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SCOPING STUDY FOR A NATIONAL STRATEGIC PLAN FOR TRANSPORTATION INFORMATION MANAGEMENT

FINAL REPORT

Prepared for
National Cooperative Highway Research Program
Transportation Research Board
National Research Council

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June 2003

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ABSTRACT

To address the lack of management for transportation information, the American Association of State Highway and Transportation Officials Standing Committee on Research determined that a scoping study should be done to examine the major issues confronting information access and availability for transportation practice. This study examines needs and current practice within the transportation community, identifies the most pressing problems, describes potential models that could be applied, and details a framework for a strategic plan for transportation information management.

The framework is based on expressed user needs: sustain present level of activities and prevent erosion of services and capabilities by broadening the number of state DOTs and federal organizations that can share information on a national scale; enhance services and quality of information and expand the extent of subject content available; provide a desktop available electronic portal that allows a seamless flow of timely and reliable information independent of source and media type.

The study shows the increased opportunity to find meaningful information allows transportation agencies to save funds that 1) could justify the cost of preparing a policy study that details a national strategic plan for transportation information management, and 2) could support a nationally coordinated transportation information management infrastructure for years to come.

As a primary recommendation, the study outlines elements of a strategic plan. It's objectives are: to develop national coordination, ensure long-term, stable funding, provide a sustainable mechanism for the information infrastructure, including user and provider tools, and education, identify all players and their roles, and change attitudes regarding the importance of information availability and accessibility as a strategic asset.

EXECUTIVE SUMMARY

Accessible, reliable, and timely information is central to quality performance for all transportation agencies and organizations. Yet, due in large part to the fragmented and decentralized nature of jurisdictional control over the transportation infrastructure, there is no centralized authority or clearly established network with responsibility for locating, identifying, storing, and making accessible published transportation information. In fact, a vast amount of transportation-related information resources published by the U.S. Department of Transportation, state departments of transportation (DOTs), professional associations, and other publishers is neither collected nor made available for use by others. (Jerry Baldwin, Access to U.S. Transportation Information Resources, Minnesota DOT, 2000.)

To address this lack of management for transportation information, the American Association of State Highway and Transportation Officials Standing Committee on Research determined that a scoping study should be done to examine the major issues confronting information access and availability for transportation practice. This study examines needs and current practice within the transportation community, identifies the most pressing problems, describes potential models that could be applied, and details a framework for a strategic plan for transportation information management.

For the purposes of this study, information is defined to be published material such as reports, journals, conference proceedings, manuals, guidelines, standards, maps, and textbooks as well as unpublished descriptions of works in progress, and the bibliographic or summary data that describe all of the above. The term covers materials available in hard copy or electronic format. The definition of information also includes "raw" data sources, yet methods to address this type of information availability are to be considered in later phases of the strategic plan. Managing information is used in this report as the effective process by which materials are put into the information infrastructure system and retrieved from it along with the associated administrative and policy actions required for system operation. Managing information as used herein does not refer to definitions commonly used in the information technology and computer systems community that focus on the technology and its applications rather than the information content.

To determine customer needs for transportation information and the gaps existing within the information infrastructure, interviews were conducted with over 60 representatives from federal, state, and local transportation agencies, academia, and the private sector, including chief executive officers and senior decision makers, research directors, and project engineers/technical practitioners as well as those having expertise in technology transfer and information sciences.

Customer or user needs focused on increasing the availability of information, enhancing its quality and relevancy, easing the access to information, and providing services such as information summaries, best practices, and facilitating peer-to-peer

interchange. The customer needs also provided a basis for a framework for the strategic plan. Importantly, the customers' needs provided a vision for transportation information management.

Vision

A financially stable, sustainable, and electronically accessible information management system, locally and readily available by transportation policy makers, practitioners, researchers, and the public to efficiently and reliably identify and acquire information needed to develop, operate, maintain, or use the nation's transportation network.

The study describes the current practice and identifies the organizations responsible for getting material into the information system and tools for identifying and obtaining information for getting material out of the system. The information infrastructure as currently exists is comprised of information producers, the intermediaries that connect the user with the information producer, and collectors of information plus the information professionals who identify and obtain information for users (decision makers to practitioners), and the individual users as well.

Problems, issues, and gaps occur in the workings of the information infrastructure. Transportation lacks a national perspective with respect to management of transportation information, which has led to gaps in collecting, indexing, and retaining information. Information services in transportation are severely under-funded – thwarting the ability to make information availability more cost effective. Specialized transportation libraries are few and far between, and many of those are not members of important library networks for sharing catalog records and materials. The many transportation practitioners who do not have ready access to information services are at a disadvantage when it comes to identifying and acquiring information that might help them in their work. Lack of such access to appropriate information may often result in less effective decisions, duplication of effort, and greater cost.

The networks and activities associated with the National Agricultural Library (NAL) and the National Library of Medicine (NLM) and the proposed TRISNET of the 1970s serve as models for what a system for transportation information management might encompass. NAL and NLM are legislatively mandated to serve as national libraries with responsibilities to coordinate with other libraries and develop and retain collections. Similar national coordination is critical for the transportation community.

After examining needs and current practice, identifying the most pressing problems, and then describing potential models to follow, the study calls for a basic decision:

- do nothing, that is, let the general forces at work provide whatever impetus there may be to enhance or dismantle capabilities that exist today for those in transportation to do the best job they can; or
- provide some level of commitment to move forward the national agenda of having transportation professionals to do more with less – increasing

productivity, enhancing quality, and enabling better stewardship of resources.

The do nothing alternative unfortunately has been the option that has enabled the existing information infrastructure to decline. Resources have been withdrawn, the Internet has been looked at as a surrogate to library and information expertise, and the gaps and problems with the current practice are not an "easy fix." Yet, action is the only viable choice, the study presents a framework for a strategic plan for transportation information management. The framework has three levels:

Level 1 - Breadth: Sustain present level of activities and prevent erosion of services and capabilities by broadening the number of state DOTs and federal organizations that make information available through existing national information services.
Level 2 - Depth: Enhance services and expand the reach of the information infrastructure to more participating organizations and to a deeper range of subject content.
Level 3 - Connectivity: Provide support to allow a seamless flow of timely and reliable information independent of source and media type.

Among many benefits, timely, accurate, transportation information is an investment in the transportation system that saves time and money. Considering that the annual financial commitment to transportation consumes more than $1.7 trillion dollars annually, 16 percent of the gross domestic product, methods to make these huge expenditures more effective are very attractive. A number of examples within the transportation arena show that with increased opportunity to find meaningful information, transportation agencies can save funds equal to, and therefore justify, the cost of preparing a policy study that maps out a national strategic plan for transportation information management. Moreover, cost savings from continued successful application of information within agencies nationwide can support a nationally coordinated information management process. One state DOT recently saved $300,000 through access to research information from a university located in another state; another DOT saved $9 million from the results of a literature search. While access to information may not save $9 million each time new information is found and used, $300,000 is not uncommon. Increasing the opportunity to find relevant information several times per year for each state quickly turns the topic of enhanced access and availability of information to substantial economic advantage for the whole of the transportation community.

It is estimated the average transportation practitioner, performing an Internet search with a search engine such as Google and who does not use an information professional, is potentially only accessing a small portion of the full-text electronic information that is pertinent to the search topic. Moreover, from an analysis of records included in a consortium of midwestern states' libraries called the Midwest Transportation Knowledge Network, it is clear that the catalogs of transportation libraries include a significant amount of material not covered by Google or TRIS Online.

Furthermore, for just finding that a resource exists, the University of California, Berkeley, Library, cautions users on the incomplete information found through any single search engine – only about 50 percent of pages in any search engine database are also found in others. Library and information services personnel and resources can substantially increase the potential for access of documents, however, many transportation professionals do not use such value-added services or do not have access to them.

Recommendations of this study are:

- **Increase funding to sustain the present level of activities and prevent erosion of services and capabilities**. Accomplish Level 1 of the framework, Breadth, as an interim measure while awaiting outcomes of a policy study.

- **Create a national body to oversee progress** on enhancing the access and availability of information. This body must have as its goal the shift of control for future actions on this subject from the library and information professionals to transportation leadership.

- **Implement nationwide, the midwestern states library consortium pilot project currently managed by the U.S. DOT Bureau of Transportation Statistics, National Transportation Library.**

- **Identify an organization and raise funds to conduct a policy study** aimed at senior management in transportation that will:

    - **Initiate basic support for a strategic approach** to transportation information management.

    - **Detail a strategic plan or roadmap for the future.** Major elements of the strategic plan are as follows:
        - National coordination such as creating a National Library of Transportation, a national policy oversight body, and a standards and procedures setting body -- including where the Library and these bodies are housed and organizational membership or participation
        - Sources and avenues for stable funding and other resources required to sustain a system for the long term
        - Information standards that will promote information sharing and communication
        - Identification organizations which are responsible for items such as collections, cataloguing, indexing, abstracting, loaning, archiving, and preserving materials
        - Electronically available system with a single portal entry at the user's desktop

        - Value-added information availability, e.g., syntheses, document summaries, expertise locators, linked bibliographies and references in documents, push technologies

    - **Develop a process to identify and describe unique reports and publications currently held only in private collections of senior transportation officials and ensure the preservation of, and wider access to, these items by including them in resource sharing networks**.

    - **Form relationships with private sector and academic organizations** to begin the process of developing their participation in a national system.

    - **Begin to create support for a legislative solution** to address the needs for a more robust transportation information infrastructure.

- **Enlist a cadre of state DOT CEOs and other influential decision makers to support and endorse activities related to the policy study and its outcomes.**

- **Consider the NCHRP project 20-24, which recently has funded projects dealing with strategic management within state DOTs as a resource to create awareness among the AASHTO leadership** for a national strategic plan for transportation information management and to implement results of the recommended policy study.

CHAPTER 1. INTRODUCTION

PURPOSE OF THE STUDY

The purpose of this study is to bring to the attention of transportation decision and policy makers an opportunity to significantly enhance stewardship of transportation resources. In today's economic downturn, transportation leaders are particularly looking to enhance the effectiveness and productivity of their assets – to do more with less. In this effort, the strategic tool of information and its availability is a dramatically underutilized asset. A national strategic plan for creating a coordinated system of transportation information management would facilitate use of this asset. Technological assets such as computing and telecommunications are well supported by the transportation community. However, there is an ever-widening information gap: the content -- the purpose for the technology -- is not being addressed through these technological solutions.

The Research Advisory Committee (RAC) of the American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on Research (SCOR) determined that information access and availability must be part of the national discussion and it must be positioned as a strategic tool for transportation executives. The consequence of not elevating this topic to strategic levels impacts the productivity and effectiveness of the whole of transportation. In that context, this study provides an initial step to create awareness and bring to the forefront this important strategic asset.

PROBLEM STATEMENT

Due in large part to the fragmented and decentralized nature of jurisdictional control over the transportation infrastructure, there is no centralized authority or clearly established network with responsibility for locating, identifying, storing, and making accessible published transportation information. In fact, a vast amount of transportation-related information resources published by the U.S. Department of Transportation (U.S. DOT), state departments of transportation (DOTs), professional associations, and other publishers is neither collected nor made available for use by others with any systematic process. Except for the efforts of the Transportation Research Board (TRB) in developing the Transportation Research Information Services database (TRIS), tasks of identifying and making available information have, for the most part, been addressed only by a loosely knit group of inadequately funded information professionals in a variety of transportation agencies. [1]

There are model information infrastructures in other disciplines, e.g., agriculture and medicine, but there is no such resource for the transportation community. No current model provides a reliable means to share critical knowledge among transportation professionals. The current system works to an extent, but for the most part it is ad hoc.

With the advent of the Internet, much more information is available at an individual's desktop computer because some transportation organizations are making

significant efforts to create full-text online documents. While this may produce more direct information at the desktop, it results in considerably less overall information than if an information professional were to assist in accessing information. That is, transportation practitioners may be receiving less information while thinking that they have the most comprehensive resources available.

There is a mistaken perception that the Internet can find just about anything that exists, if one searches diligently. No commercial search engine provides full access to all electronically available documents. In fact, as of 1999, even the best search engines indexed only about 16 percent of the World Wide Web.[2] While this percentage may be greater today, there is still a very large quantity of information on the World Wide Web (web) that is not being found by search engines, and even more that is not available in full text. Furthermore, as seen through the literature review performed in connection with this study, a large amount of published transportation information is not identified for use by individuals outside the agency in which it was produced.

The information and library professionals in the transportation community know the gaps and deficiencies of the currently available resources. They have identified many of the needs and problems associated with information availability, access, archiving, and preservation. For some time this group within transportation has been discussing these issues on a tactical level, identifying unique problems, and seeking solutions. Yet while these professionals have the understanding of what could provide impacts of consequence to transportation productivity, they do not have the influence or opportunity to present this topic at the strategic level on which it should be addressed. There is no strategic approach to information management by the transportation leadership nor is there full comprehension of the value of information as a strategic asset.

REPORT ORGANIZATION

The first chapter of this document introduces the topic and provides information about the conduct of the study. Chapter 2 presents a summary of needs identified by all levels of the transportation community, from project engineers and practitioners to policy and decision makers. Chapter 3 puts forth a vision for the future for a stable and sustainable system for transportation information management. Chapter 4 describes the current practice, identifies users and providers of information, and discusses current ways to get materials into and out of the system. Chapter 5 discusses problems and issues with the system. Models for information management and a framework for a national strategic plan and recommendations for improving transportation information services are discussed in Chapter 6. Chapter 7 presents information on the economic rationale for enhancing the information infrastructure. Chapter 8 proposes the initial steps to put into practice the recommendations for action. The last chapter of the document provides a summary, general conclusions, and recommendations.

STUDY METHODOLOGY

This study focused mainly on the current practice, gaps in the current system, and needs of the transportation community. Information was gathered through personal interviews and facilitated group discussions, both in person and via telephone, and through a literature search. The protocol for the personal interviews and facilitated group discussions is included in this report as Appendix A.

The literature search focused on the existing system of transportation information management and on the models for information services described in Chapter 6, the National Library of Medicine, the National Agriculture Library, and TRISNET. Documents were identified through Internet searches, searches of the Library Literature database, by members of the study panel, and by librarians familiar with the TRISNET planning process in the 1970s. See the Bibliography at the end of the report for a list of the specific titles reviewed.

Members of the study team themselves were an excellent source of information for the effort. Their expertise and knowledge provided cogent input and advice.

DEFINITIONS

For the purposes of this study, the primary customers – consumers of the information within this report -- are considered to be the employees of AASHTO member agencies. Secondary customers include employees of all organizations working in the transportation field, in academia, and in the public and private sectors.

Information is defined to be published material such as reports, journals, conference proceedings, manuals, guidelines, standards, maps, and textbooks as well as unpublished descriptions of works in progress, and the bibliographic or summary data that describe all of the above. The term covers materials available in hard copy or electronic format. The definition of information also includes "raw" data sources, such as traffic counts, axle load data, temperature profiles, geographic information system (GIS) databases and so on. However, it is expected that methods to improve access to this type of information will not be addressed immediately in the policy study recommended to follow, but will be considered in a later phase. [3]

Managing information is used in this report as the effective process by which materials are put into the information infrastructure and retrieved from it along with the associated administrative and policy actions required for system operation. Managing information as used herein does not refer to definitions commonly used in the information technology and computer systems community that focus on the technology and its applications rather than the information content.

CHAPTER 2. CUSTOMER (USER) NEEDS

TARGET AUDIENCES

Customers for transportation information access, availability, storage, and preservation are quite varied. They come from private sector and academia, from all levels within organizations, from practitioners and executives and particularly from within public sector agencies – they are users of all types of transportation information. Because customers for this study are defined primarily as AASHTO member departments, these organizations were targeted to determine their information needs. Other users of information from the public sector and academia were also included because they are critical parts of the transportation community. Private sector organizations and international sources were not emphasized because these participants in transportation will have less of a role in providing leadership for initial enhancements to the primarily public sector driven system of information management.

In order to understand the complex needs of the wide spectrum of customers, the study team categorized them into groups with similar information needs. These groups are:

- State department of transportation executives
- Other decision makers -- influential members of organizations such as the Federal Highway Administration (FHWA), TRB, and AASHTO
- State DOT research managers
- Transportation practitioners (technical information users)
- Local and regional transportation officials
- Technology transfer professionals
- Librarians and information specialists
- Academic users
- Private sector customers

A list of the members within the transportation community, organized by group, that were contacted to determine customer needs and the needs they expressed are contained in Appendix B. These needs were identified during the interviews and facilitated discussions with those who graciously provided their time, knowledge, and expertise.

Needs expressed spanned a wide spectrum, from basic information management practices to sophisticated systems to enhance the information infrastructure and facilitate its operation. As anticipated each group raised needs that were most critical to its aspect of the business of transportation. While needs differed for each group, many needs were common to multiple groups.

In order to present a full picture of the needs, the basic needs are discussed first. Progressively more complex needs are added to complete the view of what the customers think should be the system for managing information available to the transportation community.

