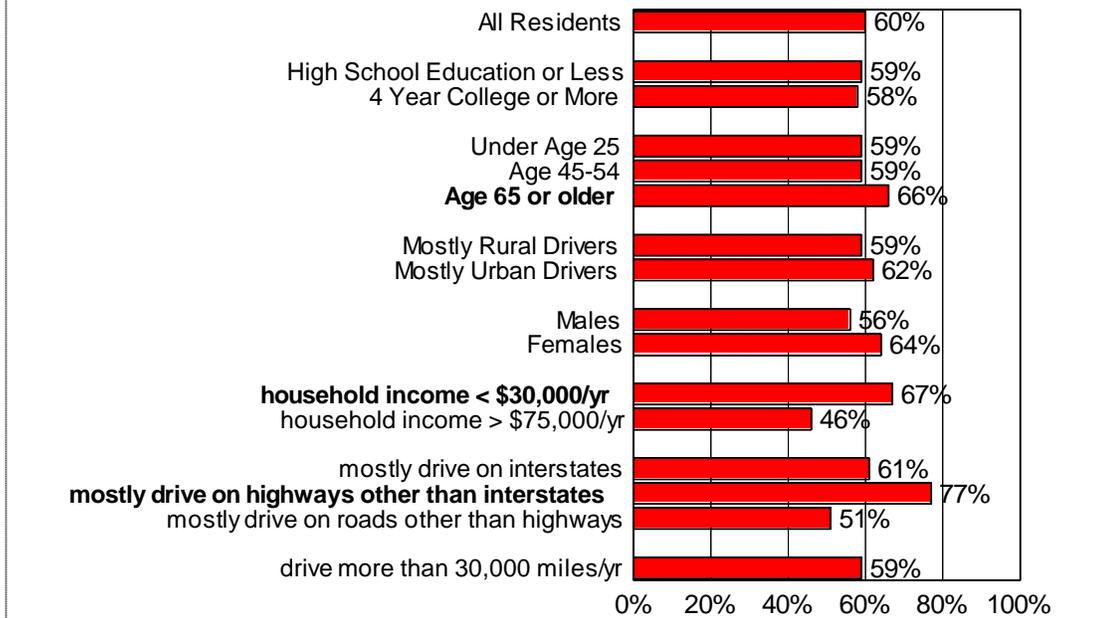


Interest in Receiving Information via PUBLIC ACCESS CHANNELS ON TELEVISION

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.

Percentage of Kansas Residents Who Would Like to Get Information From KDOT from a Local Public Access Channel on Television by Demographic Category

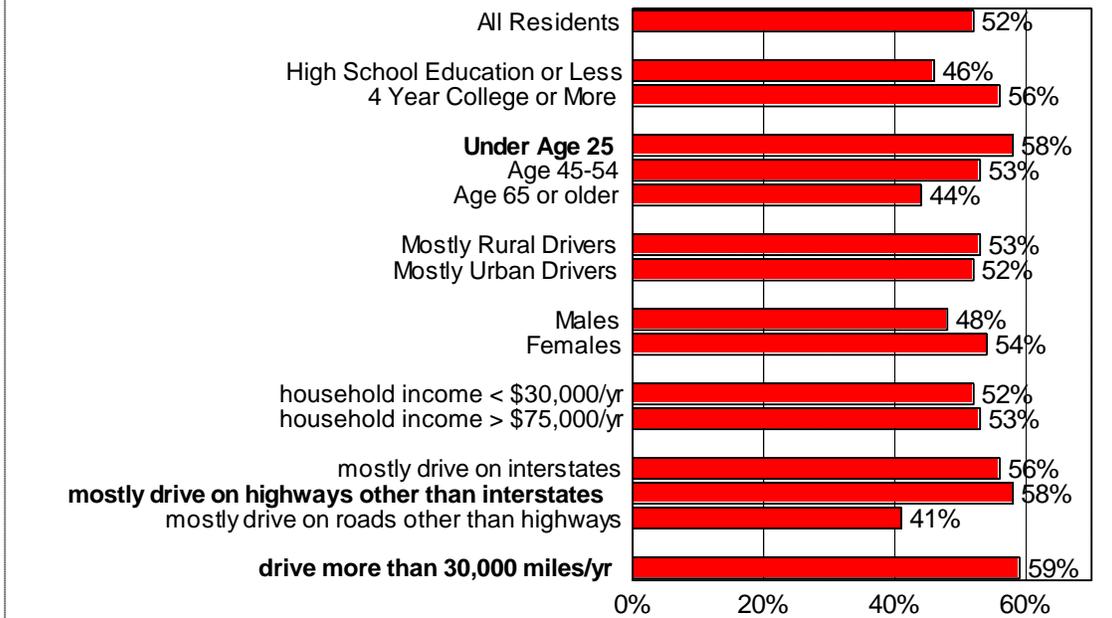


Interest in Receiving Information via a TOLL-FREE PHONE LINE

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.

