

Transportation Knowledge Networks

*A Management Strategy
for the 21st Century*



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Transportation Knowledge Networks

A Management Strategy for the
21st Century

Committee for a Future Strategy for
Transportation Information Management

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

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This report has been reviewed by a group other than the authors according to the procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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The **Transportation Research Board** is a division of the National Research Council, which serves the National Academy of Sciences and the National Academy of Engineering. The Board's mission is to promote innovation and progress in transportation through research. In an objective and interdisciplinary setting, the Board facilitates the sharing of information on transportation practice and policy by researchers and practitioners; stimulates research and offers research management services that promote technical excellence; provides expert advice on transportation policy and programs; and disseminates research results broadly and encourages their implementation. The Board's varied activities annually engage more than 5,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation. www.TRB.org

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Preface

Information technology has transformed the way users access information and the volume of information available, resulting in both new opportunities (e.g., desktop information access) and new problems (e.g., information overload). In this context, the Standing Committee on Research of the American Association of State Highway and Transportation Officials (AASHTO) funded a study by the Transportation Research Board (TRB) of the National Research Council (NRC) designed to lay out a future course for managing transportation information in the information age.

In response to this request, TRB formed a committee chaired by Francis B. Francois, former Executive Director of AASHTO. The 12 committee members brought to the study expertise in information and computer science, library science and management, transportation policy and research, and transportation agency and research administration.

The committee supplemented its own expertise by drawing on an exploratory study conducted for AASHTO by Barbara T. Harder (B. T. Harder, Inc.) and Sandra L. Tucker (Texas Transportation Institute) entitled *Scoping Study for a National Strategic Plan for Transportation Information Management*. Completed in June 2002, this study compared existing transportation information services with current needs through structured interviews with a wide range of transportation users. In addition, the committee was briefed at its first two meetings by numerous experts on national libraries and various network and consortium arrangements with the potential to serve as models for managing information in the transportation sector. In particular, the committee thanks Peter Young, director of the National Agricultural Library; Jane Bortnick Griffith, acting deputy director of the National Library of Medicine; Nelda E. Bravo, head of the National Transportation Library; Christine Dunn,

executive director of the National Library of Education (interviewed by telephone); Kate Nevins, executive director of the Southeast Library Network, Inc.; Joan K. Lippincott, associate executive director of the Coalition for Networked Information; and Mary Chute, deputy director for Library Services of the Institute of Museum and Library Services. In addition, Carl Lagoze, senior research associate at Cornell University, briefed the committee on the Digital Library Initiative of the National Science Foundation and on the 2000 NRC Study for a Digital Strategy for the Library of Congress. The committee also thanks Eric C. Peterson, deputy administrator for the Research and Innovative Technology Administration (RITA) in the U.S. Department of Transportation, and Harold C. Relyea, specialist in American national government with the Congressional Research Service of the Library of Congress, who met with the committee chair and TRB staff to discuss future options for the National Transportation Library and the pros and cons of other federal organizational alternatives for a transportation information management system, respectively.

Finally, the committee acknowledges Jerome C. Baldwin, director of the Minnesota Department of Transportation Library, who provided the committee with numerous baseline surveys on state department of transportation library staffing and budgets; Andrew C. Lemer, senior staff, TRB, who assisted with formation of the committee; Barbara L. Post, manager of information services, Christopher J. Hedges, senior program officer, and Thomas M. Palmerlee, transportation data specialist, all at TRB, for their thoughtful observations and assistance throughout the study; and John McCracken, director of the Office of Research and Technology Services at the Turner-Fairbank Highway Research Center, Timothy A. Klein, senior advisor in RITA, and Thomas G. Bolle, deputy director for governmental, international, and public affairs in RITA, for their interest and participation in the open sessions of the committee meetings.

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by NRC's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that assist the authors and NRC in making the published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The contents of

the review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. The committee thanks the following individuals for their participation in the review of this report: E. Dean Carlson, Carlson Associates, Topeka, Kansas; Daniel C. Krummes, University of California, Berkeley; Ronald Larsen, University of Pittsburgh; Richard C. Long, Florida Department of Transportation, Tallahassee; Carol A. Murray, New Hampshire Department of Transportation, Concord; and Jeanne F. Thomas, Strategy Group, Inc., Scottsdale, Arizona.

Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the committee's conclusions or recommendations, nor did they see the final draft of the report before its release. The review of this report was overseen by Lester A. Hoel, University of Virginia, and C. Michael Walton, University of Texas at Austin. Appointed by NRC, they were responsible for making certain that an independent examination of the report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

Nancy P. Humphrey managed the study and drafted the final report under the guidance of the committee and the supervision of Stephen R. Godwin, director of studies and information services. Suzanne Schneider, associate executive director of TRB, managed the report review process. Special appreciation is expressed to Rona Briere, who edited the report. Jennifer J. Weeks prepared the prepublication copy of this report, and Juanita Green managed the book design and production under the supervision of Javy Awan, director of publications. Alisa Decatur provided word processing support, and Amelia Mathis assisted with meeting arrangements and communications with committee members.

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Executive Summary

In today's information age, public- and private-sector transportation professionals seek rapid delivery of reliable information and data¹ to enable them to perform their work, carry out the mission-critical goals of their organizations, and remain on the cutting edge of new research and technologies. The Internet and search engines—such as Google and Yahoo!—have transformed the scale and scope of information available to users and the way that information is accessed and delivered. Users can now obtain a broad array of information at their desktops.

The increasing amount of information available through the Internet has caused many transportation agencies, associations, and consulting firms to question the need for traditional transportation libraries. As a result, a number of transportation libraries have been downsized, seen their budgets reduced, or been required to justify their value repeatedly and aggressively. For example, the U.S. Department of Transportation (USDOT) headquarters library has been downsized, several state DOT libraries have lost staff and funding, and some have been closed.

Despite the wealth of information on the Internet, transportation professionals still report that they face an overwhelming volume of information and have difficulty locating and retrieving many technical reports, even those in digital form. Professionals in other fields, such as health and agriculture, have addressed this problem by transforming, not closing, their libraries. As information has become increasingly electronic and widely

¹ The study committee distinguished among data, information, and knowledge. Data consist of facts, measurements, or statistics, which can be thought of as the raw material of information. Information is data organized in a form useful for analysis and decision making. Knowledge is information that has been combined with experience, context, and interpretation that make it possible to understand and draw implications from both data and information. At the same time, for purposes of conciseness, this report often uses the term “information” more loosely to encompass data as well.

distributed, their libraries have evolved from centralized and managed physical collections into decentralized networks providing information services to users wherever they reside. Physical collections remain critically important to maintain historical information and printed reference materials, but forward-looking libraries have developed new approaches for managing and adding value to widely dispersed information sources. With the help of information technology professionals and communications experts in coordinating information delivery, they offer many services through their decentralized networks of information providers.

The transportation sector needs to do more to transform its libraries to meet the demands of the information age. In 1998 USDOT established a congressionally authorized National Transportation Library (NTL). Originally intended as a digital collection only, NTL was charged with coordinating information sharing among other transportation libraries and information providers to facilitate access to their materials by the transportation community. Without consistent USDOT support and funding, however, NTL has been able to operate only within a narrow definition of its mission.

Concerned by the above trends and growing user demand for information services better geared to new technologies, the Standing Committee on Research (SCOR) of the American Association of State Highway and Transportation Officials (AASHTO) requested that the Transportation Research Board (TRB) conduct a study to take a fresh look at how transportation information should be managed and provided. AASHTO directed that an expert committee be formed to carry out the study and provide strategic advice to the federal government and the states with regard to a sustainable administrative structure and funding mechanism for meeting the information service needs of the transportation sector.

THE STATE OF TRANSPORTATION INFORMATION MANAGEMENT AND THE CASE FOR CHANGE

Transportation information professionals first laid out a vision for a transportation information management system in the early 1970s that included an evolving network of information services and users, a national-level coordinating unit, and stable and broad-based financial support.