FUNDAMENTALS

Information customers, users, see a need for enhancing essential elements of information management practices within their organizations as well as the TRB and the U.S. DOT. More efficient access to physical collections were seen as important because some information may not currently be, or ever will be, available electronically. However, electronic document access is also an important basic need. Users want enhanced TRIS and Research-in Progress (RIP) databases, with greater numbers of participants supplying information as well as having a ready process to locate all documents found in TRIS.

Users endorsed the growing availability of electronic documents and saw a great need for full-text searchable documents. Moreover users want to have the option of printing a document in their office when they choose to do so. Yet when a document is very lengthy, users also want the option of being able to easily acquire a hard copy from the publisher or distributor. A more capable system of physical collections and electronic assess forms the basis of what users expressed was needed.

Users also went on to describe that there is a fundamental need for access to other state DOT document holdings, research activities, and plans. Furthermore, users thought that the U.S. DOT libraries should be active participants in nation-wide information services to the transportation community. Having both state and federal resources available leads to what users said was very basic -- a comprehensive list of holdings from federal and state agencies, which today does not exist. Some users expressed that participation in existing commercially available networks and services could help the transportation community as a whole, but at present such solutions have not been widely adopted.

In addition to wanting to efficiently access materials on their own, users expressed a desire for more effective interaction between information professionals and practitioners. This is addressed in part by creating better support systems for the information professional, such as peer-to-peer associations and training, so that they can serve the transportation community more effectively. Furthermore, users expressed a need to be better informed about the services the information professionals can supply. The answer to the question of when to use the professional versus when to do the searching oneself is not always obvious. Also, information professionals may not be accessible to users particularly if the information staff and the users are in two different organizations. It was also noted by users that the essential characteristics of a national information system – interlibrary loans, union catalog, and a transportation thesaurus were not consistently available to transportation users nationwide.

Transportation practitioners, the private sector, state research managers, decision makers, and librarian and information professionals, were the primary groups that focused on these fundamentals. These users saw many needs for a broader reach to incorporate existing information. Many spoke of knowing information exists but could not easily access it or only could access it if they knew who authored the item and contacted that individual directly. For example, often state research managers or practitioners had to rely on personal contact networks to access information from other

states, noting that such access is constrained by the span of the personal network established. The private sector also found access to state information difficult except for information that is currently available on a state DOT web site, and in most cases for the private sector, access to state information professionals was limited. Decision makers also understood the tools currently available to the transportation community need enhancements.

This discussion of fundamental needs focuses attention on filling gaps in current practice. At this fundamental level, users agree, if states and federal suppliers of information could participate by providing a full complement of their documents, this would be a significant improvement to information availability. A number of the users mentioned the activity of the midwestern states library consortium as a significant activity for advancing these fundamentals.

QUALITY AND CONTENT

Such basic needs were only the beginning of what users thought were critical to having a working, nation-wide, accessible system for information management. Users were very concerned about the quality of the information that could be accessed. Users envisioned a system that capitalized on the electronic technologies currently available, and they clearly described what they saw as an increasing problem regarding the quality of electronically available information. Nearly every group of users including State DOT CEOs mentioned that quality and credibility of the information found through the Internet was not sufficiently robust to be used as the main source of information for the transportation community.

Moreover, at every turn users described the "information overload" of the Internet and expressed frustration over the lack of screening and relevancy tools available to assist the general seeker to narrow searches appropriately to locate specific transportation information. Additionally, users who were familiar with services that librarians and information professionals could supply lamented the lack of access to these individuals. For these users, information professionals were seen as a major influencing factor for efficiently locating high quality information on the Internet and elsewhere. Other users did not connect the issues of quality with the information professional and continued to be dissatisfied with what they could find on the web.

Quality is only one aspect of content, and users embraced many other content needs and described enhancements to the content of the information available to transportation practitioners and decision-makers alike. Users saw needs in having more publications identified: more historical information, more non-traditional transportation information, international data, and a greater span of media types accessible. Furthermore, users asked for highly applied research results contained in practical, user-oriented publications, such as "how-to" manuals and guides. Users called for linked references in electronically available research report references and bibliographies, saw needs in addressing access to unpublished reports, wanted access to materials having short life spans, data models, not just the data, for analytical efforts, and were concerned about finding a rational way to handle sensitive information. Users saw needs for access to planning documents, construction information, standards and specification

information, and other documents that are published by state DOTs – and users thought these types of documents should be locally printable from an electronic format.

Needs were also recognized regarding information security when dealing with electronic systems as well as the storage and preservation of the physical and electronic collections. Many users were particularly concerned with having stability in information availability. What could be accessed one day needs to be accessed similarly in a month or in five or ten years.

To deal with all these needs, users also recognized that there must be an increased level of support from information professionals to facilitate information transfer. Users realized that they were describing a vastly more complex system of information than is usually considered for information access. At this level of discussing needs, users were particularly concerned with ferreting out the existing information to enhance the content rather than creating new information or tools that facilitate access. All groups were well represented in making these observations on quality and content needs. To summarize, access to a greater depth of content from existing materials is a critical need for all members of the transportation community.

ELECTRONIC TOOLS AND META-INFORMATION

Adding greater depth of content to the fundamental needs greatly expands the reach of information access and availability. But users said needs don't end there. In many of the discussions, users understood that the needs described could only be addressed by creating a linked network of libraries and information professionals, information suppliers, and users. In fact every group of users made some reference to a distributed linked network, integrated with information professionals, that had access through a single portal -- their desktop or local computer resource. Users also said they did not believe one very large database could address the varying needs within the transportation community, and that the cost of doing so would be prohibitively expensive.

Users described a sophisticated level of services that would address needs of timeliness, ease of use, financial and content sustainability, and reliability, including being up-to-date and continuously maintained. For tools that would address the needs, users envisioned "an utterly pragmatic" expert system that guides the user to find information whether the user locates the information him- or herself or through an information professional that is available locally or online. Users particularly saw a need for a tool that allows searching by topic or key word with the capability to access differing levels of detail depending on need. Regarding these key words, users expressed a need for a transportation rich index that assisted in directing an individual's search efforts. Other tools the users identified as being able to address needs were subscription services and "information push technology," where information of specific interest is directed automatically to a user's location in the information network.

All users in one form or another acknowledged that being connected through such described tools would require development that would take considerable resources. These resources were identified in two major areas: financial and information management expertise. Users understood that creating this connectivity would require substantial funding. Reserving funding for information activities was seen as a challenge,

but one that could be tackled. Some users clearly recognized the role of the information professional as being instrumental in facilitating information transfer and called for vastly increased resources in funding these "information expediters."

In addition to a system that is financially stable, users also expressed the need for a high quality infrastructure that guides and shapes the management of information. Users identified formal policies and operating standards as being a necessary element of the system. There were numerous speculations on who or what body would oversee the activities of these administrative responsibilities. TRB, AASHTO, the National Transportation Library at the U.S. DOT BTS, or a new library consortium were the leading suggestions.

As users thought about needs being addressed through technological tools, they realized that their needs described a system that makes an overwhelming amount of information available and accessible. They quickly realized also that most users would not be able to handle the volume of information that such a system would produce. Users then called for "meta-information" -- information generated that is of a higher or second order of development. Nearly every group saw a critical and immediate need for summaries of research and other published information, including syntheses and high quality abstracts, as well as best practices information, peer-to-peer interchange, and expertise locators. The most pressing need accompanying this type of information supply is creating the meta-information – much of what is needed in this area is not currently available. While generating such meta-information is a step removed from creating an infrastructure to manage information, users saw the availability of such meta-information as integral to the management system. In fact, having this second-order information was seen as a major advantage of the system for information management. State DOT CEOs and other decision-makers clearly saw needs at this level. They were interested in the maximum efficiency in acquiring information. In general, all groups of users saw the need for a connected and seamless flow of information, independent of source or media type.

CUSTOMER (USER) NEEDS SUMMARY

Overall, customers, that is, the users, saw three main areas of need beginning with the fundamental activities of making accessible nationwide the readily available documents from major participant organizations such as the state DOTs and the U.S. DOT and its modal administrations. These needs described as fundamental activities include, among many items, efficient access to existing physical and electronic collections, greater access to full text electronically searchable documents, availability of a nationwide list of holdings from state and federal governments, and enhanced support for information professionals to enable more effective information retrieval through interlibrary loans and other information services. The second primary category of need is quality and content of the information. Concerns abounded about the quality of information found today especially on the Internet. Likewise the consistency of availability was considered a problem. Users also determined that there was little capacity to preserve and store materials and that attention must be addressed to this important area. Users called for more information of a non-traditional transportation nature, more information that is published by state DOTs and federal agencies,

particularly that which is not commonly available, more international materials, unpublished reports, historical information, and many other types in varying media formats. Because of the vast amounts of information that will be available through adding more participant organizations and increasing the content, the third major area of need is electronic tools and information summaries, syntheses, best practices, and other processing of information that provide an efficient grasp of vast quantities of materials. Finally, users specifically detailed the need to employ available technology in the form of an electronic network linked to physical and electronic collections and information professionals having a single portal entry available at their desktops.

CHAPTER 3. VISION FOR THE FUTURE

The interviews with the various customer group representatives conducted through this study and discussions with the study panel produced a vision for the future. This vision foresees:

> *A financially stable, sustainable, and electronically accessible information management system, locally and readily available by transportation policy makers, practitioners, researchers, and the public to efficiently and reliably identify and acquire information needed to develop, operate, maintain, or use the nation's transportation network.*

This vision can be realized. It requires a reliable and sufficient budget committed to accomplishing the work of the system. Such budget commitments may come from a variety of sources extending from user agency funds to legislated funding. Moreover the vision calls for sustainability – that characteristic which allows the continuation of the system over a long period of time and which provides for content and operational practices that continue to meet users' needs even as their information needs change. This vision establishes the benefits of technology through electronic access.

Many of the user groups interviewed expressed a desire to have one place, one Internet portal, to get the information they require. Also, according to those interviewed, full-text online documents are their preferred information access format. Often, however, necessary information is not available in electronic format, or it requires complex searches to find. In those cases it is important to have access to information professionals so that the "one portal" can link the user to a means of reaching appropriate resources. Such a combination of online access to documents and online access to information professionals would provide more timely and higher-quality information that would be in most cases, locally (at the desktop) and readily available.

The vision for a system that allows more effective transportation information management extends to a wide spectrum of users and user needs. Each of the various segments will be better equipped to perform its assigned responsibilities whether users are operating, maintaining, providing innovation for, studying or using the transportation system.

CHAPTER 4. CURRENT PRACTICE – INFORMATION PRODUCERS AND INTERMEDIARIES

The present transportation information infrastructure consists of information users, who's needs are described in Chapter 2, information producers, and the various intermediaries that connect them. Within the community of transportation practitioners there is wide variation in access to the intermediaries and, as a result, wide variation in ready access to transportation information.

GETTING MATERIAL INTO THE SYSTEM

Information Producers

Information producers are those that generate the information and make the information available through their own media formats or to others that collect information and then make it available. Information producers may, but not necessarily, collect and preserve their own print, multi-media and electronic documents. The major information producers are:

- U.S. DOT and its modal administrations
- Other federal agencies
- Associations and professional societies (e.g., TRB and AASHTO)
- State DOTs
- Regional or metropolitan planning organizations (MPOs)
- University research centers
- Transit, trucking, airline, airport, rail, port, pipeline, and toll operating authorities
- City and county agencies
- Equipment and products manufacturers and vendors
- Private publishers (e.g., Elsevier)
- Similar agencies and organizations in other nations and international organizations such as the Organization for Economic Cooperation and Development (OECD)

Information is found in a variety of formats:

- Print materials, including books, reports, and summary documents
- Audio-visual materials
- CD-ROM materials (e.g., conference proceedings, training resources)
- Electronic documents on the web
    - Free
    - Subscription basis (e.g., full-text journal articles)
- Web sites
- Archives of e-mail lists and bulletin boards
- Training materials (e.g., curricula, syllabi, participant handbooks, presentations)
- Electronic newsletters

The content of materials used in transportation is also varied:

- Research
- Statistical information
- Standards
- Practices
- Planning information
- Organizational information
- Legislative information
- News

Distribution

Publishers vary in their methods for distributing the material they produce. Within the arena of research funded by FHWA State Planning and Research (SP&R) funds, federal laws and regulations (15 USCS § 3704b-2, 23 CFR 420.207) dictate distribution to the National Technical Information Service (NTIS), the TRB for its Transportation Research Information Services (TRIS) database, and certain libraries; state regulations may require distribution to a state library.

The states may choose whether to distribute copies beyond the minimum required and whether to publish electronically or in paper. If a state sponsors research that is not supported by SP&R funds, the results may or may not be distributed to NTIS, TRIS, and libraries.

An issue for some states and for federal agencies is the labor-intensive task of ensuring that electronic documents meet federal accessibility requirements for the disabled. Many organizations post reports in portable document format (PDF), but in order for PDF files to be accessible to this segment of users, there must be a text equivalent for every non-text element (photograph, illustration, graph). Currently most electronic documents do not have these text equivalents.

Planning documents developed with SP&R funds are not routinely sent to TRIS nor are they systematically collected by any one agency. Statistical information collected by the state transportation agencies may or may not be shared with national organizations or with local governments within the state.

The Turner-Fairbank Highway Research Center develops customized distribution lists for the approximately 130 research publications that it distributes per year. LTAP Centers are included, and lists of transportation libraries, MPOs, county engineers and others can be added at the request of the project monitor. Although the U.S. Government Printing Office distributes publications to libraries in every state through the Depository Library Program, few research reports from U.S. DOT are included in its distribution list.

Some reports from publicly funded research are not approved for distribution. The justification may be that the research was flawed or controversial or not of interest to

a large enough audience. This happens with research sponsored by the states, FHWA, and in some cases, the National Cooperative Highway Research Program (NCHRP). In such cases the report may never reach NTIS or TRIS, and the sole copy may reside with the project monitor. There may be no intent to hide the research, but procedures are lacking to ensure that it can be discovered. In some cases the authors or the project monitor may cite the work, but those who would like to read it are frustrated in their attempts to find it.

Associations such as TRB, AASHTO, and the Institute of Transportation Engineers routinely distribute lists of their publications to potential customers. In contrast, many programs in the U.S. DOT and in state and local transportation agencies do not compile lists of their publications, making it much more difficult for interested parties to identify and acquire the documents.

One type of publication that is especially elusive is conference proceedings from small, specialized associations or groups of scholars. Responsibility for publication may rotate from one institution to another with little thought for distribution beyond conference attendees.

Commercial publishers of books and journals actively market their titles to libraries and to individuals and make their books available through online retailers such as Amazon. Book publishers work with large libraries to develop interest profiles and automatically ship books in categories of interest through "approval plans."

Intermediaries

Information intermediaries perform a variety of roles. They identify and acquire documents, as described below in the section Collectors of Information. They create bibliographic records to describe the documents, as described in the section on Description and Classification. Intermediaries may also develop user interfaces to the records; see User Interfaces below.

Librarian intermediaries perform yet another role. They circulate documents from their collections and assist end users in borrowing or acquiring documents from other organizations.

Collectors of Information

Collectors of information identify and gather information to make it available in formats oriented to the variety of users of the information. Collectors of information, particularly libraries, not only collect but also often preserve information in a variety of formats: print, multi-media, and electronic. Some organizations preserve messages from e-mail lists and make them searchable. Because of space limitations, collectors may not be able to preserve the information permanently. Roles of the librarian in the task of collection are to identify the information to collect, especially information in the librarian's own organization, and to acquire the information from the various sources.

Collectors of information include the following:

- NTIS, part of the U.S. Department of Commerce
- Libraries (Note: Libraries in the field of transportation operate largely independently of each other)
    - National Transportation Library, part of the U.S. DOT Bureau of Transportation Statistics (BTS)
    - U.S. DOT Library
    - Other U.S. DOT modal administration libraries (e.g., Federal Aviation Administration, Federal Transit Administration)
    - TRB Library
    - University-based transportation libraries (e.g., Northwestern, University of California, Berkeley (U.C Berkeley or Berkeley), University of Michigan Transportation Research Institute)
    - Libraries at colleges and universities (e.g., engineering libraries, multi-disciplinary libraries)
    - State DOT libraries (Note: In a recent survey by the Minnesota DOT Library, 44 state DOTs reported having one or more units referred to as a "library." Of these, fewer than 20 were staffed by individuals with basic education in library and information services.) [4]
    - Libraries in professional associations or operating authorities (e.g., American Public Transportation Association, Bay Area Rapid Transit)
    - Libraries in private sector organizations (e.g., automotive and aerospace companies, consulting firms, research institutes)
- LTAP Centers
- Subject clearinghouses (e.g., LTAP, Work Zone Safety)

Description and Classification

After documents have been identified and acquired, another group of intermediaries creates surrogate records for the documents, also called bibliographic records. Forty years ago the library card catalog and the print Readers' Guide were common examples of collections of bibliographic records. Today the comparable tools are online.