Percentage of Kansas Residents Who Would Like to Get Information From KDOT from a Toll-Free Phone Line by Demographic Category

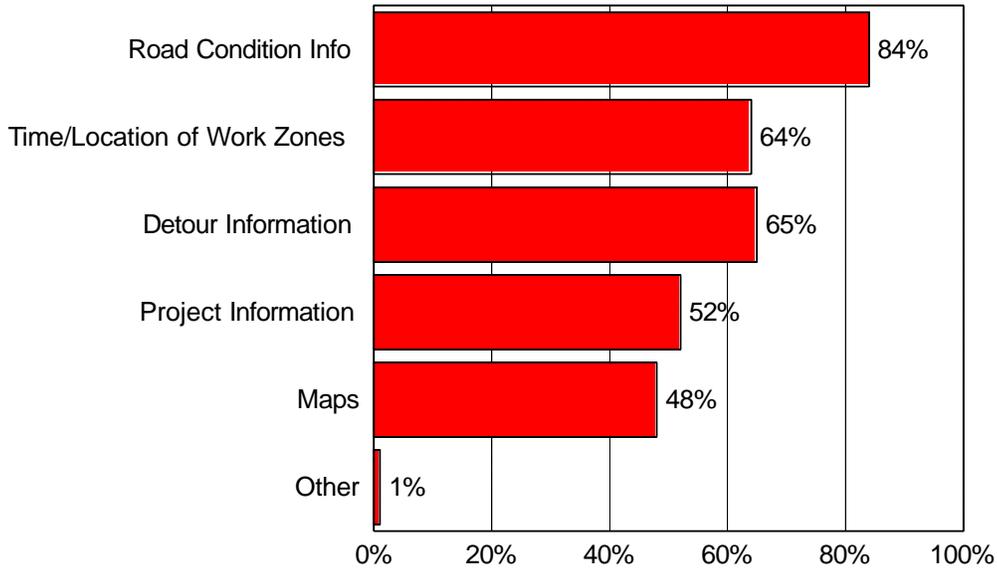


Types of Information Residents Would Like to Receive

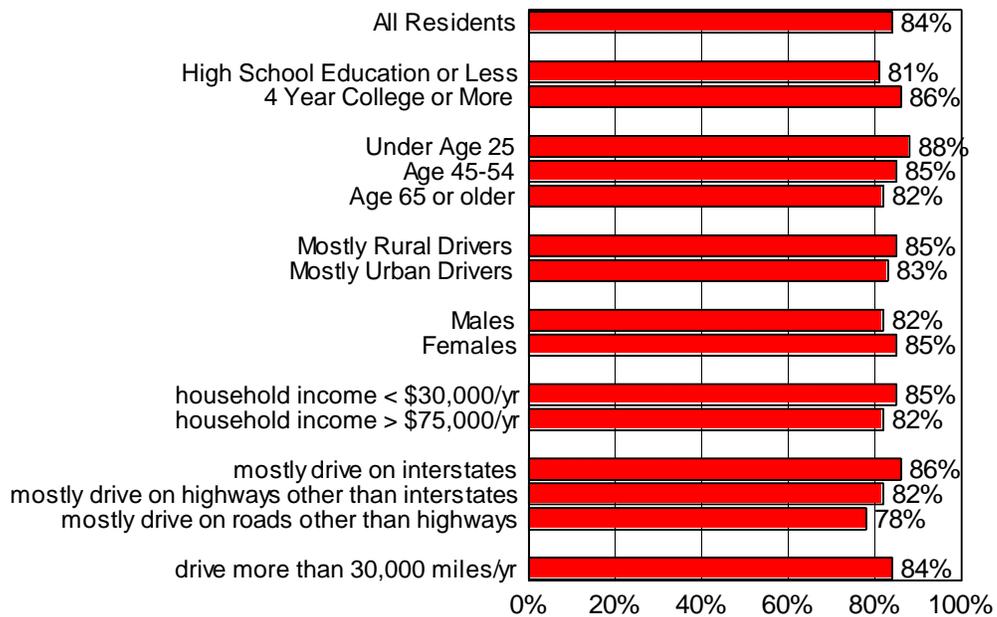
The following chart shows the overall level of interest residents have in receiving various types of information from KDOT. The charts on the subsequent pages show the level of interest in each type of information that KDOT could provide by demographic category.

