INFORMATION MANAGEMENT

ARTERIAL MANAGEMENT AGENCIES FREQUENTLY USE ARCHIVED DATA TO SUPPORT TRAFFIC ANALYSIS AND MANAGEMENT, OPERATIONS PLANNING AND ANALYSIS, AND CAPITAL PLANNING.

MANAGEMENT AND OPERATIONS

Intelligent transportation systems collect vast amounts of data on the operational status of the transportation system. Archiving and analyzing this data can provide significant benefits to transportation agencies.

Archived data management systems (ADMS) collect data from ITS applications and assist in transportation administration, policy evaluation, safety, planning, program assessment, operations research, and other applications. Small-scale data archiving systems can support a single agency or operations center, while larger systems support multiple agencies and can act as a regional warehouse for ITS data. Transportation management centers (TMCs) provide an opportunity for centralized collection of data collected by ITS. However, TMC performance requirements are necessary during ADMS development for the succesful development of such a system. Example uses of archived ITS data include the following:

- Incident management programs may review incident locations to schedule staging and patrol routes, and frequencies for service patrol vehicles.
- Historical traffic information can be used to develop predictive travel times.
- Transit agencies may review schedule performance data archived from automatic vehicle location, computer-aided dispatch systems and/or automatic passenger counting systems to design more effective schedules and route designs, or to manage operations more efficiently.

The collection and storage of data on transportation system performance often occurs at TMCs. The transportation management centers chapter discusses TMCs in detail. In addition, the transit management chapter discusses the archiving and use of transit performance data.

Findings

Benefits

Data archiving enhances ITS integration and allows for coordinated regional decision making. Traffic surveillance system data, as well as data collected from commercial vehicle operations, transit systems, electronic payment systems, and road weather information systems have been the primary sources of archived data available to researchers and planners. As more advanced data analysis techniques develop and the efficiency of data reporting systems are improved, additional examples of the effectiveness of information management systems will become available.

As shown in table 13, results of studies to date have demonstrated the cost savings that can be achieved by agencies making use of archived ITS data. A study reviewing over 60 data archiving programs documented substantial returns on the investments made in the programs. Stakeholders making use of archived data also had positive experiences to report.

INFORMATION MANAGEMENT CATEGORIES IN THE ITS KNOWLEDGE RESOURCES

Data Archiving

ADMS COSTS VARY; ESTIMATES RANGE FROM $85,000 TO $8 MILLION DEPENDING ON THE SIZE OF THE SYSTEM AND FEATURES PROVIDED.

OTHER ITS KNOWLEDGE RESOURCE CATEGORIES RELATED TO INFORMATION MANAGEMENT

Refer to other chapters in this document.

Transit Management

Fleet Management: Planning

Transportation Management Centers

OPERATIONS/ITS HELPLINE

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ITS APPLICATION OVERVIEW

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Table 13—Information Management Benefits Summary

	Safety	Mobility	Efficiency	Productivity	Energy and Environment	Customer Satisfaction
Data Archiving	●			●		✚

● Substantial positive impacts
✚ Positive impacts
❍ Negligible impacts
✱ Mixed results
✖ Negative impacts
blank Not enough data

Costs

The costs to develop ADMS vary based on the size of the system and features provided. Based on limited data available from a study of six transportation agencies that have established ADMS, costs for one system was $85,000 and $8 million for another. Four of the six systems were developed jointly with a university. Typically, the state DOT pays for the development with the university hosting the system. Operations and maintenance (O&M) costs were in a closer range, $150,000 to $350,000; these costs were usually on an annual basis.[455]

Deployment

Table 14 shows the percentage of arterial, freeway, and transit management agencies that reported using archived data for various functions from a survey of the country's 108 largest metropolitan areas in 2004. The survey covered 546 arterial agencies, 147 freeway agencies, and 219 transit agencies. The most common uses for archived data by arterial management agencies were traffic analysis, traffic management, operations planning and analysis, and capital planning. Most common uses for archived data reported by freeway agencies were traffic analysis, operations planning and analysis, dissemination to the public, and performance measurement. Transit agencies most frequently reported using archived data for operations planning, performance measurement, safety analysis, and dissemination to the public.

The 2004 survey of the country's 108 largest metropolitan areas is the source of deployment statistics presented later in this chapter.

Table 14—Archived Data by Agencies in 108 Metropolitan Areas in 2004			
	Arterial Management	**Freeway Management**	**Transit Management**
Capital Planning and Analysis	18%	26%	26%
Construction Impact Determination	17%	16%	6%
Crash Prediction Modeling	4%	13%	3%
Dissemination to the Public	15%	40%	21%
Incident Detection Algorithm Development	4%	22%	2%
Performance Measurement	16%	37%	35%
Operations Planning and Analysis	22%	43%	48%
Safety Analysis	17%	28%	24%
Traffic Analysis	37%	55%	N/A
Traffic Management	25%	29%	8%
Traffic Simulation Modeling	17%	26%	N/A
Travel Time Prediction	4%	15%	N/A

LESSONS LEARNED

Consider requirements definition and system design issues for archived data management systems.

ADMS offer numerous potential benefits including the ability to plan for operations, evaluate system performance, and support future investment decisions. During the planning and design of an ADMS, there are a number of issues that transportation agencies need to consider to ensure the success of their project.

- Define the audience that will be the main system users so as to understand their data and application needs.

  The Minnesota transportation management center's database format is structured to facilitate query response to support a broad range of users and applications. Data formats used by the system include commercially-available relational database applications. Moreover, system developers focused on ensuring that all data were centralized and distributed via the Internet.