It is useful to consider the difference in purpose between library catalogs and bibliographic databases such as Readers' Guide and TRIS. Library catalogs are built to describe a particular library's holdings. The existence of the catalog record equates to ownership, and the call number indicates the spot on the shelf. A catalog record tells the user the location of the document. In contrast, a bibliographic database describes materials in a specific content area without regard to whom might own them. Once the user identifies a document through a bibliographic database, there is an extra step involved in locating the document. The distinction between the two types of resources is beginning to blur to some extent. Library catalogs and bibliographic databases both now include records for web documents with links to the full text.

The surrogate records for documents in online catalogs and bibliographic databases are based on structured information. The author goes in the author field, the title goes in the title field, etc. For library catalogs, international standards govern how the fields are used, which allows sharing of records.

OCLC (Online Computer Library Center), a nonprofit membership organization, provides tools for record sharing. Its database represents the combined catalogs of its 43,000 member libraries and includes records for more than 50 million unique items. If one library has cataloged a book, another library can download the record and add it to its local catalog. As a byproduct of the cataloging process, the system develops a list of all of the libraries that own a particular work. These records of holdings enable another important OCLC function, interlibrary loan.

For the intermediaries who create bibliographic records, particular effort is involved in assigning subject indexing and classification to documents. In order to ensure consistency across records in a bibliographic database, a controlled set of terms should be used. Those who create records for the TRIS database, for example, use the Transportation Research Thesaurus, which was developed under an NCHRP project. Consistent indexing allows the information seeker to find all material on "drunk driving," for example, even if the author of a particular article has used the term "driving under the influence."

In recent decades computers have been able to build indexes of words in documents to facilitate discovery. Web search engines such as Google are modern examples. Such indexes may be effective in certain cases, but they cannot match good subject indexing in their ability to retrieve all material on a topic while at the same time excluding irrelevant information.

A further advantage of both library catalogs and bibliographic databases over Internet search engines is that the user knows that the material described in the record has been selected by a knowledgeable professional who has identified it as originating from an authoritative source. This process is described in the section on Collectors of Information above.

The single most comprehensive attempt to abstract and index transportation information resources is the Transportation Research Board's TRIS database. TRB staff and TRB contractors create almost half of the records. One librarian at TRB is primarily responsible for selecting all of the documents that TRB covers, a very large task. A part-time person assists by placing requests for free copies of the materials that the librarian has identified. As journals and documents arrive, TRB staff make note of them in a tracking database, then route them to the indexers for record creation. Some of the indexers telecommute, sending the records they have created by e-mail.

Other organizations assist TRB with the work of document selection and record creation. Of 27,000 records added to TRIS in 2002 about 14,000 were added through ongoing agreements between TRB and other organizations:

- The Road Transport Research program of the Organization for Economic Cooperation and Development (OECD) contributed about 5,000 records from its International Transportation Research Documentation (ITRD) database. TRB provided OECD with all TRIS records in exchange.
- The transportation libraries at U.C.-Berkeley and Northwestern contributed records that they added to their library catalogs (called the TLIB records), a combined total of 8,500. The two libraries are not compensated for their efforts. The TLIB records do not include abstracts, as do the other records in TRIS.
- The California PATH program contributed 1,500 records created at the transportation library at U.C.-Berkeley.

TRIS is available on a for-fee basis from the commercial online vendors Dialog, STN (as part of OECD's ITRD database, mentioned above), and SilverPlatter. Through a memorandum of agreement between TRB and the U.S. DOT BTS, TRIS is available on the Internet at no charge as TRIS Online. Because the ITRD has not granted permission for inclusion in this tool, its records are not part of TRIS Online.

Here is a list of other describers, classifiers, and indexers that develop products used in the field of transportation:

- Web search engines supply automatic indexing for web pages and web sites.
- DOTBOT indexes a subset of the web, pages on U.S. DOT servers and a few other servers
- Commercial publishers create bibliographic records for discipline-specific databases such as INSPEC, Compendex, and Lexis-Nexis Legal Research. Other examples of commercial databases useful in transportation are Trade and Industry Index, Applied Science & Technology Abstracts, and Society of Automotive Engineers Global Mobility. The databases may include records of print documents, web documents/web sites, and documents in other formats. The records may include links to full-text documents on the web.
- Government agencies create bibliographic databases, such as AGRICOLA, Medline, and the NTIS database.
- Libraries/librarians create a bibliographic (catalog) record for each information resource added to their collections. The library record also includes information about the specific location of the information resource. Some libraries use OCLC in creating catalog records, which enables them to use cataloging information that has been previously entered into the database by another library, modify it to meet local needs, and to add information about their holdings to the large OCLC database. The U.S. DOT Library, the TRB Library, most college and university libraries, and fewer than 20 state DOT libraries participate in OCLC.
- Topic-specific services produce indexing. These include clearinghouses that index information about documents, regulations, and experts (e.g., National Work Zone Safety Information Clearinghouse); clearinghouses that create records of

information about transportation-related products (e.g., the Highway Innovative Technology Evaluation Center Clearinghouse, the National Transportation Products Evaluation Center products, and AASHTO Products Evaluation Listing); and project-oriented databases that index information about research projects (e.g., the TRB Research in Progress database and the database of the transportation Pooled-Fund Program).

- Producers of directories create indexes of persons and organizations, both in print and online. They include government organizations, educational institutions, associations, and commercial publishers.

Summary

To summarize the issues related to getting material into the system, the field of transportation includes many kinds of information producers that publish varied content in varied formats. Some documents are distributed widely and others not at all. Some organizations actively market their publications while others, which may produce equally valuable works, do not compile lists of new releases. The variety presents challenges both to information users and to the intermediaries who seek to help with their information needs.

Information intermediaries perform significant tasks related to getting material into the system, beginning with identifying and collecting documents. They also create records in library catalogs and topic-specific bibliographic databases that describe and classify the documents.

Internet search engines collect and index documents but without regard to source or quality. Human intermediaries are more selective, choosing materials based on topic from known authoritative sources.

GETTING MATERIAL OUT OF THE SYSTEM

User Interfaces

Searching and retrieving bibliographic records requires a user interface. Many people are familiar with the interfaces of online library catalogs and Internet search engines. Library catalogs frequently allow the user to specify if he or she is looking for a title word, an author name, or a subject heading. The Google interface looks very simple, but unless the searcher is familiar with and uses its advanced features, it returns only pages and documents that contain all of the words in the search statement.

User interfaces may be developed within organizations that produce bibliographic records or by an outside vendor. The producers of records may make the records available on their own computers, or they may lease use of the records to other organizations that supply the user interface. NTIS, for one, hosts a subset of its records on its own web site, yet also makes its records available to vendors such as SilverPlatter, which distributes the records with its own interface.

Because of the large number of developers there is considerable variation across user interfaces. One interface will automatically search for the plural form of a word entered while the next one will not. One will assume that terms entered should be searched as a phrase; others will retrieve any record in which only one of the terms appears. The challenge for the end user is to understand the logic implicit in all of the interfaces encountered.

Identifying Information

There are two primary means by which users identify information: use of personal skills or assistance from an information specialist or librarian. There are several kinds of resources for identifying information, among them the following:

- Internet search engines
- Bibliographies
- Library catalogs
- Database searches
- Recommendations from experts, colleagues, and peers
- Conferences and training sessions
- E-mail list services
- Alerting services
- Publisher and association catalogs and advertisements of publications

Databases of bibliographic records and Internet search engines facilitate the efforts of end users to identify and acquire information. The single most important resource for *identifying information* in the field of transportation is TRB's TRIS database, which now includes half a million records of documents and is available to end users through the Internet. The single most important resource for *locating documents* is the OCLC database because it includes the records of thousands of libraries. OCLC is available to end users only through member libraries.

However, within the field of transportation many practitioners do not make use of the existing information infrastructure but rely primarily or in part on their personal network of contacts for acquiring information. Most of the practitioners that the authors interviewed cited the Internet, newsletters or other professional publications, personal contacts, and e-mail lists as their primary resources. They did not tend to seek out information beyond this realm. Many expressed a wish for something like TRIS – topic searching and authoritative materials – suggesting that they were not TRIS users. Many mentioned best practices as a category of information that they wanted but could not easily identify.

Practitioners with interests in specific topic areas and disciplines may develop formal and informal "communities of practice" that foster peer-to-peer exchange of best practices and other knowledge. They may develop their own information resources, such as the Snow and Ice e-mail list; some groups find funding to develop clearinghouses and

web sites. However, lack of coordination at a national level means that there is no one focal point for identifying these disparate resources. As mentioned above, best practices are of interest to practitioners but difficult to find.

Conferences and training sessions are excellent sources of information for those who can attend. Conference proceedings and course materials may be useful to others, but in many cases there is no mechanism for sending them to TRIS or to a library where they can be indexed and retained for borrowing.

Practitioners with access to a library can search the local library catalog and may receive assistance in searching the catalogs of other libraries as well. Knowledgeable transportation specialists regularly search the catalogs of the transportation libraries at Berkeley and Northwestern because of the depth of their holdings. In libraries that are members of OCLC the librarians and in some cases the customers may search the OCLC catalog, which includes the holdings of all member libraries.

In addition to OCLC there is another means for groups to build a shared catalog. International Standard ISO 23950: Information Retrieval (Z39.50): Application Service Definition and Protocol Specification specifies a client/server-based protocol for searching and retrieving information from remote databases**.** The Z39.50 standard was developed to overcome the problems associated with multiple-database searching, such as having to know the unique menus, command language, and search procedures of each system accessed. Z39.50 simplifies the search process by making it possible for a searcher to use the familiar user interface of the local system to search both the local library catalogue as well as any remote database systems that support the standard. (For additional information see http://www.ifla.org/VI/5/op/udtop3/udtop3.htm) Groups of libraries whose catalogs adhere to the standard can build a common "union" catalog. One example is a joint catalog of libraries at the institutions that belong to the Big Ten athletic conference.

Beyond TRIS and library catalogs, there are other databases, many from for-profit publishers that practitioners can use to identify information. In the interdisciplinary field of transportation practitioners might use information from databases that cover law, medicine, news, environmental sciences, and structural engineering, to name a few. Such resources may require licensing agreements and are much more likely to be available in organizations with libraries (to manage the licenses and payments) than those without.

Obtaining Information

Having identified a document needed, users may acquire a copy to retain or borrow a copy. Again, they can use personal skills or get help from an information specialist/librarian. Colleagues and peers can lend documents. A variety of organizations and entities make documents available, including the following:

- Agency or organization that published the document
- Libraries (see detailed list in Collectors of Information above)

- LTAP Centers
- Clearinghouses
- NTIS
- Commercial document delivery services
- Bookstores
- Myriad web sites (for electronic documents)

Over time the Internet is becoming a better resource for do-it-yourself information seekers. More and more reports from public agencies are available on the web and, given an *exact title*, search engines such as Google are effective at finding them.

Some TRIS records now include links to full-text documents. However, documents that are not linked may be difficult or expensive for practitioners to obtain on their own. Practitioners may not be aware of such resources as the NTIS for technical reports and the Linda Hall Library in Kansas City for journal articles. Journal articles from profit-making providers such as Ingenta and Science Direct may be available in electronic formats on the web, but there will be a fee to download them.

Practitioners who can turn to a librarian for assistance have an advantage. As noted in *The Value of Information and Information Services* report, firms without libraries spend 2 to 4 times more to acquire information than those with in-house libraries. Obtaining information through use of alternative sources costs 2.3 times as much as acquiring the same information through an in-house library.[5]

Part of the cost saving is associated with sharing of resources. If a library owns a document, multiple individuals within an organization can use it. If another library owns it, it can be borrowed.

The two largest transportation libraries, the Harmer E. Davis Library at the University of California, Berkeley, and the Transportation Library of Northwestern University, will lend to non-OCLC libraries. Northwestern lends to transportation libraries at no cost and will also supply documents to individuals for a nominal fee. Users are able to identify the holdings of the two libraries through their web catalogs. The libraries' primary mission is to serve their respective academic communities and to serve nationwide interests only as they are able. It is fortunate for all in the transportation field that the parent organizations support the two libraries in serving a broader clientele.

Informal lending takes place among many transportation libraries, often based on friendships. Over the years the Transportation Division of the Special Libraries Association and committees of the TRB have fostered these relationships.

Beyond lending and borrowing, librarians can help customers acquire personal copies of documents. With their knowledge of publishers and vendors, they are likely to be more efficient than most practitioners in tracking down books, articles, reports, and even unpublished materials.

Summary

To summarize the section on getting material out of the system, user interfaces facilitate the discovery of documents in catalogs and databases, but they are quite varied in how they function.

To identify and locate documents, users can rely on their own resources or get help from a librarian or information specialist. Many who rely on their own skills tend not to use the specialized tools available for identifying information.

Having identified documents that they want to read but that are not on the web, practitioners who can turn to a librarian for assistance have an advantage. Librarians can lend documents or borrow them through a network. If the practitioner wants a copy to keep, the librarian is likely to be familiar with sources.

CHAPTER 5. PROBLEMS AND ISSUES

LACK OF COORDINATION

The overarching issue related to transportation information is the limited number of coordinating influences with a national perspective. In contrast with other disciplines such as agriculture, medicine, education, or chemistry, no one entity in the transportation community has assumed responsibility for oversight of transportation information access, availability, storage, and preservation.

An organization with a relevant legislative mandate is the National Transportation Library (NTL) whose mission is threefold:

- Establish and maintain the NTL,
- Promote access to the Library with the goal of improving the ability of the transportation community to share information, and
- Coordinate with other transportation libraries.

However, interpretation of the mandate has been narrow. The NTL deals only with electronic documents, has no provision for archiving and preservation of print materials, has been given little authority to work on a national scale, and has not been provided with a secure budget. The NTL could serve as a dynamic leader for coordinating transportation information management, but as it exists currently, its level of effort is constrained. The other libraries of the U.S. DOT view their roles as serving selected sub-groups of DOT employees and there is little, if any, coordination among them.

Beyond the groups contributing records to TRIS (TRB, Berkeley, Northwestern, ITRD), there are no organized efforts among transportation libraries to share the responsibility of and cost of identifying, collecting, and retaining information. As transportation libraries close, there is no one with the responsibility to review and distribute their collections. A national level library could promote cooperative ventures, even with limited resources.

A recent positive step is a pilot project of the NTL, called the Midwest Transportation Knowledge Network (Knowledge Network). The NTL is funding three academic libraries and ten state DOT libraries to join OCLC if they are not already members and to create and add records of their unique holdings to the OCLC catalog. The work of these libraries is the first phase of a transportation "union catalog" that anyone with access to OCLC will be able to search. It is envisioned that over time other transportation libraries will also contribute their records.

Another gap resulting from lack of coordination is in the area of information standards for transportation. Other national libraries are cooperating to produce standards for retention and discovery of electronic documents. Transportation should be

participating in these conversations to stay abreast of developing standards and to promote their use throughout the transportation industry.

The effects of lack of coordination on users are numerous. As mentioned above and described further below, there are gaps in the information available. A significant gap is lack of user input regarding the transportation information system. Without a coordinating agency, practitioners do not have a voice concerning topic coverage, user assistance, and user interfaces. A national library could give practitioners a chance to influence information resources and services.

INTERMEDIARIES: INFORMATION PROFESSIONALS

Involvement in the Transportation Division of the Special Libraries Association and in two library-related TRB committees promotes cooperation among librarians and supports continuing education. However, the number of transportation employers that support participation is small, perhaps because their information specialists are not considered professionals. (As mentioned in Chapter 4, fewer than 20 of 44 libraries in state DOTs are staffed by individuals with basic education in library and information services.)

Transportation employers should perhaps consider hiring well-qualified information professionals. In return they should expect the kinds of skills outlined in a 1996 report from the Special Libraries Association, *Competencies for Special Librarians of the 21st Century (*http://www.sla.org/content/SLA/professional/meaning/comp.cfm)

Professional Competencies

The Special Librarian:

- Has expert knowledge of the content of information resources, including the ability to critically evaluate and filter them
- Has specialized subject knowledge appropriate to the business of the organization or client
- Develops and manages convenient, accessible and cost-effective information services that are aligned with the strategic directions of the organization
- Provides excellent instruction and support for library and information service users
- Assesses information needs and designs and markets value-added information services and products to meet identified needs
- Uses appropriate information technology to acquire, organize and disseminate information
- Uses appropriate business and management approaches to communicate the importance of information services to senior management
- Develops specialized information products for use inside or outside the organization or by individual clients
- Evaluates the outcomes of information use and conducts research related to the solution of information management problems

- Continually improves information services in response to changing needs
- Is an effective member of the senior management team and a consultant to the organization on information issues

Personal Competencies

The Special Librarian:

- Is committed to service excellence
- Seeks out challenges and sees new opportunities both inside and outside the library
- Sees the big picture
- Looks for partnerships and alliances
- Creates an environment of mutual respect and trust
- Has effective communications skills
- Works well with others in a team
- Provides leadership
- Plans, prioritizes, and focuses on what is critical
- Is committed to lifelong learning and personal career planning
- Has personal business skills and creates new opportunities
- Recognizes the value of professional networking
- Is flexible and positive in a time of continuing change

In sufficient numbers and with coordination of effort, information professionals can build an information infrastructure that will serve the needs of the transportation industry. They can train transportation practitioners to use aspects of the information infrastructure on their own and can assist them when needed in identifying and obtaining information. They can add value in many ways to the organizations that employ them.