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)

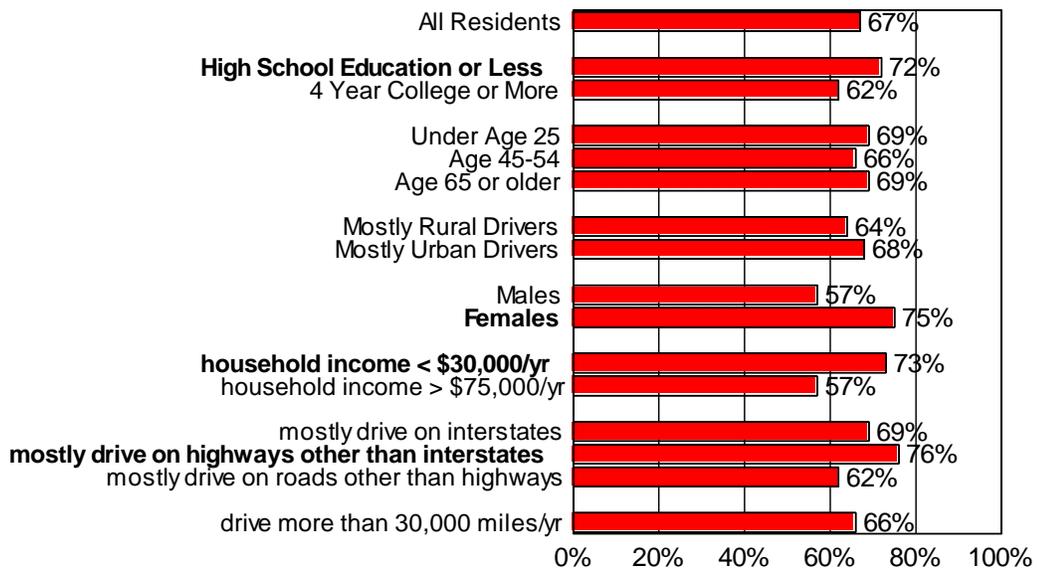


Percentage of Kansas Residents Who Think KDOT Should Provide Information About Road Conditions by Demographic Category