Although the whole system was never established, major elements are in place:

- In 1970 TRB developed the Transportation Research Information Service (TRIS)—a bibliographic database of transportation research—which it has managed since that time.
- In 1996 TRB developed a Transportation Thesaurus to improve and standardize the indexing and retrieval of transportation information.
- Collections of many U.S. transportation libraries have been catalogued in the Online Computer Library Center.
- The Transportation Libraries Catalog (TLCat), which enables users to search multiple transportation library holdings in a single catalogue, was launched in 2004.
- NTL has built a small digital collection of noncopyrighted research reports, provides free access to TLCat, offers reference services, and made available seed funds to create a pilot regional consortium of libraries—the Midwest Transportation Knowledge Network (MTKN).
- Ten state DOTs and one University Transportation Center have pooled funds to support a Transportation Library Connectivity project.

Despite these initiatives, the primary elements of the original vision of a transportation information management system have not been realized. Most notably absent are a sustainable coordinating mechanism and stable financial support. Indeed, compared with other major sectors of the economy that support national libraries and broad networks of information providers, such as health and agriculture, the transportation sector devotes relatively few resources to information services. In short, the transportation sector's approach to information management is piecemeal, unevenly funded, and largely dependent on informal institutional arrangements.

In today's digital age, why are transportation libraries and information services not more valued? First, cost-conscious managers ask why the personnel costs and space requirements of running a library and providing information services are necessary when users can simply summon up the information they require at their desktops. Second, like research, good information is often taken for granted, and its benefits are not always evident. Finally, the services offered by librarians are frequently not known, particularly at the DOT leadership level.

Librarians and information professionals would identify these views as misperceptions. Indeed, one can make a business case for the time and efficiency gains—the value added—of well-organized, readily accessible, and reliable information resources. Examples can be cited in which summaries prepared by librarians and information professionals have enabled DOT staff to make more informed decisions in the areas of safety, engineering and materials, design and construction, and minimizing of environmental impacts, although more detail about and quantification of the benefits of these value-added information services are needed.

Below the committee presents its consensus findings and recommendations for the organization and development of an information management system that can help meet the information needs of the transportation sector in the 21st century. Figure ES-1 illustrates the committee's conception—a national-level coordinating structure to guide and manage a much larger system of transportation knowledge networks in all U.S. regions and at the federal level.

FINDINGS AND RECOMMENDATIONS

Establishment of Transportation Knowledge Networks

Finding: The provision of transportation information can best be accomplished through decentralized, managed networks linking information providers to users wherever they are located.

Networks are the organizing structure of the information age. They can form the backbone of a better system for managing transportation information and help achieve efficiencies in the provision of information services through partnerships and collaborations—for example, by rationalizing transportation collection policies and holdings, creating centers of subject-area specialization, and coordinating the preservation and storage of printed and electronic materials. Effective networks require both a management component to help organize and coordinate the provision of information services and the physical infrastructure necessary to enable networked operations (e.g., development of common standards and protocols, authentication of materials, communication links, storage and redundancy of materials, and security).