GAPS IN GETTING INFORMATION INTO THE SYSTEM AND IN RETAINING THE INFORMATION

A shortage of human and budgetary resources causes specific gaps and problems related to the provision of transportation information, some with respect to getting material into the system. There are few librarians to identify and collect information, especially from abroad and from unfamiliar publishers. Conference proceedings, in particular, require time and effort to identify.

There are only small budgets available to collect anything other than free materials. Portions of collections in state DOT libraries are similar for this reason. A large number of transportation documents are held by only one OCLC library. If the one copy is in use, others who need it must wait. If it is lost, there is no backup.

Transportation needs a national library with the resources to identify, acquire, index, lend, and preserve materials that are not likely to be purchased by a state DOT or university library. This would include many conference proceedings and materials from Europe (those indexed by ITRD). There is also a need for a library to actively seek out

publications from programs with the U.S. DOT, state DOTs, and MPOs that do not routinely send their publications to libraries for long-term access. There is a further need to develop policies for report distribution and to educate the publisher community.

When a significant transportation library is closed, such as the library of the Port Authority of New York and New Jersey, a national library is needed to receive and retain the unique materials from the collection. Permanent storage is also needed for electronic documents. Without it, important data, planning and policy documents, and research published temporarily on the web will be lost to potential future users because they are not being archived.

Although some academic libraries regard it as their mission to retain materials permanently, even they are constrained by issues of space. Few libraries in transportation agencies regard permanent retention of documents as their responsibility. Again there is a need for a national library for transportation.

Some disciplines rely largely on journal literature, but transportation information appears in technical reports and government documents in addition to journals, making it more difficult to collect. Lists of documents available from U.S. DOT and its modal administrations are not readily available, for example. Nor are such lists available from many state transportation agencies. A national library could take the lead in gathering and sharing such information.

In addition there are materials that organizations may decide not to distribute (publish) or to distribute to a very narrow audience even though they might be of broader interest. As discussed previously, the sole copy of some research reports may reside with the project monitor. Some documents may be distributed to a group that the person responsible thinks would be interested without regard to needs for the document in years hence. A national library could take the lead in educating publishers and developing guidelines and policies for distribution of publications. It could also reach out to organizations proactively to help identify and collect materials that the organizations might not have considered significant.

Although TRIS is the single best database for transportation, it should be strengthened with more complete coverage in the closely allied disciplines such as environmental management and with consistently applied standards for abstracts. As mentioned above TRIS records from Berkeley and Northwestern do not include abstracts. Grants from a national library could allow the two libraries to employ staff to write abstracts for the materials that the libraries already own and index. Grants could also be used to involve more libraries in identifying materials for and contributing records to TRIS.

To the extent that there are gaps in the information that practitioners can readily identify, whether through TRIS or the Internet or other sources, the practitioners may be handicapped in their work. Without complete information, practitioners may use

outdated methods or pursue unproductive activities. They may be unable to provide suitable advice or make fully informed decisions.

PROBLEMS IN GETTING MATERIAL OUT OF THE SYSTEM

Matching End Users with Resources

There are few librarians to serve a large number of potential customers who would benefit from their assistance, whether in tracking down a fact or a statistic or an expert or in identifying a list of documents and other resources that would meet their information needs. It is possible that most transportation practitioners work in organizations that do not employ a librarian or information specialist.

Many end users are not able to access the range of resources available for identifying information. Although the web can help, the information it supplies is not complete, and the amount of information returned by search engines can be overwhelming. The best commercial bibliographic databases, such as Compendex, INSPEC, and ABI Inform, are generally available only in organizations with libraries, although not all libraries. However, for some small transportation libraries commercial databases may be too expensive.

One possible means for providing more librarian support and database resources might be a reference department at a national transportation library that would accommodate all requests. Another might be system of regional support by existing transportation libraries, funded through competitive grants.

Many end users are unaware of the range of resources to which they do have access. Although TRIS Online and the NTIS database are available at no charge on the web, many transportation practitioners do not know of their existence. Practitioners who rely on web search engines may not realize that such tools do not retrieve records in databases. A Google search, for example, will not find records in TRIS Online.

Many of the practitioners interviewed for this study mentioned the overload of unfiltered material that results from an Internet search. As mentioned before, many of them expressed a wish for a system with criteria that TRIS already meets to a large extent – searching by topic and search results that describe materials from authoritative sources. Clearly, there is a need to educate practitioners on the availability of existing information resources. A national transportation library could provide leadership and direction in this area.

There is also a need to teach practitioners to search. Because search interfaces vary considerably, some expertise is required to use them effectively. Many transportation practitioners may not be aware of the default logic implicit in a search statement and may not realize that the wild card symbol can differ from one system to the next. The result is lower precision and recall in search results than would be achieved by

an experienced searcher. Again, a national library could provide leadership in training practitioners to use information resources.

Beyond the issue of tracking down information that does exist, there are concerns from the practitioners' point of view about desired information resources that may be unavailable or difficult to find. As mentioned in Chapter 2, many practitioners would like to have convenient access to the kinds of information listed below:

- Quick-study formats: synopses, executive summaries, and synthesis reports -- database abstracts that emphasize research results rather than research approach would help in some cases
- Expertise locator
- Readily accessible technical data
- Subscription service by topic that sends summary of latest happenings by email
- Readily accessible standards and specifications
- Best practices
- Practical "how-to" materials – course materials and video demonstrations
- Web publications with graphic/visual content

Email lists, informal networks, and clearinghouses may provide such resources, but they are not always easy to find. FHWA's communities of practice have potential, but such efforts may languish if they rely entirely on volunteers. They seem to prosper more if an expert is assigned the job of seeking out information and promoting discussion. However the task is accomplished, the transportation community should address the issue of providing practitioners with practical information resources in formats that are convenient to use.

In summary, there is work to be done to empower users of transportation information. Transportation practitioners as a group have had little training in use of information resources, and even those in organizations with libraries may be unaware of the rich resources available to them. Personal access to the Internet bypasses information specialists, which may be appropriate for many situations. Yet such bypassing tends to spill over to the opportunities where information specialists should be used. End users may make decisions based on an incomplete literature review, resulting in potentially less effective decisions, duplication of effort, and greater cost.

Obtaining Documents

If an end user does not have access to an information specialist/librarian, he/she may need to rely on his/her own resources to obtain copies of documents. A colleague may be willing to lend, but if that is not an option, obtaining an out-of-print document may be impossible without interlibrary loan. In any case, the effort may prove time-consuming and expensive.

Purchasing a document for one user is more expensive than borrowing it through a library. As noted in *The Value of Information and Information Services* report, firms

without libraries spend two to four times more to acquire information than those with in-house libraries.[6]

Many potential information users are not aware of sources of documents. Although more and more documents are available in full text on the web, it is not always easy to find them. Services such as NTIS are not well known among transportation practitioners.

Lack of participation in OCLC is another impediment to obtaining information in the field of transportation. The holdings of many transportation libraries cannot be discovered because they do not participate in OCLC, and their catalogs are not on the Internet. Libraries without access to OCLC are not able to see OCLC holdings and must rely on other networks for borrowing.

Access to OCLC is a solution only if a document is owned by a library. A study by Bonnie Osif found that eleven percent of the English-language documents in the Transport database, which combines the records of TRIS and OECD's ITRD (International Transport Research Documentation) database, are not available through standard borrowing or acquisition procedures (e.g., OCLC or NTIS). In addition, a much higher percentage of foreign-language documents are similarly not readily accessible.[7]

Of the literature indexed in the Transport database, documents described in ITRD records are the most difficult to acquire. Although the U.S. can learn much from the research of other developed nations, there is no coordinated effort to see that it is readily accessible to U.S. transportation researchers and practitioners. Users of the Transport database may become aware of foreign documents important to their work, but may find it impossible to acquire them. There is no organization with the mission to collect all literature indexed by ITRD and no organization to coordinate the efforts of libraries that might be willing to help. The result is difficulty in obtaining needed information.

SUMMARY

Transportation lacks a national perspective with respect to management of transportation information, which has led to gaps in collecting, indexing, and retaining information. Specialized transportation libraries are few and far between, and many of those are not members of OCLC, the most important library network for sharing catalog records and materials. The many transportation practitioners who do not have ready access to information services are at a disadvantage when it comes to identifying and acquiring information that might help them in their work. Lack of ready access to appropriate information may often result in less effective decisions, duplication of effort, and greater cost.

Specific gaps and action items to correct problems discussed in this chapter include the following:

- Share the cost and responsibility of identifying, collecting, and cataloging information resources
- Provide grants to institutions to support these activities
- Participate in discussion and implementation of national and international information standards
- Promulgate the use of information standards to promote information sharing
- Implement procedures for permanent access to electronic documents
- Provide means for transportation practitioners to express their needs concerning topic coverage, information formats, user assistance, and user interfaces
- Provide more resources to identify and collect information, especially from abroad and from publishers outside the mainstream
- Support redundant collections so that resources are held by more than one library
- Support an organization with the resources to identify, acquire, index, lend, and preserve materials that are not likely to be purchased by a state DOT or university library
- Review and distribute collections of transportation libraries that close
- Archive and preserve print materials on a permanent basis
- Develop guidelines and procedures for publishers concerning distribution of documents, including some that are presently considered "unpublished"
- Educate publishers concerning distribution of documents
- Gather and share lists of publications issued by transportation agencies
- Collect all of the documents indexed in the ITRD database and house them in a U.S. library or libraries
- Provide librarian support for transportation practitioners through a national library or through a system of regional libraries
- Provide grants to institutions for regional libraries
- Support a program to educate transportation practitioners concerning the range of information resources available and their use
- Provide centralized information about communities of practice, email lists, and topical clearinghouses
- Support the development of a network of transportation libraries to facilitate interlibrary loan, shared collection development, and training for library staff
- Expect professional competencies from information staff
- Support involvement of information staff in professional organizations
- Expand subject coverage in TRIS
- Implement consistent standards for TRIS records, including standards for abstracts
- Develop the kinds of information resources requested by practitioners such as expertise locators, subject summaries, email newsletters, and email alerts

CHAPTER 6. MODELS AND A STRATEGIC FRAMEWORK FORIMPROVED TRANSPORTATION INFORMATION SERVICES

MODELS FOR INFORMATION MANAGEMENT

This chapter discusses models for information management that the field of transportation could emulate, including models in agriculture and medicine and a model developed in the 1970s for transportation information.

Agriculture

Information management in agriculture is coordinated by the National Agricultural Library (NAL), which was officially made a national library by Congress in 1990 in PL 101-624. This law ensures that NAL serves both as a national library of the United States and the library of the U.S. Department of Agriculture (USDA).[8] First established in 1862, the NAL collection includes books and journals, audiovisuals, reports, theses, software, and artifacts. The library subscribes to more than 25,000 serial titles.[9]

NAL's mission includes the following:

- Acquire, preserve, and manage information resources of agriculture and allied sciences
- Organize agricultural information and information products and services
- Provide agricultural information and information products and services within the United States and internationally
- Plan, coordinate, and evaluate information and library needs related to agricultural research and education
- Cooperate with and coordinate efforts toward development of a comprehensive agricultural library and information network
- Coordinate the development of specialized subject information services among the agricultural and library information communities.[10]

In 2000 USDA appointed a panel, chaired by Larry N. Vanderhoef, Chancellor of the University of California, Davis, to study the NAL with the charge to "…review the activities of the National Agricultural Library in pursuit of its mandate to serve as the chief agricultural information resource of the United States and make recommendations to the Under Secretary, Research, Education, and Economics on NAL's management, staff, programs, and operations."[11] In its August 2002 report the panel concluded that the NAL is functioning satisfactorily as a departmental library but that as a national library, NAL has thus far been unable to meet the expectations or the required intentions."[12]

Access

The NAL staff numbers about 190 librarians, computer specialists, administrators, information specialists, and clerical personnel. NAL cooperates with a large network of USDA field libraries at land-grant universities. Its web page on information research services[13] provides contact information for all of them and requests that those in need of assistance contact their regional libraries first. Requests for copies of documents not available online must be made through a library.

NAL's six national information centers are portals to reliable sources of information in key areas of American agriculture, including alternative farming systems, animal welfare, and food and nutrition. Special projects develop resources in key areas. One such project is documenting the eradication a particularly destructive crop insect, considered a model of the success in combining agricultural research with interagency cooperation. A project manager identified and collected key documents, oral histories, and films that illustrate the history of the program that made eradication possible. The story is told in a multi-media CD-ROM.

Budget

Despite a broad mission, NAL has suffered from flat funding in recent years. The quality of NAL's bibliographic database, AGRICOLA, which is available at no charge on the web, has suffered as a result. There are fewer recent records of international publications and experiment station publications, and abstracts are added to the database only if author-supplied.

The panel appointed in 2000 would like the NAL to emulate programs of the National Library of Medicine (NLM) but also points out the disparities in the budgets of the two libraries, both in total dollars and in percentage increases over the past several years. Their report projects a FY 2001 NLM budget for library operations at $56,752,000, complemented by a projected budget of $9,500,000 at the National Institutes of Health Library. It projects the NAL budget for the same year at $20,400,000. NLM's budget for library operations doubled from 1991 to 2001 while NAL's budget increased at half that rate. (See Appendix C for additional information.)

Future Directions

The panel's recommendations call for the NAL to develop a dynamic agricultural information system that would do the following:

"…draw on innovative technologies to directly link users to quality content (abstracts, full-text, data, and information packages) in all areas related to the sustainable management of natural resources in the support of the total U.S. food and fiber enterprise. Included would be a complementary mix of services including a greatly enhanced AGRICOLA database, a series of comprehensive and topical web sites, 24/7 document

delivery, and all interconnected through a powerful search interface providing users with the closest approximation possible to a 'one-stop-shopping' reality."

By way of further explanation, the panel says that, "The NAL should change its self-concept from being a place to that of performing customer-driven functions, and its national role from being the place where every item is, into the role of being the hub through which every item can be obtained online anytime."

Medicine

NLM, a part of the Department of Health and Human Services National Institutes of Health, is the world's largest library of the health sciences. Its statutory basis is stated in 42 USCS 286, and its mission includes the following:

- Assist the advancement of medical and related sciences and aid the dissemination and exchange of scientific and other information important to the progress of medicine
- Acquire and preserve collections
- Build, publish, and disseminate catalogs, indexes, and bibliographies
- Make available copies of library materials
- Provide reference services
- Publicize the availability of library products and services
- Promote the use of computers and telecommunications by health professionals for purposes of improving access to biomedical information for health care delivery and medical research
- Establish regional medical libraries where there is a need for them
- Accept gifts for the benefit of the library

Breaking with more than a century of tradition and practice, the NLM Board of Regents, at its May 1999 meeting, formally affirmed that NLM should seek to serve the general public as well as the health professions. This step was made possible by the growth of the World Wide Web and widespread acceptance of NLM's free Medline service. Because Medline was originally designed for librarians, researchers, and health professionals, new products are being developed to provide information on health topics to consumers.

Access

To encourage the widest possible use of the library's information products and services, NLM engages in a variety of outreach activities that involve the National Network of Libraries of Medicine (NNLM). NLM funds the network through eight regional medical libraries, each responsible for a geographic area of the country. Those institutions, together with 140 large academic health science libraries and more than 4,000 hospital libraries and other libraries in the network, provide information services to scientists, health professionals and, increasingly, the public.[14]

A web page at http://nnlm.gov/members/ allows end users to identify libraries in their states that will assist them in the following activities:

- Reference services
- Access to books and journals
- Database search training
- Database searches by librarians
- Internet training
- Copies of articles

The Loansome Doc™ service allows anyone to register with a library to order the full text (usually a photocopy via mail or fax) for references retrieved in an online search of the NLM databases. Many libraries do charge fees for the Loansome Doc™ service.

More than 23,000 serial publications are received regularly by NLM, and hundreds of pieces of health information in many formats arrive daily. Increasingly, the information is in digital form, and NLM, as a national library responsible for preserving the scholarly record of biomedicine, is working with the Library of Congress and the National Agricultural Library to develop a strategy for selecting, organizing, and ensuring permanent access to digital information. Part of the effort involves developing a system of metadata for managing, displaying, and retrieving data in digital archival systems.

Budget

The $56 million mentioned above for library operations is but a portion of the total NLM budget, which exceeded $280,000,000 (appropriated) in FY 2002.[15] NLM supports programs of grants and research and is noted for its work in the area of informatics, which includes such topics as data and knowledge capture, knowledge and concept representation, medical natural language processing, and integration of disparate information sources. NLM has also funded a variety of innovative telemedicine projects that demonstrate the application and use of the capabilities of the Next Generation Internet. (See Appendix C for budgeting information.)