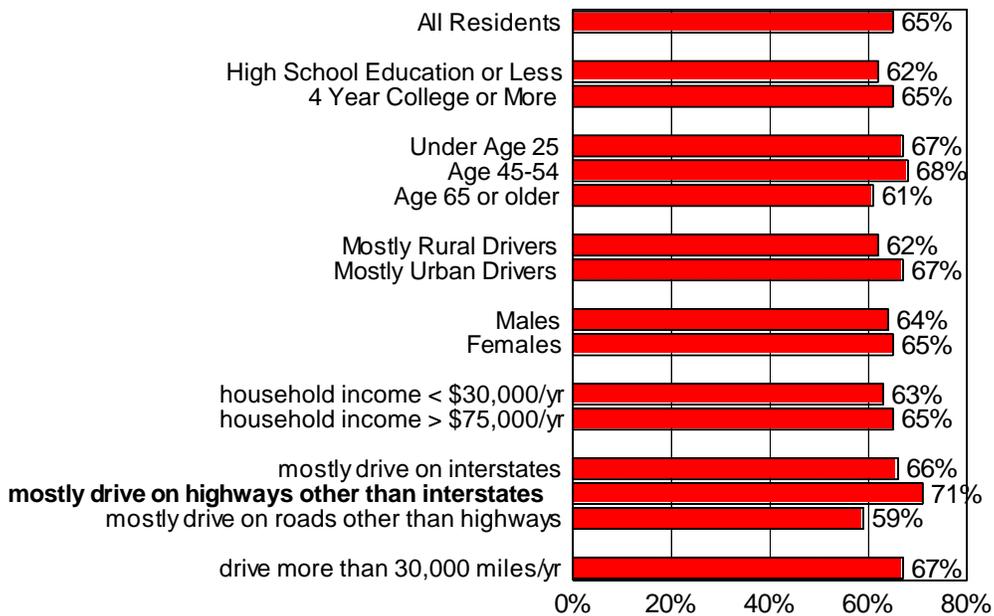


Importance of Information About Snow and Ice Conditions

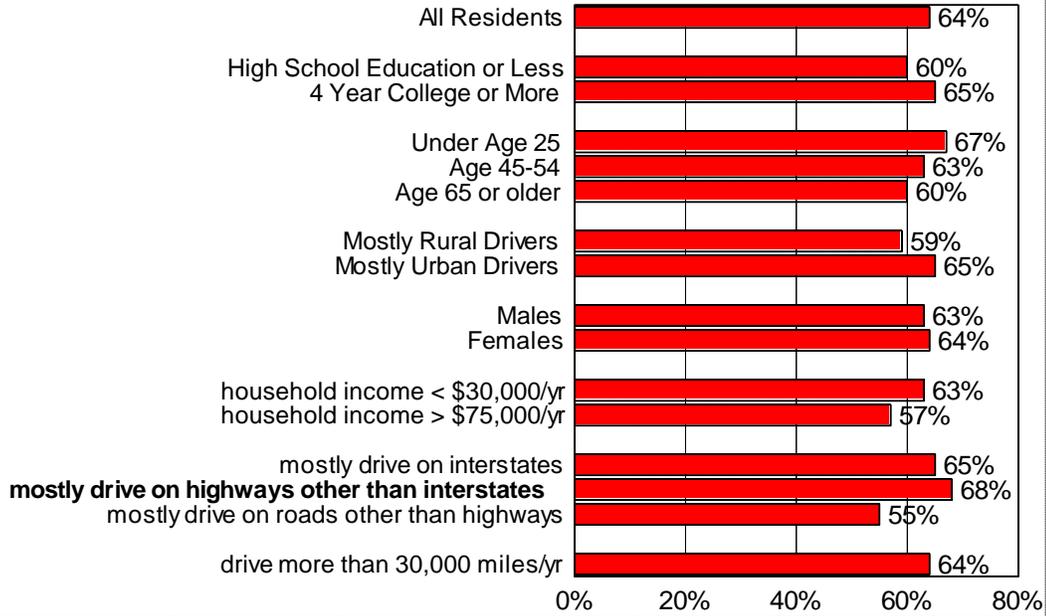
By percentage of respondents who rated the importance of the information as "very important"



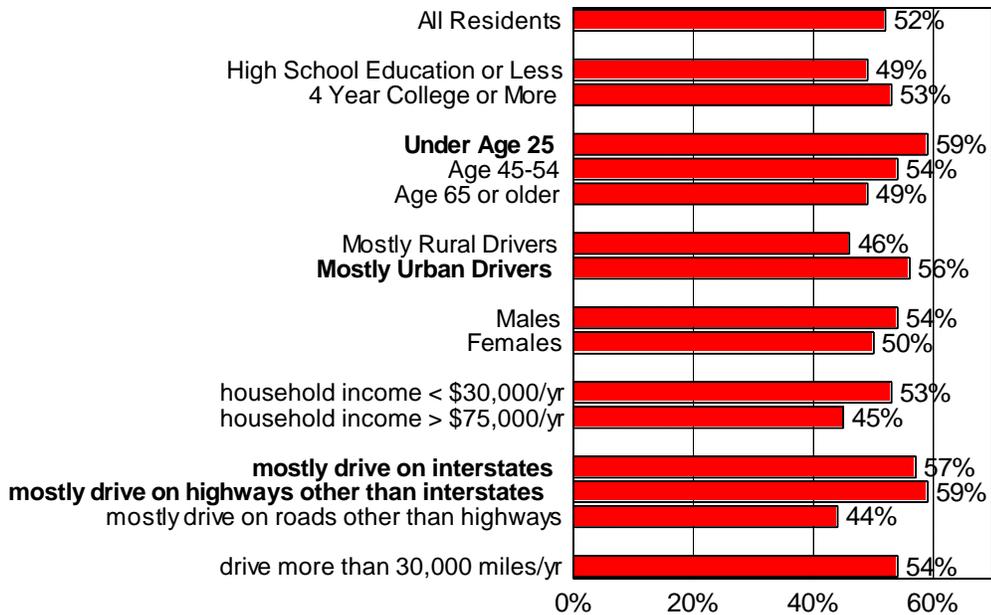
Percentage of Kansas Residents Who Think KDOT Should Provide Information About Detours by Demographic Category



Percentage of Kansas Residents Who Think KDOT Should Provide Information About Work Zones by Demographic Category



Percentage of Kansas Residents Who Think KDOT Should Provide Information About Projects by Demographic Category



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.