CHAPTER FOUR
CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Primary Issues Confronting a Uniform National Data-Management System

The more significant issues confronting the feasibility of creating a uniform data-management system for national implementation arise from the financial and emotional current that surrounds the tort claims environment. The concerns tied to tort claims information have manifested in strict administrative policies to protect the state from further liability and, together with a genuine desire to protect overworked staff, present a substantial barrier to moving forward with a national data-management system. With these and other extraneous factors pressing the daily decision-making process of department heads, the concept of a national data-management system and its value may not have been clearly grasped by those to whom it was presented during the initial contact for state participation, especially with the initial phone contact taking place during regular scheduled work hours. To break through the concerns about participation in a national model data-management system, an education and demonstration process is recommended to show key officials and decision makers that the system does not collect sensitive data such as "award caps" and that the burden to their employees would be minimal. The burden to administrative and technical staff would be highly focused during the initial 3-4 week survey and assessment period. Once completed, a data retrieval process/mechanism will be developed that minimizes the involvement of the state's personnel.

The AASHTO survey questions offered a guide for the selection of featured information that provided an immediate value for the model system. The core data elements derived from the survey provided a meaningful set of target data for assessing the state systems. Though the states' existing legal and risk management electronic information systems did not support the core data elements directly, sufficient data resources exist, although not necessarily in electronic form, to obtain the information specified in the AASHTO study and more. The initial target content of the project focused on supporting legal and risk management departments; however, the data content required to answer the AASHTO

study could support decision making in a number of other functional areas. Information from traffic operations and motor vehicle departments could considerably enhance the national data-management system. The traffic operations information can provide added incentive to participating in the project, added value to the quality and validity of information, and added functionality to the system by providing the maintenance and engineering departments with a proactive tool to plan and evaluate the effect of implementing policy and programs. By offering a total package of transportation information, the utility of a national data-management system could be even more far-reaching, since other joint federal and state transportation-related organizations could benefit from the same information. Additional funding partners could develop, especially if a national accident database were established. Federal agencies would find components of the data useful. An evolutionary process of creating a uniform data standard will require a commitment to a long-term implementation process that will depend on the rate of gaining state participation and data analysis.

The ability to overcome the knowledge gap between functional managers and technical support staff can be realized by implementing a more thorough and in-depth assessment of all related department information systems within a participant state. Together with a single entity organizing and directing the assessment and implementation process, many of the issues related to a knowledge gap could be resolved. The assessment information could be packaged in a reference document that diagrams the state's computer-based information network, data content, and its relevant function and value to each department. The document would enhance understanding and support the state's technology staff for assisting the data-management managers.

An immediate value of a system designed according to the parameters set forth in this evaluation can be measured against the current data systems being used for federal statistics. A problem with current database technologies out of the box in many transportation industries is the limitations of the software to handle large amounts of data (Access is limited to 255 fields in a table). Generally the statistics produced are derived from aggregate totals from a limited population and manipulated using a data model that theorizes national statistics. They can show the frequency of a particular kind of event that is a symptom of weakness in a highway transportation system, but not provide the level of analysis that can help determine the cause. For instance, federal fatality statistics are derived by obtaining raw statistics from approximately 20 states, and then amplified using a data model that is based on

assumptions. The accuracy of the information is low and it does not reflect variations of annual activity in regions of the country based on other criteria. However, a system that is capable of collecting and processing whole data records could create an accident profile that is made up of true values. The accident profile would include demographics, alleged causal factor, and other contributory factors (i.e., fell asleep, type of vehicle, weather conditions) that could map out a tort claim from accident report to litigation defense. This would provide a complete picture of the state and national tort claims environment for highway accidents. A national data-management system that could process actual data records would be a very powerful and valuable tool for any state's department of transportation, especially those that do not have the internal ability for electronic information sharing.

Data Summary and Requirements

Not all of the data required to complete the AASHTO study exist in electronic format. State agencies maintain detailed and consolidated electronic files that support accident, injury, highway, and engineering issues and related statistics addressed in the AASHTO study. Obtaining permission to access these files is a comparatively simple and straightforward process. The consolidated file structure is suitable for immediate analysis. Claim and lawsuit data also exist in electronic files. However, the files lack the scope and detail necessary to directly support the current model system requirements. They are typically distributed among several legal, administrative, accounting, and judicial state agencies and outsourced service providers. Permission to access all of the necessary files will require penetration of executive and technical layers of several state agencies. The broad dispersal of claim and lawsuit data will require an analyst to review, assess, and extract state resources to generate a consolidated data file. This would require more time and increased involvement by state personnel to complete the state on-site survey, but most importantly the permission to access the necessary information systems.