Future Directions

The NLM has a successful history of long-range planning. In 1985 the NLM Board of Regents began to develop a 20-year plan to guide the library in using its human, physical, and financial resources to fulfill its mission. Supplemental reports in the years following addressed specific topical areas. In 1999 the Board of Regents asked the director to prepare a new long-range plan for the library for the next five years. The *Long Range Plan 2000-2005* lays out ambitious goals. In addition to traditional roles, the plan emphasizes seven areas:

- Health information for the public
- Molecular biology information systems
- Training for computational biology
- Definition of the research publication of the future

- Permanent access to electronic information
- Fundamental informatics research
- Global health partnerships

NLM's ability to plan and to carry out its plans has propelled it to the forefront of information services and technology. Its products are generally considered to be among the best in the world.

TRISNET

Thirty years ago a Highway Research Board committee developed a detailed plan for a national network of transportation research information services. The committee concluded that "technical information needs of the research community can be met effectively and served best by a transportation research information system that is an evolving network of services and users, and whose overall scope and capabilities are coordinated at the national level."[16] It defined the research community broadly to include not just research and development (R&D) directors but also individuals and organizations that are engaged in transportation administration, planning, and engineering. The committee further stated, "The terms transportation R&D, or transportation research, must be construed to include all transportation research and development and undefined portions of transportation planning and engineering activities."

Organization

The four major components of the proposed system were the user community, the network of information service providers linked to one another and to users, the information that exists in various forms within the system, and a mechanism for coordinating the information scope, coverage, products, and transfer procedures throughout the system. Excerpts below from the report further explain the committee's view of the four components:

- User community and its needs:
    - Users need to know the scopes, resources, and capabilities of existing information services.
    - From any point of entry, users need speedy and sure access to information that exists at every point in the system.
    - Users need information analyses and syntheses in relatively narrow but critical areas.
    - Users need specific information in response to direct questions.

- Information services and related needs:
    - Service providers should know the critical needs of users and should provide products that fulfill these needs.
    - Gaps, ambiguities, and undesirable redundancies in the overall scope and coverage of transportation research information by existing services need to be identified and rectified so that the whole field is efficiently served.

- Weak and missing linkages among existing services need to be strengthened and completed so that any service is a point of entry through which a user may draw upon the capabilities of the entire system.
- Each service provider should know the capabilities of other services so that referrals can be precise and minimal.
- The system as a whole needs professional capability for analyzing, synthesizing, and refining its information holdings and for providing users with specific information upon request.

- Transportation research information and related needs:
  - Information holdings need to be purged and refined so that users are not presented with redundant, obsolete, superficial, or ambiguous information. This need is especially prevalent with respect to research-in-progress information.
  - Consistent with the above need, resumes for all transportation research projects and surrogates for all transportation research documents should be made available in hard copy and machine-readable form to any service provider in the system.
  - The surrogate file should contain references to data collections that are within the scope of transportation research information.
  - Machine-readable records and their data elements should be transferable and convertible from one service to another without information loss.
  - A full-text version of every record in the surrogate file should be within easy access of every transportation research information system service provider and user. Each surrogate should refer to at least one document repository and corresponding accession number for the document it represents.

- Coordinating mechanisms and related needs:
  - The coordinating group should know first-hand and on a sustaining basis the information problems and needs of both the users and the information service providers in the system.
  - The coordinating group should work with national and international organizations whose objectives include or interact with TRIS objectives. Liaison with information infrastructure of the U.S. DOT is of particular importance.
  - The coordinating group needs a factual basis for determining gaps, redundancies, and deficiencies in the scopes, coverages, and linkages of existing transportation research information system services. From this basis the group should identify needs and recommend ways to improve the system.
  - The coordinating group should promote the development and implementation of information processes and products that are most responsive to the needs of the user community.

Implementation

The committee recommended five initial steps to implement the Transportation Research Information System:

1. Establish a coordinating committee
2. Develop a resources inventory
3. Develop a machine-readable database to contain project resumes and document surrogates
4. Reference at least one document repository through which the full-text document could be acquired for each surrogate in the database
5. Analytical capability by transportation specialists who would provide analysis and synthesis of information according to the specialties of the service and extension of the service into the user community on a person-to-person, question-and answer basis[17]

The committee recommended that the costs of the first four implementation steps be shared by the sponsors of the existing information services (mainly at associations, universities, and government agencies) most directly involved and that U.S. DOT provide additional support that might be required. The costs of upgrading the staffs of existing services (Step 5) were to be borne by the individual service providers.

Reports in 1973 and 1975 refined concepts presented in the original report. TRISNET was conceived as a coordinated network of libraries, document repositories, abstracting and indexing services and other types of information centers that provide information services to users of transportation research information. The four major components were similar to those in the original report, but the vision was circumscribed. There was more emphasis on the online system and less on personal service to users. The components are described here in an excerpt from the 1975 report:

- Abstracting and Indexing Service (AIS) Component. Elements are services that provide reference information on transportation research projects, transportation documents, transportation data, and other forms of transportation research information.
- Document Delivery Service (DDS) Component. Elements are libraries and repositories that respond to requests for documents that have been referenced by the AIS component. Examples are the Northwestern University Transportation Center Library and the National Technical Information Service.
- Online Service (OLS) Component. Elements are one or more centers that collect reference information from the AIS component, organize the references for online storage, provide online retrieval service for stored references, and provide online ordering service for document delivery.
- Communication and Coordination Center (CCC). Elements are a TRISNET Advisory Committee that provides advice and guidance for TRISNET development and operations, a TRISNET Managers Council that defines and implements cooperative tasks that are necessary for the attainment of TRISNET

objectives, and a TRISNET Secretariat that is a focal point for internal and external communications and that provides staff support to the other CCC elements.[18]

Perhaps because it was ahead of its time or perhaps because there was no high-level support within the U.S. DOT, TRISNET was never fully funded or implemented. Discussion of TRISNET did, however, raise the interest of the research community in having a unified information delivery system. Most U. S. DOT modal administrations provided support for a period of time, and TRIS survived, even after some of them withdrew as sponsors.

Current Status

Current technology makes it much easier to provide some components of TRISNET than the available technology of the 1970s. End users can search TRIS Online from their desktops, or an information specialist can search on their behalf at minimal cost. E-mail is available for receiving questions from users and sending replies. OCLC provides the infrastructure to disclose which organizations own particular documents and to manage requests for copies.

The current infrastructure of institutional and human resources would require further development to realize the vision of TRISNET. As noted in Chapter 5, there is no one coordinating mechanism for information services in transportation. With respect to the information services envisioned under TRISNET, there are too few information specialists to meet the individual needs of all potential end users.

MODELS SUMMARY

The networks and activities associated with NAL and NLM and the proposed TRISNET can serve as examples for what a system for transportation information management might encompass. NAL and NLM are legislatively mandated to serve as national libraries with responsibilities to coordinate with other libraries and develop and retain collections. A coordinating council, such as envisioned in TRISNET, might be able to fulfill a similar role but not without funding to support collections and services at the institutions participating in a network.

Given the proper authority and funding, the National Transportation Library might also be able to assume a significant leadership role in the management of transportation information. One thing that must be clarified is that the existing National Transportation Library, while having a similar name to the national libraries for medicine and agriculture, is only a small program operated by the U.S. DOT Bureau of Transportation Statistics resulting from language in the Transportation Equity Act for the 21st Century. The National Transportation Library has no legislated funding, currently operates under a narrow interpretation of its mandate and, unless specifically addressed, and could be dropped in the next transportation act.

A STRATEGIC FRAMEWORK FOR IMPROVED TRANSPORTATION INFORMATION

Two Major Decisions

There are two major decisions to be made about supporting more effective access to and availability of information: 1) Does the transportation community want improved transportation information management, and 2) if yes, to what degree?

The first major decision is a "yes" or "no." For the initial decision, the two basic responses are:

- do nothing, that is, let the general forces at work provide whatever impetus there may be to enhance or dismantle capabilities that exist today for those in transportation to do the best job they can; or
- provide some level of commitment to move forward the national agenda of having transportation professionals to do more with less – increasing productivity, enhancing quality, and enabling better stewardship of resources.

The second major decision, if required, examines the degree to which commitments should be made to these topics of importance to transportation leaders throughout the nation.

Do Nothing Alternative

Unfortunately much of the discussion to date on the subject of information availability focuses on items of lesser importance, such as the cost of libraries and the comparison of physical libraries to online access to information, not on the contribution information makes to the excellence of job performance and the best stewardship of transportation funds. The initial decision is a strategic decision, yet the subject is usually discussed at the wrong level – the tactical level.

Strategic Considerations

Moreover, the tendency to discuss the issues and problems at the tactical level adds to the lack of discussion of the full subject on a national level by decision makers and influential voices in the transportation community. Information access, for example, is relegated to the issues of full-time equivalent personnel, who can be online and places to store reports produced by the organization. These issues are simply not important enough to surface in the national (or public) debate. It is no wonder that information access and availability are rarely discussed at the national level, and in particular not discussed in terms of the greatest importance – that of its strategic contribution to the effectiveness, quality, and stewardship of resources for the business of transportation. Transportation leaders do not have the time or the inclination to discuss such issues on the national level when faced with other subjects that they perceive have higher strategic importance.

The resulting question is, "Does discussion of the strategic implications of increasing the effectiveness, quality, and stewardship of resources belong in the national discussion?" Of course such value-enhancing subjects do. However, before information management is discussed at the national level, it must not only have the requisite foundational value-enhancing capabilities, but it must be perceived as a strategically important activity, having great potential for high returns. It must capture the vision of leadership within the domestic transportation community. This vision must be sufficiently strong to transfer into action. Furthermore, the leadership must be informed of the merits of information management as compared to other strategically important high payoff activities now capturing its attention.

But at present the leadership is not properly informed on the subject to respond to an action-inspiring vision. There is little written on the strategic nature of information management for transportation, and especially little directed at the level of the transportation community's leadership. A reference about the strategic nature of information is made in *The Value of Information and Information Services* report mentioned earlier. Information is discussed as a strategic asset that "provides the greatest potential payback to the organization." Moreover, this report notes that "information is an asset and it requires management. Unlike other assets though, information is reusable. It does not deteriorate or depreciate." [19] While this reference is an excellent motivator for transportation leaders, more such references to the transportation sector are needed.

There are additional hurdles to having a sufficiently informed leadership. When anyone in the transportation community, particularly including its leadership, expresses thoughts about whether access and availability of information is important, the answer is invariably, "It's very important; we need reliable and timely information." There is a universal and tacit agreement of its import. Implicit agreement on a maxim that has little quantitative or qualitative justification is hollow and powerless. Unless leadership is effectively informed about the potential high-payoff of properly managing this important asset, there will be no national strategy and no opportunity to enhance the productivity, quality, security, and stewardship of resources within the transportation community.

Barriers to Action

Capturing leadership attention for more effective transportation information management has additional hurdles to overcome. Not only is the leadership lacking in foundational material about the strategic importance of the topic, there is not enough information available that quantitatively identifies the potential for high payoff. Because some of this "legwork" has not been done in the transportation arena, the subject is perceived as only able to produce "intangible results" and is "hard to get a handle on benefits" and consequently passed over for the next activity that has "run the numbers with positive results."

A subtle factor also increases the inability for transportation leadership to grasp the strategic importance of effective information management. Few if any of the leadership in transportation today have had a background in the disciplines of library and

information sciences. There is no identification with the issues, and there is a chasm separating the understanding between the information professionals and the leadership of today's transportation systems.

The economic downturn currently affecting many transportation organizations presents another significant barrier for decision makers to become knowledgeable about the role and benefits of effective information management for transportation practice. During the economically hard times, actions focus on established and well-accepted cost-cutting strategies. In fact, information-related activities are easy targets for cuts to generate short-term bottom line cost reductions. In addition, there is little political will to forge ahead with an initiative that is unfamiliar and most probably will incur costs up-front even though it has high potential to yield substantial future benefits. Furthermore, there will be no "quick fixes" – this is a long-term effort, consensus must be developed and momentum must be built to carry actions forward over the lifespan of the initiative.

Cooperative Efforts

There has been some progress through individual organizational commitments and a relatively minimum amount of cooperative effort. The most significant work has been that of the AASHTO RAC in support of the Research-in-Progress database, the Transportation Research Board sponsorship of TRIS, the contribution of records to TRIS by the transportation libraries at Berkeley and Northwestern, a few lead DOTs, and the efforts of the BTS National Transportation Library in making TRIS available online and its fostering of collaboration among the midwestern states' information professionals. There has been significant devolution as well. Currently, for example:

- The U.S. DOT libraries primarily provide services internal to the department, rather than to the transportation community at large, as occurred in the past.
- Information expertise and facilities are shrinking among state DOTs, even those considered leaders in information expertise.
- BTS cut its upcoming budget for collaboration among states' information professionals.

In reality, the "do nothing" alternative is not zero-sum; it is the scenario that inevitably declines, taking two steps forward and three steps backward. This scenario allows regression of capabilities through termination of activities or limited budgets that little can be done except house a small collection of readily accessible publications. The "do nothing" alternative for the first major decision equates with less collaboration and more duplication of effort, more reliance on the inadequate resources of the Internet, fewer physical and human resources to mitigate the shortcomings of the Internet, and increasingly greater unmet needs for timely and accurate information. It's a picture of information gridlock with no congestion management system to provide a measure of relief.

Looking Ahead

Will this eroding scenario continue? Considering the increasingly negative effect, the "do nothing" scenario is not viable. It is incumbent upon the leaders and decision makers in the transportation community to recognize that there is strategic value to fostering effectiveness of information management for today's transportation professionals. Furthermore, with the current awareness of security needs, information and its strategic value now becomes a uniquely critical aspect of transportation management.

Even with the current environment encouraging the "do nothing" alternative, some in the transportation community are open to lifting effective management of information to a position of strategic importance. There is a cadre of information and library professionals within transportation who are knowledgeable about the strategic importance of effective information access and availability of information. Also, there are transportation leaders who understand the cause and effect relationship between effective information access and availability and the resultant productivity, quality, and stewardship of an organization.

Three Levels of Commitment – Action Alternative

Glimpses of the usefulness of information management on a national scale make the second major decision relevant and exciting. What can and should be done?

Three distinct levels emerged from background research and examination of the needs and expectations of those interviewed in conjunction with this study. As anticipated, enhancing the access to and availability of information had merit for all the interviewees whether they were a newly hired engineer or a seasoned veteran with decades of experience and now in a leadership position. The levels of support must occur on a national scale. Efforts of individual organizations, while helping to slow the erosion of capabilities, will not achieve national results. Without a national response to the subject, the commitment slips into a form of the "do nothing" scenario where each organization does what it can. However, a national approach will capitalize on the strength and synergy of many resources working toward the same goal, reducing duplication of effort, multiplying the impact of resources, and enhancing every player's return on investment.

Level 1--Breadth

Breadth assures that the system of information supporting performance of today's transportation responsibilities is sustainable. The most basic element for sustainability is a nationwide coordinated approach to keep the supply of information available and accessible. Level 1 deals primarily with improving the information infrastructure by having all state DOTs and the U.S.DOT and its modal administrations participate.

At this level, all state DOTs are members of a service network such as OCLC, which when used in concert with TRIS and other databases can identify the location of a document. This system would also be a primary vehicle for facilitating interlibrary loans. While it has proven difficult for state DOT libraries to keep up-to-date in submitting information to such databases, it is critical that states allow others to know what is available. At Level 1, state DOTs have all of their unique documents entered into the system as well as into TRIS and the RIP databases. Federal transportation publications, likewise, are entered as well. A lead organization with national purview would administer Level 1 activities.

Level 1 enables all transportation documents produced by the states and those considered of importance to the states to be accessible by every state DOT. Level 1 effort requires that those producing or having collections of information make known the information's existence and make it readily available. Level 1 involves indexing and abstracting published materials and research in progress as well as creates one catalog of all members' individual catalog listings, which becomes the definitive reference for what is available.

Currently, this portion of the required Level 1 foundational infrastructure is being piloted through the Midwestern Transportation Knowledge Network. A complete Level 1 system implements the process throughout the nation so that every state DOT has direct access to readily available published transportation resources considered important by state DOTs. At this level there is also a need for the continued development of capabilities within the state DOT organizations to sustain a system of information management. It is critical that states be fully contributing members of a national system.

Level 1 also provides enhancements to TRIS so that users can get a copy of all items it contains whether full text online or through loaned documents or purchases. At this level, all state DOTs and federal transportation organizations' entries are up-to-date. Efforts accomplished in Level 1 use the expertise currently available within the organizations.

The results of this broadening effort will not be obvious to many users. The underlying infrastructure, however, will enable users to receive more complete information in a timelier manner. The strategic return for addressing this level of commitment has high payoff for safety and security, for financial stewardship, for asset management, and for facility operations among many other areas.