- Use commercially-available or open-source software over proprietary or custom-designed systems.

  Sharing of software code with other public sector ADMS developers may result in development of a set of standard practices to assure that minimum quality standards are addressed. Systems that rely largely on open-source software to address data collection can collect data via the Internet, CD-ROMs, or dedicated telephone lines.[463]

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ITS APPLICATION OVERVIEW

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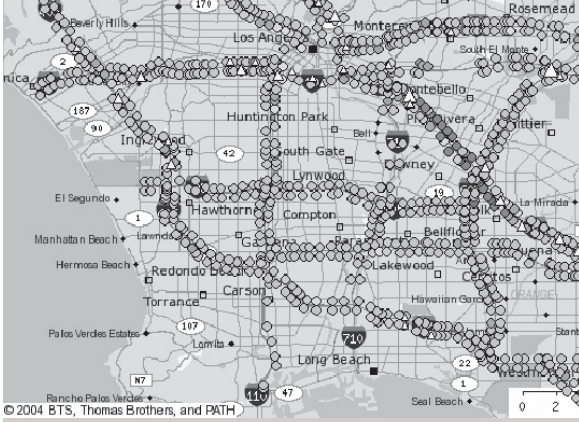
Selected Highlights from the ITS Knowledge Resources on Information Management

Data Archiving

Data archiving is the collection, storage, and distribution of ITS data for transportation planning, administration, policy, operations, safety analyses, and research. Data archiving systems make use of a variety of software, database, and electronic data storage technologies.

Data Archiving	
Deployment	
Data collection and archiving were reported by arterial management agencies in 77 metropolitan areas, by freeway management agencies in 49 metropolitan areas, and by transit agencies in 38 metropolitan areas.	
Benefits	
ITS Goals	**Selected Findings**
Efficiency	In Portland, Oregon, the Tri-Met transit agency used archived AVL data to construct running time distributions (by route and time period) and provide enhanced information to operators and dispatchers. Evaluation data indicated that the reduced variation in run times and improved schedule efficiency maximized the effective use of resources.[456]
Productivity	In Montana, weigh-in-motion (WIM) sensors were installed directly in freeway travel lanes to continuously collect truck weight and classification data at 28 sites. The study found that if freeway pavement designs were based on fatigue calculations derived from comprehensive WIM data instead of available weigh station data, the State would save about $4.1 million each year in construction costs. The pavement fatigue calculations based on WIM data were 11 percent lower on Interstate roadways and 26 percent lower on non-Interstate primary roadways.[457]
Customer Satisfaction	In Virginia, a Web-based ADMS was deployed to provide decision makers and other transportation professionals with traffic, incident, and weather data needed for planning and traffic analysis. An assessment of Web site activity (from 2003 to 2005) indicated that 80 percent of the Web site usage was devoted to downloading data files needed to create simple maps and graphics. Overall, users were pleased with the ability to obtain a variety of data; but they wanted more data on traffic counts, turning movements, and work zones, as well as broader coverage.[458]



Data Archiving
Costs
Sample Costs of ITS Deployments
Washington, California, and Arizona: A study was conducted of six successful ADMS and included cost data from three of the agencies. The annual software upgrades for the California DOT Freeway Performance Measuring System ranged from **$150,000 to $250,000 per year** and required approximately 1.5 full-time equivalent positions. Biannual budgets, which included software improvements, ranged from **$250,000 to $350,000** for the Washington State Transportation Center ADMS. The annual maintenance cost for the Maricopa County Arizona Regional Archive Data Server is estimated at **$150,000**, but does not include hardware or software upgrades.[459]
Virginia: In 2002, the Federal Highway Administration awarded a field operational test to the Virginia DOT to use archived data to effect transportation operations and management decisions. The scope of the project was expanded to include applications for transportation planners as well as operators. Virginia DOT has set aside **$300,000 annually** to maintain and upgrade ADMS Virginia; maintaining the ADMS is estimated to require 1 to1.5 full-time equivalent positions.[460]
Nevada: The total cost of the Nevada DOT Freeway and Arterial System of Transportation (FAST) central system software design and development was approximately **$4.225 million**. The software provides a fully automated freeway management system, plus the capability to receive, collect, archive, summarize, and distribute data generated by FAST. Of the $4.225 million, the cost to develop the design for the implementation of an ADMS for FAST was approximately **$225,000**. This cost included needs assessment, update of functional requirements, update of the regional architecture for the Las Vegas area, and system design.[461]
Benefit-Cost Studies
United States: One study evaluating data archiving at more than 60 organizations found that data warehousing generated an average return on investment of 401 percent over 3 years.[462]

LESSONS LEARNED

Engage in marketing, training, and outreach of archived data management systems.

Successful ADMS require marketing, training, and outreach. Transportation professionals may not be aware that operational data are being archived and may not be cognizant of the potential uses and benefits of the data. The stakeholders also may need training in order to more effectively utilize the data.

- Inform users about the quality of the data they are using.
- Agencies use different methods for data quality assurance and they need to share this information with users so that the users can make any necessary adjustments in their analyses.
- Provide training classes for system users so that they understand the data and applications they are using.
- The Washington State Transportation Center developed a formal training class for the archive and analysis software. A Web site was also created to provide training support.
- Market the potential uses of archived ITS data to the transportation community.

Members of the University of Washington staff speak at national meetings about how the data archive is used and why it is valuable.[464]

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