The major obstacle to collecting appropriate data is obtaining permission to review record layouts and access pertinent data files from all the agencies managing pertinent data. A second obstacle of importance is determining the existence of key fields or identifiers in an agency's data structure. These identifiers enable the association of related statistics to a single record. If the identifiers exist, then extraction and consolidation can be a simple process. However, if they do not exist, analytical techniques would be required to sort data and match them to the appropriate record. A third critical

obstacle is that too many data fields are not populated, particularly in the legal data systems. An organizational and individual commitment to the maintenance of current data in the individual state databases will be necessary if a national data-management system is to be viable and effective. In other words, claims files will have to be kept current according to the pre-determined data retrieval schedule.

Converting the data into useful information will require analysts to normalize values, standardize terms, and design data systems that accommodate bi-directional translation. The analyst must understand all of the terms and values associated with the collected data from each agency before the normalization and standardization process begins. After normalization the analyst must develop a dynamic standard data structure based on the "least common data values" (analogous to "least common factor" or "prime factors" in mathematics). The analysts must develop a translation process to convert data from their original form to the standard and back again. The collection process will require constant updating to accommodate changes to information management practices among state agencies. Bi-directional translation of the data will enable states to make greater use of the content of each data table. Such a feature would eliminate the learning curve for analysts in each agency and may promote greater participation among states.

RECOMMENDATIONS

The current functionality of the model system provides an electronic tool for collecting a portion of the same aggregate information collected by the 1992 AASHTO paper survey. The information can be entered via web-based entry forms and displayed in preformatted reports that can be updated with new information every 24 hours. There are a few significant functions and components that require completion to bring the system closer to representing a fully functional data-management system. The potential value of completing the current system can be realized. The following options and accompanying cost estimates were developed by the research team.

Option 1: Refine the Pilot Model Data-Management System

Refine the Phase II Model Data-Management System for Demonstration Purposes. The model system could be used to demonstrate the potential for a national data-management system

and generate interest to proceed with constructing a national data-management system. Requirements to complete and refine the Phase II work would include:

- Conduct an in-depth review of Phase II model system construction and presentation with project panel to gain feedback and direction on current model system .
- Refine the Phase II system components and features:
    - Refine existing data model (content and presentation objectives);
    - Include information from traffic operations and related departments;
    - Reconstruct site components to comply with refined data model;
    - Complete Highway Deficiency component;
    - Construct custom data entry forms to supplement state's data electronic files;
    - Complete custom report mechanism for creating presentation-quality reports that can be printed; and
    - Complete overall editing and clean-up of model system.

Cost estimates for Option 1 (shown in Table 4.1) are based on contracting private consultants to complete the work at a base hourly rate of $50.00 per hour. The time for each of the following tasks are estimates based on the level of expertise used to develop the pilot data-management model.

Table 4.1 - Option 1 Cost Estimates

Database Developer:	
Complete and refine Phase II system components (175 hrs)	$8,750
Systems Administrator:	
Complete security, system optimization (100 hrs)	$5,000
Project Administration:	
Administration and Management of Completion process (160 hrs)	$8,000
Web Developer:	
Complete and refine web content and components. (150 hrs)	$7,500
Overhead Cost:	
Overhead rate of 40%	$11,700
Total Estimated cost to complete and refine Phase II	**$40,950**

Option 2: Production Level Prototype of a National Tort Data-Management System

Construct a fully functional prototype of a national data-management system based on the findings of Phase II and solicit the participation of more states. Use this system as a premiere showcase to demonstrate and market the value of a national data-management system. This process would include the following:

- Solicit participation of five additional states:
  - Broaden data pool for standardization process;
  - Demonstrate interest and value; and
  - Improve cost analysis for national implementation.
- Broaden data collection to include traffic operations and engineering departments.
- Seek the assistance of state Chief Information Officer:
  - Obtain permission to access data resources, record layouts, and data;
  - Stress need for statistics rather than personal data;

    - Stress avoidance of personal identification data; and
    - Obtain identification of data resources and managing technicians.
- Conduct on-site interviews (increased assessment time to 2 weeks):
    - Explore alternate sources of data within the state (e.g., state judicial data);
    - Obtain and review record layout for each potential data source;
    - Establish record content list with each data resource;
    - Establish a transfer method; and
    - Establish a monthly transfer date.
- Develop the database system with a dynamic data standard (the programming entity should be prepared to accommodate metamorphosis of data structures from state information systems in transition).
- Extend data resources to include traffic operations and engineering.
- Develop automated data collection and reporting process:
    - Design an interactive website;
    - Provide a secure file transfer protocol (FTP) area;
    - Provide direct access to copies of database files in their entirety;
    - Provide preformatted downloading reports; and
    - Provide search-and-query language (SQL) area.
- Develop an expert data resource should be the goal of the project.
- Provide a research function to expand relevance of content data.
- Utilize contractors with integrated skills (business model and programming skills).
- Use industry conferences and regional meetings to demonstrate the model system.
- Seek funding partners after initial site and application are complete.