As noted earlier in this report, the current information infrastructure has substantial gaps. An example of such a gap was mentioned by one of the individuals interviewed during the course of this study. Not long ago this transportation leader discussed with a state DOT official the need for solutions to a longstanding transportation problem. Shortly thereafter this same transportation leader had the opportunity to discuss results of work performed by a prominent research institute, which clearly solved the problem experienced by the state DOT official. The research institute thought they had spent considerable effort making sure that the transportation community knew of this new

finding. Yet a primary user of such information was totally unaware of the existence of the study. This is not an isolated example; evidences of this simple gap abound. The cost of not having the data for the state DOT official was extremely high. Only through serendipity did this need and solution happen to intersect. While there is definitely a place for personal networks, which allow such occurrences to foster technology transfer, reliance on these "by chance" networks as a foundation for the information infrastructure is not appropriate. Level 1 provides a solid basis for knowing what state and federal documents are available and accessible.

Level 2--Depth

Depth builds on the foundation created in Level 1 by enhancing the content of available information. Private sector, industry organizations, academic institutions, and local and municipal government must be included in this level of the information infrastructure. International sources must also be considered, as they are becoming more accessible due to increasingly capable global communications capabilities. Additionally, deepening the available information for today's transportation professional requires access to a wide variety of publications in disciplines heretofore not considered important to the business of transportation. As in Level 1, information that is in existence must be readily accessible in any number of formats – including online full-text searchable documents that can be printed in a transportation professional's office as needed.

Transportation professionals must receive accurate, trustworthy information upon which to make decisions. Therefore, particularly for electronic documents received through Internet search engines, quality of the information, and reliability and dependability of the source are major issues addressed in Level 2. To-date there are few standards of quality, no guides for determining the reliability of a source, and little assurance that the information will continue to be available in subsequent searches for the information. To assist in quality assurances, at this level there is more involvement from information professionals to locate and acquire copies of documents or the links to full-text documents from authoritative sources. When using the Level 2 system, transportation professionals will know that they are using accurate, trustworthy information.

Level 2 also begins a formalized process of creating summaries for published documents. These summaries have more substance than a brief abstract and fully describe the contents of the report, including findings and conclusions. Standard criteria for the content of summaries would be developed. Summaries are a primary means for transportation professionals to receive a quick, accurate overview about the developments in a topic. Because so much information is being created, summaries may well become the most effective means for transportation professionals to be knowledgeable about all the issues concerning specific areas of interest.

Level 2 fosters activities for creating greater capabilities for electronic access to information, focusing on making more documents available electronically as well as providing a permanent location for the documents. Level 2 also incorporates the means

to archive and preserve physical documents for future access. A significant aspect of preservation is identifying and making available the unique reports and publications from the personal collections of today's transportation leaders and from libraries that are being closed. A wealth of information for tomorrow's transportation professional is simply disappearing because there is no system within the information infrastructure to house and make available such items from these valuable collections. To assure robust resources in the future, a number of depositories for publications are required. A decentralized approach can be used through building collections on unique topics at various existing libraries. Yet a coordinating function is necessary. A national library could identify, acquire, index, lend, and preserve materials that may not be acquired by a state DOT or other library, could coordinate the activities of other libraries, and play a primary role in effective information management.

Level 2 also requires an oversight body, which sets standards, manages funding, monitors progress on closing system gaps, and facilitates training and education for information staff as well as transportation professionals, including decision makers and other users of information. Additionally, this level requires greater resources, e.g., funding for transportation organizations to support the activity and participate in the information infrastructure. At this level transportation professionals can access a greater amount of information independently, and information professionals will add even greater value to the system because their expertise is being used more effectively.

Achieving a Level 2 system for information access and availability explicitly addresses needs identified through the survey conducted in connection with this study. Transportation professionals identified the lack of quality, the need for document summaries and access to literature on topics not traditionally considered transportation references. However, such activities cannot be done without commitment to Level 1 efforts. The fundamentals must be developed so that the services deemed most useful at this level can be made available.

Level 3-Connectivity

Connectivity uses the foundation built in Levels 1 and 2 to create an Internet-based portal to access and acquire information. This portal provides the highest level of individual access to information coupled with an effective use of information professionals' expertise. A Level 3 system has the ability to access and make available published information and document summaries on a subject basis with links to best practices and includes peer-to-peer exchange capabilities. This system is the greatest level of support for deriving maximum value from the information required to perform the business of transportation throughout the nation.

As in Level 2, Level 3 requires a coordination function and an oversight body that provides policy and procedural guidance. As the capabiliites of the system become more complex, the responsibilities of this oversight body will grow. The most noteworthy aspect of this level is the seamless system in which document format, location of the

information or document, access to the document, and other factors do not hinder the efficient delivery of the information.

Many of the groups interviewed for this study expressed a need for some sort of desktop or local portal for information access. With the advent of the Internet and technological solutions for information capture and communications, there is excellent potential for having a system that supplies reliable, high quality, and timely information. The payback for having information literally at one's fingertips was described as having the ability to make a dramatic impact on today's transportation decisions. Many benefits were put forth, among them:

- Cost savings; safety and security enhancements; more effective stewardship of resources, particularly including human resources
- Higher quality of information and greater access to desired information through practitioner's increased access to information professionals
- Decreased duplication of effort
- Less wasted time and faster problem solution
- More responsiveness to customers.

FRAMEWORK SUMMARY

This chapter set out a framework for a strategic plan to address the user needs and the gaps and problems in the current information infrastructure. The framework assures that the primary members of the information suppliers and the information users, the state DOTs and the U.S. DOT, are full participants of the information system. Such participation involves making accessible readily available documents and materials produced by the agency. Furthermore, the attention to sustaining and enhancing information services by these agencies are foundational to an effective information management system. The framework also focuses on increasing the amount of information available through addition of a greater depth of materials heretofore not available to the transportation community. Such materials may be from non-traditional transportation disciplines, international information, information that is important yet tends to have a relatively short life span, unpublished materials, and media sources other than printed documents, among many other types. The framework also includes a system having a single portal via the Internet that links suppliers, information intermediaries, and users of information along with the information professionals. The framework describes the necessity for a capable oversight body to set standards and policy and to be an advocate improvements to the information infrastructure. The strategic return on the investment for such a framework ensures less waste of resources, more accurate decisions, and more efficient projects and programs.

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CHAPTER 7. ECONOMIC RATIONALE

The transportation community has never comprehensively addressed the economic advantages of applying a strategic approach to managing information. Nevertheless, the information and library literature has case examples that show the benefit of information for decision making and for supporting primary business functions. Unfortunately there is very little published that directly discusses the value and return on investment for transportation operations. However, in the1998 FHWA report, *The Value of Information and Information Services* a number of excellent examples of the value of information within the transportation arena are given. Several are:[20]

- "New York State DOT (NYDOT) estimates life-cycle cost savings of nearly $9 million per year resulting from a new concrete mix for bridge decks that was developed as the result of a literature search. The new mix was implemented by NYDOT in less than a year."

- "Illinois DOT saved approximately $300,000 through access to research at Louisiana State University on heat-strengthening of steel bridges."

- "An in-house librarian at Paccar, Inc., joined a task force to reduce the turnaround time for findings from a vehicle test track. The test results, with digitized photographs, were made available on the corporate Intranet within 1 to 6 days instead of the usual 1 to 6 months. The speedier access to the test track data significantly reduced the engineering design cycle."

Any one of these examples shows the high return for investment of information and the value of being able to get to the right information at the right time. The problem is that the current information infrastructure does not allow transportation managers and practitioners to get all of the information they need all of the time and in time to make critical decisions. A large part of what is available to the transportation community can be accessed only by an information services professional, and many other publications are not known to be available outside the office or agency producing the material.

ACCESS IMPACTS

In a recent paper Jerry Baldwin, Minnesota DOT, wrote about searching for information using conventional search engines, the TRIS database, and the Knowledge Network, a pilot project, being built by the midwestern consortium of libraries and sponsored by BTS. [21] Out of 100 documents selected from the TRIS database, copies of only 35 percent of full-text electronic copies could be located on the Internet, i.e., available at the person's desktop. That implies that an individual search from a desktop may miss about two-thirds of the available information. Searching the OCLC database, generally available only in organizations with libraries, increased the ability to find items by more than twofold.

Baldwin's study goes on to determine the ability to access a document out of a selected 200 publications contained in the unified catalog of holdings of the Knowledge Network. (One of the functions of the Knowledge Network effort is to identify and catalog unique holdings from the midwestern state DOT members.) Only about one-half of these documents could be identified in TRIS Online or Google. This shows that access to the Knowledge Network catalog will allow users, who cannot presently search OCLC, to identify considerably more literature than they can now. For the states not participating in the pilot project, this also gives an indication of the lack of access to important information that is characteristic of current practice.

COST AND TIME SAVINGS

Consider the cost and time savings shown by the several examples at the beginning of this section. Not all state DOTs will find one set of information that will save $9 million a year, but many or all can find material that will reduce costs by hundreds of thousands of dollars. If a state DOT finds just one significant finding per year, say worth $250,000, the business case for providing a national strategic plan for transportation information is easily made. Furthermore, locating information for a few significant findings every year is a reasonable objective for each state. Extending this objective to all 50 states amounts to substantial annual cost savings for transportation that would save resources and more than pay for the desired improvements to current practice.

The cost of accomplishing Level 1 is relatively modest. The BTS National Transportation Library is contributing the costs of a project manager for one year to assist in accomplishing its Knowledge Network pilot project. In addition, BTS estimates that state DOTs are spending approximately $10,000 per state of Knowledge Network project funds to get the most important unique holdings cataloged and thus available and accessible. These state DOTs are using their currently available library professionals to participate in the Knowledge Network. These staff resources are committed in concert with the ongoing library activities and have not generated major degradations in services to the DOTs. Other states are cataloging all their holdings whether unique to the state DOT or not. A typical state DOT having 13,000 publications to catalog estimates a total cost of $100,000.

For the remaining 39 states (those other than in the Knowledge Network) $12,000 (excluding some agency labor) could pay for incorporating the most important unique holdings. These direct costs are something like the funds a state may commit to a pooled-fund research project. If state DOTs decide to spend these funds on joining the Knowledge Network activities, and if the pilot project is extended to national implementation, Level 1could easily be accomplished. The pilot project is a 12-month effort. Getting the remaining states on board could be done in 24 months.

NATIONAL LEADERSHIP

Only a few state DOTs are forging ahead without waiting for the Knowledge Network to be implemented nationally. One state has contracted with an organization to

convert its library to a more modern information services operation with all publications fully cataloged for access through OCLC. There was considerable start up effort to acquaint the contractor with the specific nature of transportation information, and the state also is adding web access to the system. During the project, the contractor is providing 20 hours per week of reference services. At present one quarter of the 10,000-item collection has been cataloged. All of this work has cost $60,000. A majority of the remaining cataloging is anticipated in the second year of the project, for which the state has committed about $75,000. On an annual basis, such an expense is the size of one research project. However, it is difficult for a state to "go it alone," and it requires greater effort for the state than if the Knowledge Network pilot were to be expanded to a national network. Currently, there is no funding for national implementation of the successful Knowledge Network pilot, and this pilot effort of the BTS National Transportation Library has every potential for being successful nationally.

Without a national leader organization and some funds available as incentive, it will be very difficult to get 100 percent participation from the state DOTs. Even a matching program of funds for state use would be a significant incentive to encourage participation. Because the information services topic is not on the strategic level for discussion by decision makers, committing even the amount of one research project to create a national broadening activity of Level 1 is daunting. However, an AASHTO Board of Directors decision agreeing to an initiative within their respective states is all this effort needs to be accomplished. Additionally, federal funding for this work would also be a success driver. The contracted cost for the Knowledge Network pilot project was $144,000, plus a project manager, which covered the cost of creating records of the libraries' most important unique holdings. Assuming that the costs would be similar in other regions of the country, funding amounting to about $450,000, plus project management and some agency labor, would accomplish the remaining state DOT portion of Level 1. State DOTs wishing to catalog other items would then commit their own moneys to accomplish this activity.

In concert with the state DOTs participating in the Knowledge Network, the U.S. DOT modal administrations must also participate by making available their collections. To date there has been little coordinated activity to accomplish such a basic element of the information infrastructure. Much of this work could be done with existing resources.

Activity must begin simultaneously on preparing for deepening the content and making the system even more accessible through enhanced connectivity and improved services, i.e. pursuing Levels 2 and 3. Background materials are not yet available to adequately describe what must be done to further develop the transportation information infrastructure. A policy study, such as those done by the Transportation Research Board, is one of the most effective mechanisms to raise a topic to the strategic level and to attract national attention to a critical issue in transportation.

Traditionally, Congress or public agencies request the TRB to perform policy studies. Approximately $250,000 to $400,000 is committed to perform such a policy study. The states could raise funds and request the Transportation Research Board to

perform a policy study. This study would include a high-level study committee and would produce a TRB special study report. Funds could be raised through state contributions to a pooled-fund study. If all states participated with $5,000 to 8,000 each, a study could be requested.

EXISTING SYSTEMS

Estimating the economic case for Levels 2 and 3 is more difficult. However, budget information from NLM and NAL, described in Chapter 6, can be very helpful in suggesting potential costs. Both NLM and NAL perform services for their respective communities in a fashion similar to what is needed by the transportation community. While the these libraries may be vastly larger than what might be conceived for a similar body for transportation – a National Library of Transportation -- planning for a system of considerable magnitude is necessary. The budget for the National Agricultural Library is currently near $20 million per year and with some substantial technological and other improvements that figure could be somewhat greater.[22] (See Appendix C for additional information.)

Consider a transportation information infrastructure – all accessed online, distributed across the country in various central libraries, which would provide all the services as expressed by the users. Consider also that one of the examples of the benefits of good information management and access to the right information at the right time is a savings to one state DOT of $9 million. Two such incidences in one year could nearly pay for the cost of a national information infrastructure as sophisticated as currently exists within the agricultural community.

Alternatively, if each state found information that saved it $250,000 per project two times in one year, a national savings of $25 million could be realized – also clearly showing that a national system which provides greater access to and availability of information for transportation professionals is worth serious consideration. Such a system has the likelihood to produce returns not only to provide for its annual upkeep, but also for substantial cost savings for the agency users.

SUMMARY

The issue of better transportation information for better transportation practice has been a hidden topic for many years. The potential return for the investment in a significant nationally coordinated transportation information infrastructure is more than sufficient to create what the transportation community needs and wants. A sophisticated, user-oriented, electronically available system of publications and information access is easily within reach because of the potential high-payoff returns of the investment. Transportation decision makers and practitioners can have better information to accomplish their work effectively and enable their overall organizations to perform more efficiently.

It is estimated the average transportation practitioner, performing an Internet search with a search engine such as Google and who does not use an information professional is potentially only accessing about one-third of the full-text electronic information that is available. Moreover, only about half of the participating states' print documents can be found with search tools commonly available to practitioners. Library and information services personnel and resources can substantially increase the potential for access of documents, however, many transportation professionals do not use such value-added services or do not have access to them.

The transportation community is sufficiently unique that it will not be able to directly adopt an existing information model to its application. However, the elements contained in the medical and agricultural fields as well as efforts in transportation clearly show that a more structured, coordinated, and planned approach to transportation information management is essential, is financially viable, and can be accomplished with current expertise and technology.

The benefits, in particular, cost savings, from having access to a broader span of information and a greater depth of quality information, along with tools and education to use them will more than pay for the cost of creating an effective information management system. Documented cases show that users of a more robust information infrastructure will directly experience cost savings based on the use of the system. The greater the use of such a system provides opportunity for greater realization of benefits -- reduced project cost, less duplication of effort, more timely decisions, application of best practice, and more.

CHAPTER 8. THE NEXT STEPS -- IMPLEMENTATION

There are two major steps that will begin the process to carry forward the vision of creating a national system for transportation information management. These actions can be accomplished simultaneously. Once started, they will take approximately two years to complete.

NATIONAL IMPLEMENTATION

The first major step is: national implementation of the BTS National Transportation Library's pilot project that created the Midwest Transportation Knowledge Network.

To accomplish this step state leadership must be informed of the benefits of participation. The funds for this effort could be made available through State Planning and Research, Part II Research moneys. Such a project can be programmed in a state DOT research program. The key for each state leader is to assure this effort is given sufficient priority to be programmed. To assist in this process, members of the Midwest Transportation Knowledge Network can be tapped to mentor other states as these states begin participating in the national implementation of the Knowledge Network.

Alternatively, the national implementation of the BTS Knowledge Network pilot project could be funded from federal funds from a research or planning budget from within U.S. DOT. Few projects have potential return on investment as large as this project, and the sponsoring organization will be credited with significant contribution to the advancement of stewardship of federal-aid funds controlled by the states.

POLICY STUDY

The second major step is: commission a policy study detailing a national strategic plan for transportation information management.

This step also has several actions that must be accomplished. The 50 states can create a State Planning and Research pooled-fund study as the basic mechanism for funding a policy study (using funds from Planning, Part I or Research, Part II). If each state contributes up to $8,000, a significant policy study can be performed. The project can be a research pooled-fund effort. However, funding this policy study with planning moneys involves those traditionally addressing strategic issues considered by a state DOT. Moreover, by involving planning, it broadens the supporting groups within an agency for the effort. Additionally senior managers within the state DOT must also be informed about this study and enlisted as supporters.

Having the policy study performed by the Transportation Research Board Studies and Information Services Division is the most desirable venue for presenting strategically important information to state and federal DOT leadership. A key to the success of this

effort is TRB's judicious selection of decision makers and opinion leaders within transportation as members of the policy study committee.

SUBSEQUENT ACTIONS

Both of these two major steps can be accomplished simultaneously. They should, however, be done independently and not rely on each other to be accomplished. Implementing the Knowledge Network nationwide will make substantial headway in stopping the erosion of services for information access. The policy study will create the plan to move forward in creating a useful system for all transportation professionals.

Several other items should be addressed during the time the national Knowledge Network and policy study are being implemented.

Enlist a cadre of state DOT CEOs and other influential decision makers to support and endorse activities: for example, early policy study results or such potential items as creating a National Library of Transportation. This committee also could be a liaison with other critical issues groups such as national security and work to solidify the naturally occurring links between the two activities.

Consider the NCHRP project 20-24, which recently has funded projects dealing with strategic management within state DOTs as a resource to create awareness among the AASHTO leadership for a national strategic plan for transportation information management and to implement results of the recommended policy study.

CHAPTER 9. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

It is clear that continued effort must be applied to enhancing the system of information access, availability, storage, and preservation for transportation. Every resource consulted during this study points toward the necessity of having more timely, reliable, and complete information for addressing today's complex transportation problems. The problem, its cause and result as well as the solution to a more robust information management system are summarized as follows:

The Problem

- Lack of a full complement of accessible, reliable, and timely information for practitioners, researchers, and decision makers throughout the transportation community
- Unknown quality and limited depth of information content available through the Internet in concert with an overload of information
- No financially sustainable mechanisms to support an effective and efficient information management system

The Cause of the Problem

- Limited coordinating influences for information activities that have a national perspective; no entity in the transportation community has assumed responsibility for oversight of transportation information access, availability, storage, and preservation
- Most executives and other decision makers within the public transportation community are not sufficiently aware of the value and benefits of information management; in particular, they have not recognized information management as a strategic asset that will generate high returns for modest investments
- Users often do not understand the variety of information resources available to assist them in locating what they need
- Eroding support and insufficient resources are causing serious degradation of information services within the transportation community
    - Many agencies have little or no professional information expertise; and few employers and agencies within transportation are committed to professional capacity building for their information professionals
- Agencies responsible to make information available often do not do so; not all documents are catalogued or included in library collections, and many agencies do not report information into databases such as TRIS or RIP.

The Result of the Problem

- Faulty or bad decision making due to lack of information or lack of timely information
- Duplication of effort especially among the state DOTs, which have many similarities in mission, scope, and activities
- Lack of knowledge of best practices, including lowest costs, most effective methods, safest standards, and more
- Reduced efficiencies in stewardship of resources; wasted funds and misdirected effort or use of expertise
- Less technology transfer and innovation implementation
- Inability to find existing information when needed

The Solution

The solution: Perform a policy study that develops a strategic plan for transportation information management

Objectives of the strategic plan include the following:

- Develop national coordination
- Ensure long-term, stable funding
- Provide a sustainable mechanism for the information infrastructure, tools, education, training, and more
- Include all players in the transportation community and clearly identifies their roles (State DOTs/AASHTO, TRB, U.S. DOT and its modal administrations, universities, local governments, associations, and the private sector)
- Change attitudes regarding the importance of information availability and accessibility as a strategic asset

Elements to be included in a strategic plan are as follows:

- National coordination such as creating a National Library of Transportation, a national policy oversight body, and a standards and procedures setting body
- Sources and avenues for stable funding and other resources required to sustain a system for the long term
- Information standards that will promote information sharing and communication
- Identification of organizations which are responsible for items such as collections, cataloguing, indexing, abstracting, loaning, archiving, and preserving materials
- Improvements to existing systems such as TRIS and TRIS Online, RIP, and OCLC; e.g. expanding subject coverage of TRIS
- Tools and methods to enhance the quality of information both hard copy and electronic documents

- Expansion of information content such as: from disciplines traditionally outside the transportation field, international sources, varying types of media, and unpublished materials or those that have historic or short-term applicability
- Enhanced procedures for publishers and distribution of their documents
- Standards and policies for information services and information professionals' skill sets
- Training and education of information system users at all levels
- Permanence of electronic documents and provision for archiving and preservation
- Electronically available system with a single portal entry at the user's desktop
- Effective use of the Internet and new technology
- Value-added information availability, e.g., syntheses, document summaries, expertise locators, linked bibliographies and references in documents, push technologies, and more

CONCLUSIONS

Conclusions of this study are as follows:

- A national vision for enhancing the information infrastructure needs to be adopted. A possible statement of vision is as follows:

  A financially stable, sustainable, and electronically accessible information management system, locally and readily available by transportation policy makers, practitioners, researchers, and the public to efficiently and reliably identify and acquire information is needed to develop, operate, maintain, or use the nation's transportation network.

- Needs of users and suppliers of transportation information must be addressed in strategic planning of the information system.

- Concentration on user training and education must be part of any future planned effort. Use of the Internet and search tools requires a degree of skill to maximize the resources available. With future development of the information infrastructure, users will require additional expertise for continuing effectiveness.

- The current information infrastructure consists of information providers and information users and the various intermediaries that connect them. Within the community of transportation practitioners there is wide variation in ready access to transportation information.

- The overarching issue related to transportation information is there are few coordinating influences with a national perspective. No one entity in the

transportation community has assumed responsibility for oversight of transportation information access, availability, storage, and preservation.

- Although TRIS is the best database available for transportation information management, it could be strengthened with more complete coverage in the closely allied disciplines and with consistently applied standards for abstracts.

- Large numbers of transportation practitioners work in organizations that do not employ a transportation information specialist or librarian. Therefore many information users are not able to access the range of resources available for identifying information. The best commercial databases are available only in organizations with libraries.

- Models of information infrastructures from medicine and agriculture as well as an early plan for TRIS are available to assist in developing a sustainable and reliable system for better managing transportation information.

- The information and library professionals in the transportation community know the gaps and deficiencies of the currently available resources. For some time this group within the transportation community has been discussing these issues on a tactical level, identifying unique problems and seeking solutions. Yet while these professionals have the understanding of what could provide impacts of consequence to transportation productivity, they do not have the influence or opportunity to present this topic at the level on which it should be addressed – a level of strategic importance to the way the business of transportation is conducted in the U.S. today.

- AASHTO RAC and SCOR have a unique opportunity to raise the topic of information access and availability to the national level and begin the process of creating awareness of its strategic importance.

- A decision for no action on this information topic allows the general forces at work to provide whatever impetus there may be to enhance or dismantle capabilities that exist today. Unfortunately with today's investment in the information infrastructure, this is a formula for a steady erosion of services and capabilities.

- A framework having three levels emerged from background research and examination of the needs and expectations of those interviewed in conjunction with this study. The levels of support for a system of information management that is of strategic worth to transportation professionals are:
  Level 1– Breadth: Sustain present level of activities and prevent erosion of services and capabilities by broadening the number of state DOTs and federal organizations that make their information available through existing national services

Level 2 – Depth: Enhance services and expand the reach of the information infrastructure to more participating organizations and to a deeper range of subject content

Level 3 – Connectivity: Provide support to allow a seamless flow of timely and reliable information independent of source and media type

RECOMMENDATIONS

Action and implementation items recommended as a result of this study are:

- **Increase funding to sustain the present level of activities and prevent erosion of services and capabilities**. State DOTs must use their various mechanisms such as SP&R funds to accomplish the framework Level 1- Breadth, described above. Federal research funds also could be committed to this relatively modest up-front effort. The actions resulting will be an interim measure while awaiting outcomes of a policy study.

- **Create a national body to oversee progress on enhancing the access and availability of information.** This body must comprise senior-level decision makers and other information users within the transportation community. (Representatives from federal, state, and local governments, AASHTO, TRB, academia, other professional organizations.) This body must have as its goal the shift of control for future actions on this subject from the library and information professionals to transportation leadership.

- **Implement nationwide, the midwestern states library consortium pilot project** currently managed by the U.S. DOT Bureau of Transportation Statistics, National Transportation Library.

- **Identify an organization and raise funds to conduct a policy study** aimed at senior management in transportation that will:

    - **Initiate basic support for a strategic approach** to transportation information management. Use current advocates for continuing to build consensus among the transportation leadership. Use materials from this report to prepare executive-level information.

    - **Detail a strategic plan or roadmap for the future.** Elements of the strategic plan are as follows:
        - National coordination such as creating a National Library of Transportation, a national policy oversight body, and a standards and procedures setting body -- including where the Library and these bodies are housed and organizational membership or participation
        - Sources and avenues for stable funding and other resources required to sustain a system for the long term

- Information standards that will promote information sharing and communication
- Identification of organizations which are responsible for items such as collections, cataloguing, indexing, abstracting, loaning, archiving, and preserving materials
- Improvements to existing systems such as TRIS and TRIS Online, RIP, and OCLC; e.g. expanding subject coverage of TRIS
- Tools and methods to enhance the quality of information both hard copy and electronic documents
- Expansion of information content such as: from disciplines traditionally outside the transportation field, international sources, varying types of media, and unpublished materials or those that have historic or short-term applicability
- Enhanced procedures for publishers and distribution of their documents
- Standards and policies for information services and information professionals' skill sets
- Training and education of information system users at all levels
- Permanence of electronic documents and provision for archiving and preservation
- Electronically available system with a single portal entry at the user's desktop
- Effective use of the Internet and new technology
- Value-added information availability, e.g., syntheses, document summaries, expertise locators, linked bibliographies and references in documents, push technologies, and more

- **Develop a process to identify and describe unique reports and publications currently held only in private collections of senior transportation officials and ensure the preservation of, and wider access to, these items by including them in resource sharing networks** where they will be accessible to researchers and the transportation community. It is critical to begin providing for such collections now. Many items in senior transportation leaders' personal collections may be lost.

- **Form relationships with private sector and academic organizations** to begin the process of developing their participation in a national system.

- **Begin to create support for a legislative solution** to address the needs for a more robust transportation information infrastructure. The ability to pay for such an information infrastructure will not be secure unless there are legislative solutions reserving funds for information activities. Such legislative intervention for funding will assure the forward motion of the strategic plan.

- **Enlist a cadre of state DOT CEOs and other influential decision makers to support and endorse activities related to the policy study and its outcomes;** for example, early policy study results or such potential items as creating a National Library for Transportation. This committee also could be a liaison with other critical issues groups dealing with other critical issues and would work to solidify links with those activities.

- **Consider the NCHRP project 20-24, which recently has funded projects dealing with strategic management within state DOTs as a resource to create awareness among the AASHTO leadership** for a national strategic plan for transportation information management and to implement results of the recommended policy study.

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APPENDIX A

Scoping Study for a National Strategic Plan for Transportation Information Management
NCHRP Project 20-7/Task 142
Interview and Facilitated Discussion Groups Plan and Protocol

Discussion Session Protocol:

Items in […] are comments and general information, not to be spoken.
Items in (…) are used as a choice of option between individual interview and a facilitated group telephone discussion.

Begin Interview (Facilitated Discussion)

[For an interview, introduce self.] Hello, I'm NAME, I am the…

[For a facilitated discussion] Please introduce yourself and tell us your organization and area of professional interest, I'll start with myself, I'm NAME, I am the discussion facilitator and …

…. co-principal investigator of the study. I am an independent consultant. Areas of focus for my consulting are research and technology management, including technology implementation, transportation policy development and evaluation and customer and stakeholder assessments.

[Have others in the discussion group introduce themselves.]

Thank you very much for agreeing to be interviewed (be part of this discussion).

The interview (facilitated discussion) is anticipated to take about forty-five minutes (one and one half hours).

Brief background and goals of the study:

- The goal is to develop a white paper that presents recommendations for the development of a national strategic plan for transportation information management

- Study staffing: Barbara T. Harder, B. T. Harder, Inc. and Sandra L. Tucker, Texas A&M Research Foundation

- The project timeframe is January – August 2002

- The study will encompass interviews and facilitated group discussions with about 40 people who are users and suppliers of transportation information; including

senior managers/executives, professional and technical transportation staff, and members of the information management community.

- You may decide to answer all questions or respond to only those questions you wish to answer. We do not want you to provide information that you are not comfortable providing.

- Information we are gathering here will be used in the summary or compilation of responses from all the interviews and facilitated discussions. Responses will not be attributed to an individual without the person's expressed consent.

- Our processes for this interview (discussion) have been reviewed by the NCHRP Study Panel and by the Committee on the Protection of Human Subjects at Texas A&M University.

- The project statement concepts are:
  - Jerry Baldwin's quote "[A] large portion of information resources needed by the nation's transportation policy makers and practitioners can not be efficiently identified, located, and retrieved when needed."

  - There is no centralized authority or clearly established network with responsibility for acquisition, indexing, abstracting, and providing access to transportation information resources. These tasks have been addressed by a loosely knit, little recognized group of inadequately funded and under-staffed libraries.

  - Senior management is beginning to recognize the deficiencies in its ability to access information.

  - The advent of digital media, access to full-text electronic information and – adaptation to new technologies

- We are not doing the plan, but we are setting the groundwork for such an effort.

- Want to look at:
  - Customers needs
  - Current practice
  - Problems and issues
  - Recommendations on ways to improve the provision of transportation information services and access to information

- Why are we interviewing you (conducting the facilitated group discussion with this group?)?
  - Expertise in your technical discipline
  - Understanding of the present practice, its strengths and weaknesses
  - Manner in which use information (type of users, suppliers)

- Ability to influence the future

[Note: The following questions will form the basis for each of the facilitated discussions; many of them were used for the session with Librarians and Information Specialists]

[Preparatory thoughts:]

To get you thinking about the topic at hand, please think about recent opportunities you had to seek out published information for the purposes of assisting you with a task or decision. Was the information easy or difficult to find? What channels did you have to go through to find the resource? Was the document or item delivered to you promptly – in time to affect your decision making? [Don't need them to recap the stories about their experiences]

A) Having these thoughts in mind, where did you go most often to get published information?

B) In general is it easy or hard to get the information you need?

Now, what I am interested in for the study is a discussing a system that will promote the availability and access to transportation information for transportation practitioners. I'm looking to find out how such a system might be brought about and to identify the most critical issues that should be included in a plan for such a system.

1) If there were a system that would facilitate information availability for you, what would the primary characteristics or elements be?

- Please give your thoughts on what these characteristics would be:
- What would the system "look like?"
- How would you prefer to interact with that system?
- What would be the necessary elements of and inputs to that system?
- What form would its responses take?
- What would its outputs and methods of delivering information look like?

2) Now that we've identified so many characteristics or elements, are there any that stand out as particularly important – essential?

3) If you could describe a short vision statement for this system that you are thinking about what would it say?

4) To achieve this system, some of the practices now being used are good and helpful. Are there any things being done today that you would incorporate into the system you envision? [Think back to your personal experiences in accessing information that you needed.]

5) Similarly, there are things being done today that may be barriers to the system you envision. What should change from present practice – where are the gaps and problems? [Don't get into discussing the issues; just getting them down is important.]

6) [Review what was discussed in last question.] Thinking of these barriers or problems, do any items stand out as more important than others? What are the top 5 most difficult problems to solve to build a system that really works for you by facilitating availability of transportation information?

7) [Take one or two of the top items and ask how these could be solved.] What are some solutions to these difficult problems?

8) Should there be national-level coordination of a system to provide transportation information?

> 8a) If so, what organization or players should have the lead, and what would their roles be?

9) Whether nationally coordinated or not, how do you think a system for transportation information should be financially supported?

10) What resources are there for us to consider in performing this study? People, articles, etc.

11) Who would be important to notify about this study and who might add credibility and influence to forwarding its goals?

We have reached the end of our time together, thank you very much for your willingness to discuss this important topic.

May I contact you again individually if I have any questions to clarify our discussion today? What telephone number shall I use? May I have an e-mail address for you as well? Thank you again.