Option 2 cost estimates are shown in Table 4.2. The research team favors the "Expert System," which is reflected in the first column of Table 4.2.

Table 4.2 - Option 2 Cost Estimates (should include maintenance for at least a six-month demonstration period)

Estimated Costs	Expert System	Automated System
Start-up (1st year only)		
Web site development	$60,000	$60,000
Central database application development flow chart, program coding, testing and implementation for specialized user functions, preformatted reports, SQL, summary data tables, detailed data tables, charts, and graphs	$100,000	$100,000
Administration and Management of System	$100,000	
Subtotal	**$260,000**	**$160,000**
First-time costs (per state)		
On-site interviews & data acquisition	$15,000	$15,000
Data normalization	$45,000	$54,000
Automated converter programming	$47,000	$47,000
Per State Total	$107,000	$116,000
Subtotal for Five States	**$535,000**	**$580,000**
One-time cost to review and process data content of the existing pilot system for assimilation into the prototype	$25,000	$25,000
Subtotal of Development Cost	**$820,000**	**$765,000**
Overhead Cost (40%)	$378,000	$306,000
Total Estimated Cost	**$1,198,000**	**$1,071,000**

Explanation of Terms

Expert System. Provides the human resources that would assist the novice and expert users in identifying, processing, and retrieving inconspicuous and obscure information quickly and easily. The system should allow simple or complex analysis and provide referent experts to assist all users in addition to the standard user functions. Expert assistance enables expert users to complete analysis on issues outside of their functional expertise. An expert system requires full-time administrative staffing.

Automated System. Provides for an on-line reference library to be developed as a supplement or replacement for the human resource offered in the expert system. It would allow users to access reference information through an automated search function. This includes: definitions of terms, procedural descriptions, and topical discussions. An automated system requires contracted part-time staffing, but no user support would be available.

The costs of Option 2 presented in Table 4.2 reflect the assumption of a core development team consisting of six members (four functional analysts/researchers with programming skills, one system administrator, and one web developer/webmaster) to coordinate

data content, maintain data content, and respond to member support issues during the duration of the project development, test phase, and a 1-year trial period. The development team could be utilized on a contract basis following the first year, should the project require it.

Option 3: Implement and Maintain a Full Production Model of a National Data-Management System

Construct and maintain a fully operational, national data-management system for a 3- or 5-year period beginning with a 10-state sample and adding either 10 or 20 states per year after the initial year. The first-year cost estimate for Option 3 is shown in Table 4.3a. The estimated cost per year for subsequent years is shown in Table 4.3b. Option 3 includes the following:

- Proceed with a national system:
    - Refine existing data model (content and presentation objectives);
    - Provide an input form that all states can use to complete legal and case management statistics, should any state lack the appropriate information systems (paper-based);
    - AASHTO members should only need to update a short form on the website annually (see Figure 4.1);
    - Provide SQL area; and
    - Provide chat room access.
- Develop an expert data resource.
- Provide a research function to expand relevance of content data.
- Utilize contractors with integrated skills (business model and programming skills).
- Seek funding partners after initial site and application are complete.
- Seek the assistance of state Chief Information Officer:
    - Obtain permission to access data resources, record layouts, and data;
    - Stress need for statistics rather than personal data;
    - Stress avoidance of personal identification data; and
    - Obtain identification of data resources and managing technicians.
- Establish an FTP site to collect data.

- Conduct on-site interviews:
    - Obtain and review record layout for each potential data source
    - Establish record content list with each data resource;
    - Establish a transfer method; and
    - Establish a monthly transfer date.
- Develop the database system with a dynamic data standard (the programming entity should be prepared to accommodate metamorphosis of data structures from state information systems in transition).
- Develop automated data collection and reporting process:
    - Design an interactive website;
    - Provide a secure FTP area;
    - Provide direct access to copies of database files in their entirety; and
    - Provide preformatted downloading reports.