APPENDIX B

Scoping Study for a National Strategic Plan for Transportation Information Management
NCHRP Project 20-7/Task 142

CUSTOMER (USER) INTERVIEWS AND FACILITATED DISCUSSION PARTICIPANTS LIST EXPRESSED NEEDS LIST

(Positions Listed at Time of Contact)

STATE DOT EXECUTIVES -- CEOS OR DEPUTIES OF STATE DOTS

Telephone Interviews

- Gary Hoffman, Chief Engineer, Pennsylvania DOT, Chair AASHTO TIG
- Dwight Bower, Director, Idaho DOT (Chair, SCOR)
- Kam Movassaghi, Director, Louisiana DOTD
- Dean Carlson, Director, Kansas DOT
- Charlie Trujillo, Deputy Secretary of Transportation Planning and Design, formerly Chief Engineer, New Mexico Highway and Transportation Department
- Parker Williams, Highway Administrator, Maryland DOT (SCOR member)

State Department of Transportation Executives – Expressed Needs
▪ Information addressed to my level and organized by familiar key words or categories – make some sense out of the information overload and weed out information that is not even closely applicable ▪ Electronic system – desktop access, one portal ▪ Network with links, owner maintains source material ▪ Timeliness – immediate response (high speed connections are great) ▪ Printable documents at my office ▪ Credible source ▪ Easy access – no layers of logons and passwords ▪ Best practice material matched with published information; wants an icon that contains all the things he/she needs at this level, e.g., Best Practices in Managing DOTs – would include best practices, contacts, summaries, reports ▪ Includes traditional engineering information, as well as finance, economics, etc. – all the associated areas dealt with by today's transportation manager and practitioner (national and international sources) ▪ Summary information; synthesis reports, high quality abstracts ▪ Web publications that have graphic/visual content – quick study, clear presentation, maximum content

OTHER DECISION MAKERS

Telephone Interviews

- Denny Judycki, Associate Administrator, Research & Technology, FHWA
- Robert Skinner, Executive Director, TRB

Facilitated Discussion Participants -- Telephone Conference

- John Horsley, Executive Director, AASHTO
- Tony Kane, Director of Engineering and Technical Services, AASHTO
- Robert Cullen, Information Resource Manager, AASHTO

Other Decision Makers -- Influential members of organizations such as FHWA, TRB and AASHTO – Expressed Needs
▪ Electronic system – an expert system that tells user where to go and how to get the information; utterly pragmatic operation ▪ One entry to system, with information that is organized by discipline or theme, with excellent cross-references ▪ Capitalize on FHWA/AASHTO's community of practice concept – published materials available along with best practices information; draw these two types of information more closely together ▪ Concern with accuracy and quality of information found on the web ▪ Enhanced TRIS and the Research in Progress Database (RIP) ▪ Need ability to determine relevancy of what one finds on the Internet – information overload ▪ Hard copy publications still important ▪ Quantum leap is needed to make a difference; if continue at current rate of investment or support in information management, we will have information gridlock

STATE DOT RESEARCH MANAGERS

Facilitated Discussion Participants – Telephone Conference

- Amy O'Leary, Virginia
- Wes Lum, California
- Nina McLawhorn, Wisconsin
- Dick McReynolds, Kansas
- Marty Pietz, Washington
- Jim Sime, Connecticut

Facilitated Discussion Participants – RAC National Meeting, Kalispell, MT

- Various state research unit managers provided feedback to study presentation

Wisconsin DOT Peer Exchange April 2002 – Focusing on Information Topics

Other general discussions about experiences in building information management systems and library capabilities:

- Ray Purvis, Missouri, State Research, Development, and Technology Engineer
- Mike Shea, Missouri, Director of Technology Transfer

State DOT Research Managers – Expressed Needs
▪ Access to other state DOT research activities and plans ▪ Access to other state DOT libraries ▪ Unified catalog of collection holdings among federal, state, regional, and local organizations, associations, private sector, and academia/transportation libraries and ability to exchange publications/information among the group ▪ Human resources -- library and information specialists to facilitate information access and transfer ▪ Full-text searchable documents ▪ Efficient access to physical collection for items not available electronically ▪ Transportation rich index for electronic searching – filter information not relevant to transportation researchers, practitioners, and management ▪ Management of information found on the Internet – concern with quality, unknown whether searches are comprehensive, information overload – no filters for relevance, and often details of research are not able to be found or found in a cost effective manner ▪ Research results in quick study formats: quality abstracting of information, synopses, excellent executive summaries, synthesis reports ▪ Electronic access, with various levels depending on the intended use (practitioner, researcher…) and expertise of the person making the inquiry ▪ Expertise locator ▪ Funding for support of information related activities (financially stable, sustainable system, not just databases)

TECHNICAL PRACTITIONERS (TECHNICAL INFORMATION USERS) DOTS/FHWA

Facilitated Discussion Participants – Telephone Conference

- Becky Knudson, Senior Transportation Economist, Oregon DOT
- Steve Walker, Assistant Design Engineer, Alabama DOT
- Judy Corley-Lay, Unit Head, Pavement, North Carolina DOT

Telephone Interviews

- David Piper, Highway Policy Engineer, Illinois DOT
- Barbara Martin, Organizational Development, Montana DOT
- Judy Skeen, Director of Information Systems, Texas DOT, AASHTO Administrative Subcommittee on Information Systems, Vice Chair, AASHTO
- Rolf Schmitt, Policy Team Leader, Office of Operations Technology Services, FHWA

Transportation Practitioners (Technical Information Users) – Expressed Needs
▪ Electronic system, searchable by key words using local nomenclature, up-to-date vocabulary, informative abstracts, table of contents and index ▪ Summaries of technical documents meaningful to practitioners ▪ Comprehensive list of holdings from federal and state transportation agencies and libraries – ease of access to these physical collections or electronic documents ▪ All information about one topic in one place ▪ Printable in my office ▪ No vendor sales pitches ▪ National list of experts by topical area ▪ Access to information specialists to assist in locating technical information ▪ Linked references in research report references and bibliographies ▪ Want technical data (often very hard to find) as well as models, which could be used to analyze own data ▪ Information push -- subscription service to topical areas sent to practitioner periodically – informs about the latest happenings on that topic

LOCAL AND REGIONAL TRANSPORTATION OFFICIALS

Telephone Interviews

- Douglas Drever, Manager, Public Works, City of Saskatoon, SK
- David Zelenok, Group Support Manager, City of Colorado Springs, CO
- Chris Doty, Engineer, Public Works Department, City of Redmond, WA
- Tony Giancola, National Association of County Engineers
- Les Locke, County Engineer, Hamilton County, Indiana
- Chuck Purvis, Senior Transportation Planner/Analyst, Metropolitan Transportation Commission, Oakland, CA
- Jean Iaderosa, Director, Development, Chatham Area Transit Authority, Savannah, GA

Local and Regional Transportation Officials -- Expressed Needs
▪ Published standards and specifications in hard copy immediately accessible (in office) ▪ Timeliness, "fresh information" ▪ Electronic access by topic, with capability to access different levels of detail ▪ Ease of use – ability to use the system effectively without training classes/courses ▪ Full-text documents as needed ▪ System that would facilitate information availability to user – Customized, with choice of links most appropriate and have information delivered electronically – e-mail digest, easy to read ▪ Summary, synthesis reports, quick study reports on technical topics ▪ Best practices and peer-to-peer exchange

TECHNOLOGY TRANSFER PROFESSIONALS

Telephone Interviews

- Deborah Reaves Divine, Consultant, formerly an LTAP Center Director
- Maria Ardila-Coulson, Nevada LTAP Center
- Terry McNinch, Michigan LTAP Center, Region 5 Representative, National LTAP Association
- Lisa Pogue, Director of Technology Transfer (LTAP Clearinghouse), American Public Works Association
- David M. Burk, Knowledge Management, Office of Operations Technology Services, FHWA

Technology Transfer Professionals -- Expressed Needs

- Multiple media formats -- electronic, physical documents, video, etc.
- Information overload; difficulty for users to adequately articulate what they want – need some human intervention – information professionals would be a great benefit
- Highly applied, practical, user-oriented publications and course materials, demonstrations, and "how to" materials
- Credibility filter – a means to assure credible source of information
- Responsive system – information available at the time seeking it
- Up-to-date information, continuously maintained electronic sources
- Access to peers and technical experts from state DOTs and other state agencies, county and local professional organizations, industry associations
- Electronic expertise locator
- Best practices information
- Summaries, synthesis reports of research publications
- Electronic access by topic with varying levels of details for different types of users, by geographical area, by language, and other categories – one entry point

LIBRARIANS AND INFORMATION SPECIALISTS

Facilitated Discussion Participants

- Janet Bix, Ohio DOT Library
- Michael Kleiber, Harmer E. Davis Transportation Library, University of California
- Nelda Bravo, Bureau of Transportation Statistics (BTS)
- Joyce W. Koeneman, at the time Association of American Railroads Library (now BTS)
- Bonnie Osif, Penn State Engineering Library
- Barbara Post, TRB Library
- Roberto Sarmiento, Northwestern University Library
- Maryanne Ward, PACCAR Technical Center
- Janice Bain-Kerr, Netalyst (contractor to BTS)
- Jane Watson, BTS

Facilitated Discussion Participants -- Telephone Conference

- Dan Krummes, Berkeley Library
- Roberto Sarmiento, Northwestern Library

Telephone Interviews

- Michael Kleiber, Harmer E. Davis Transportation Library, University of California
- Nelda Bravo, BTS
- Jerry Baldwin, Minnesota DOT Library
- Janice Bain-Kerr, Netalyst (contractor to BTS)
- David Batty, Principal Investigator, NCHRP 20-32, Development of a Comprehensive Thesaurus for Transportation Research; Adjunct Professor, Graduate School of Library and Information Science, Catholic University
- Patricia Prosperi, Principal, Information Services, Transportation Administration Service Center, U.S. DOT
- General discussions about experiences building information systems and library capabilities:
    - Julie Bolding, Contract Cataloger for South Dakota Department of Transportation
    - Ken Winter, Librarian, Virginia Transportation Research Council

Librarians and Information Specialists Expressed Needs

- Enhanced management of information -- access and availability of documents, as well as storage and preservation
- Essential characteristics of national system – interlibrary loan, union catalog, use of transportation thesaurus
- Enhanced TRIS
- Increased support for state information professionals; resources for training, peer-to-peer association, greater involvement in information services for agencies
- Online Computer Library Center, Inc.(OCLC) participation for state DOTs, and other transportation related public agencies and associations
- Creation of a subsystem in OCLC for transportation
- Greater education of transportation practitioners to information resources available to them
- Well-defined information infrastructure including policies on retention and repository for electronic publications; standards among information providers
- Mix of media, virtual/electronic and physical collections
- Credibility of information
- Rational way to handle sensitive material
- Deepening the content of what is available, including more historical information, foreign materials, and information outside of traditional transportation disciplines
- Information maintained by authoritative sources
- U.S. DOT libraries to be active participants in nationwide information services
- Network of libraries and integrated with the Internet
- Costs and benefits leveled for all participants in a national system (academic libraries should not bear undue burden)
- Incorporation of knowledge management efforts with published information
- One portal allowing search of disparate services simultaneously

ACADEMIC USERS/OTHER DECISION MAKERS -- INFLUENTIAL VOICES IN THE TRANSPORTATION COMMUNITY

Telephone Interviews

- Lester Hoel, L. A. Lacy Distinguished Professor, University of Virginia, Department of Civil Engineering, Transportation Research Board Division Chairman for National Research Council Oversight
- Michael C. Walton, E. H. Cochrell Center, Chairman Engineering, University of Texas at Austin, FHWA, Research and Technology Coordinating Committee Chair

Academic Users -- Expressed Needs
▪ Disposition of unpublished research ▪ Electronic access ▪ Assurance of quality material – reliability and accuracy ▪ Greater ease in getting information – fair amount of technical expertise is needed currently to get what you need ▪ Concern about security of information ▪ Contact with experts ▪ Distributed, linked network of different organizations, with specialty areas for access with focus on topics of interest to the transportation community

PRIVATE SECTOR CUSTOMERS

Information Needs Discussions at Indiana Peer Exchange

Representatives from:

- Asphalt Pavement Association of Indiana
- Indiana Mineral Aggregate Association
- American Concrete Pavement Association, Indiana Chapter
- Indiana Contractors Inc.

Midwest Conference on Library & Information Services for Transportation

- Wisconsin Concrete Paving Association

Private Sector Customers
▪ Ease of use of system ▪ Electronic access to state DOT standards, specifications, bid packages, and related documents ▪ Access to information professionals at the state DOT for which the organization is performing work ▪ Print copy of electronic documents as needed ▪ Hard copy of lengthy manuals and publications ▪ Link to professional/industry associations ▪ Research results in language of practitioners – application reports, summaries, synthesis reports ▪ Best practices and peer-to-peer interchanges

APPENDIX C

Comparison of Library Services:
National Library of Medicine, National Institutes of Health Library and the National Agricultural Library

	NLM Library	NIH Library	NAL
Library Services Note: NLM training primarily for librarians; NIH training primarily for end-user.	• Cataloging • Preservation • Reference • Databases • Document Delivery • Extramural Funding • National Library Network • Publications • Training and Outreach	• Online Searching • Research Updates • Translation • E-mail listserv • Custom services (journal management, clinical liaison, bibliographic databases, web pages) • Training	• Cataloging • Preservation • Reference • Databases / Indexing and Thesaurus Development • Document Delivery • Subject focused Information Centers • Publications • Training and Outreach • Current Awareness
Hours of Operation (Holiday and seasonal variation in schedules) *Reference assistance until 8:00 pm.	Mon 8:30 am - 5:00 pm Tue 8:30 am - 5:00 pm Wed 8:30 am - 5:00 pm Thu 8:30 am - 9:00 pm* Fri 8:30 am - 5:00 pm Sat 8:30 am - 12:30 pm Sun Closed	Mon – Thu 7:45 am - 10:00 pm Fri 7:45 am - 6:00 pm Sat 8:30 am - 6:00 pm Sun 1:00 pm - 5:00 pm Reference (M-F 8:30 - 5:00) Photo Copy Service (M –Th 8 - 8; F 8-6; S 10 - 5; Su 1- 5)	Mon - Fri. 8:30 am - 4:30 pm On-site reference and circulation hours. Closed Federal Holidays
Reference Services in FY 2000 *NLM has a single point to process requests, the total includes inquiries about products and services. ** Circulation requests for documents and books	Total:* 114,427 Onsite 51,456 Remote 62,871 Circulation** Onsite 363,780 ILL 390,574 **Circulation of Documents and Books	Total: 44,328 Information Desk (Reference): 12,617 Circulation Desk Information Requests (Call Number Look-up; availability of journals, etc.): 31,711	Total: 23,705 On & Off-site Mediated Reference Services Circulation** Document Delivery and ILL: 151,841 Web-based info delivery (hits): 11,830,876
Materials Budget *FY 00 Budget **Projected FY 01 budget;	Total:* $5,370,797 Serials 4,374,230 Books 542,659 Non-Print 161,305	Total:** $3,000,000 Serials 1,800,000 Books 200,000 Non-Print 1,000,000	Total:** $2,071,000 Serials 1,821,000 Books 250,000 Non-Print See Below

	NLM Library	NIH Library	NAL
	Historical 292,603 Non-Print does not include licensing access to secondary databases. NLM plans to increase licensing for more electronic materials in FY 01.	Non-Print category includes electronic journal subscriptions and databases.	Non-Print/electronic publication and database subscriptions are included in the Serials and Book budgets above and are estimated to be approximately $300,000. *Correction made to the original report.*
Customer Base	• Health care providers, researchers, scholars, and students • Librarians and information specialists • Historians of medicine and science • General public	NIH library services are only available to current NIH employees Primary audience 6-8,000 currently employed physicians and Ph.D. researchers.	• Federal, state and local government officials • Researchers, including 2,000 scientists • Farmers/producers • USDA administrators, regulators, researchers • University and college professors, researchers and students • Agri-business • Librarians & Information Specialists • News media • International agricultural organizations and individuals • General public • Congress
Staffing	*Total: 281.46 FTE	Total: 56 FTE	Total: 170.35 FTE

	NLM Library	NIH Library	NAL
*Staffing figures reported for NLM's Division of Library Operations only. These staffing figures may include contractors **Staffing figures include vacancies for FY 2001.	• Acquire, Organize, Preserve Biomedical Information = 174.6 • Provide Access to Biomedical Information = 83.3 • Increase Awareness & Use of NLM Services Among Health Professionals = 10 • Increase Awareness & Use of NLM Services Among the Public = 6.31 • Strengthen the National Network of Libraries of Medicine = 3.6 • Further Medical Informatics Research = 3.6	*Federal Positions* • Translators = 2 • Information & Education Services [nearly all professional level] = 20 • Collection Organization & Management = 8 • Information Delivery = 18 • Administrative Staff = 3 • Systems [3 computer specialists and 2 in-training] = 5 *Contract Employees* • Photocopying services, shelving, some pulling, and maintaining the self-service photocopy center = 20	*Federal Positions* • Acquire, catalog, index and thesaurus= 67.1 (+2.5 non-Fed staff) • Document delivery, interlibrary loan, collections maintenance, special collections = 14.5 (+37 non-Fed staff) • Information research services, reference, specialized information centers, circulation = 37 (+44 non-Federal) • Information systems, end-user support, systems administrators and engineers, preservation, systems security, web management = 32 • Office of the Director, administration***, public affairs, facilities, personnel, budget, travel = 19.5 (+11 non-Fed staff) *** Provides administrative services for NAL and HQ Program Management
Total Budget Projected for FY 01	Library Operations: $56,752,000 Total NLM: $230,135,000	$9,500,000 (includes budget for overhead and space charges ~ $850,000)	$20,400,000