Table 4.3a – Option 3 Cost Estimates, 1st Year

Estimated Costs - 1st Year	Expert System	Automated System
Start-up (1st year only)		
Web site development	$60,000	$60,000
Central database application development flow chart, program coding, testing and implementation for specialized user functions, preformatted reports, SQL, summary data tables, detailed data tables, charts, and graphs	$100,000	$100,000
Administration and Management of System	$100,000	
Total	**$260,000**	**$160,000**
First-Time Costs for State's Data Retrieval (per state)		
On-site interviews & data acquisition	$15,000	$15,000
Data normalization	$45,000	$54,000
Automated converter programming	$47,000	$47,000
Per State Total First Time Cost	**$106,000**	**$117,000**
Total First-Time Cost for 10 States	**$1,060,000**	**$1,170,000**
Sub-Total	**$1,320,000**	**$1,330,000**
Overhead Cost (40%)	$528,000	$532,000
Total Estimated First Year Cost (10 States)	**$1,873,000**	**$1,887,000**

Table 4.3b – Option 3 Cost Estimates, Subsequent Years

Estimated Cost - Subsequent Years	Expert System	Automated System
Administrative and Support Cost		
Per Year - Total base costs and annual maintenance by core development team (existing states). Cost based on first time start-up + administration and maintenance + $50,000 for contracted programmers and specialists	$310,000	$0
Cost of State's Data Retrieval for Subsequent States After First Year		
10 Additional states per year (cost per state)	***$75,000	$116,000
20 Additional states per year (cost per state)	***$65,000	$116,000
Total Cost for Administrative/ Support Cost + State's Data Retrieval Cost		
Per-Year Cost - (20 states per year after first year)	**$1,610,000**	**$2,320,000**
Per-Year Cost - (10 states per year after first year)	**$1,060,000**	**$1,160,000**
Total Cost to Implement and Support a National Data-Management System for all Fifty States with a 40% Overhead Rate (Includes First-Year Costs from Table 4.3a)		
3-Year Plan	**$7,130,200**	**$9,137,800**
5-Year Plan	**$8,558,200**	**$9,137,800**

Costs represent per-year costs (after initial development) for processing states data and system maintenance.

*** Demonstrates economy of savings per state after first-time development costs.

Explanation of Terms

Total Base Costs and Annual Maintenance.

- Review and update data structures of participating states.
- Review and update data transfer methodology per state.
- Conduct system analysis.
- Update terms to comply with changes in state or professional nomenclature.
- Update reporting methodology, topics, and content.
- Conduct analysis of national and regional trends.

Departmental Information			Exported data									
Internal Case No.	Accident File Ref.	Police Report Ref.	External Case Num	File Date	Injury	Deficiency	No. of Claimants	Withdrwal Date	Settlement Date	Settlement	Judgement	Award
			1									
			2									
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

Figure 4.1 Sample Data Format

Recommendations for Service Providers to Implementing a National Data-Management System

The following proposal options are listed in the order the research team believes offers the best possible outcome for implementing the data-management system on a national level.

Proposal 1: Private Provider

The use of a private provider may be the most expensive of all the options. However, the benefits of having the broadest knowledge base for melding information technology and business processes into an effective outcome-based system justify the higher cost. A profit-oriented vision in system construction would greatly increase the chances of obtaining the outcomes that make information management a valued asset. There may also be some provision for data security by having the information under the control of a private service provider. Among private alternatives are existing commercial vendors that provide legal or general research databases. The interest and capabilities of such vendors to provide and to operate the required system should be explored.

Proposal 2: Bureau of Transportation Statistics (BTS)

The Bureau of Transportation Statistics within the U.S. Department of Transportation has become a clearinghouse for transportation statistics. However, the limitations of the bureau's resources to implement a system of this magnitude are a concern. The cost of conducting the on-site surveys/data assessment and available human resources may be problematic for the bureau, though the project would benefit in cost savings from an existing infrastructure and knowledge base for implementing web-based services. Another alternative that could be explored is AASHTOWare.

Proposal 3: University Research Institute or Center

Though a university-based service provider was offered as an option in the Interim Report, the research team does not believe this environment is conducive to the effective implementation of the national project. The project requires a full-time team of professionals that are highly knowledgeable in many areas to completely understand the information flow and outcome requirements for the system. This would not be the most optimal choice for obtaining results in a timely and cost-efficient manner.

Sub-Proposal

The researchers believe that every effort should be made to include consultants from the Public Risk Data Project (PRDP) in the project. The cost analysis and coding tools provided by PRDP could prove to be invaluable to the system. The tools could not only assist the user community, but also prepare the data for input into the increasingly popular PRDP Data Exchange.

REFERENCES

American Association of State Highway and Transportation Officials (1992), AASHTO Survey on the Status of Sovereign Immunity in the States.

Gittings, G. L. (1999), Interim Report for NCHRP Project 11-7, Pennsylvania Transportation Institute, The Pennsylvania State University.