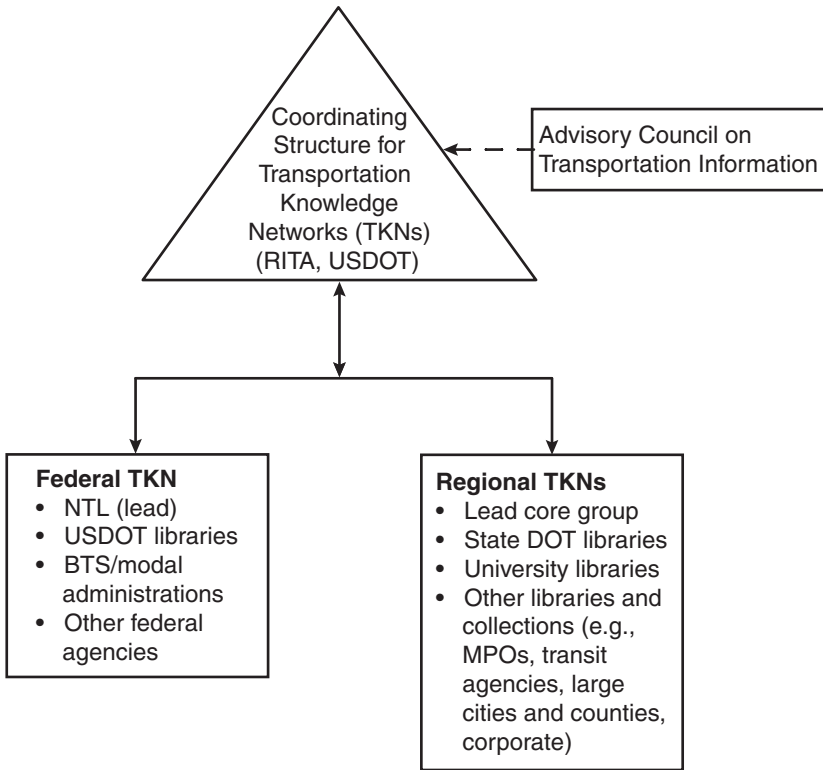


FIGURE ES-1 Proposed nationwide system for transportation information management. (BTS = Bureau of Transportation Statistics; MPO = metropolitan planning organization; RITA = Research and Innovative Technology Administration.)

Recommendation 1. Transportation knowledge networks (TKNs) should be established in every region of the United States and at the federal level.

The development of these TKNs can be accomplished by replicating the successful MTKN of state DOT, university, and corporate libraries in other regions of the country and extending its coverage to include other partners, both public (e.g., metropolitan planning organizations, transit agencies, large cities and counties) and private. Each region should have a member-elected lead group to manage network development, interface with the other networks and a national coordinating structure (see below),

and play a role in network governance. Unlike the health and agriculture sectors, with their regional libraries of medicine and state land-grant university libraries, respectively, transportation does not have an existing network of strong libraries and information providers with transportation collections in each region. The MTKN model offers sufficient flexibility to tailor networks to local resources and needs.

NTL should take the lead in forming a federal TKN that links libraries, collections, and information centers across USDOT. The federal TKN should also undertake to improve coordination among and access to related databases and statistical programs in the Bureau of Transportation Statistics (BTS) and the USDOT modal administrations, as well as in federal agencies outside USDOT (e.g., Environmental Protection Agency, Department of Agriculture, Department of Energy).

The functions and services of the regional and federal TKNs should include identification of key information provider and user groups, sharing of information and services, coordination of library and other transportation collections, interlibrary loans, sharing of catalogues through TlCat, reference services, and professional capacity building for members.

National Coordinating Structure

Finding: Capturing the full value of the TKNs requires a mechanism at the national level to coordinate and manage the activities of the networks.

A coordinating mechanism is needed to develop collection and reference strategies that will minimize duplication; manage appropriate document storage redundancy; take advantage of economies of scale in acquiring, cataloguing, digitizing, and distributing materials; ensure interoperability across networks so that operations are seamless to users; and share best practices so as to obtain the greatest value from networked operations.

Recommendation 2. A national-level coordinating structure should be established to manage and coordinate the activities of the TKNs.

This coordinating structure would fill one of the key gaps in the current transportation information system—the lack of clear leadership and a sus-

tainable coordinating entity. At the outset, a primary function of the coordinating structure should be to provide leadership and seed funding to encourage the development of TKNs in all U.S. regions. Other activities to be undertaken by the coordinating structure on behalf of all TKNs should include technical assistance for identifying and inventorying key information resources and gaps; marketing and communication to raise awareness of the value of information; government relations, including coordination of and access to international information; the convening of functions (e.g., annual meetings); planning and priority setting for networkwide programs and projects; administrative support for the TKNs; information infrastructure development and tool creation; facilitation of networkwide standards setting and protocol development; research on new information technologies, best practices, and changing user information needs; and professional capacity building and curriculum development.

Finding: The proposed coordinating structure will serve a national purpose for the transportation sector and therefore should be located in an institution with a national transportation role.

The committee considered several options: locating the coordinating center at USDOT, creating a structure within an existing nonfederal transportation organization (e.g., AASHTO, TRB), and creating a new non-profit consortium. In weighing the options, the committee concluded that the coordinating structure will need to have sufficient autonomy to carry out its mission, be closely linked with stakeholders, and receive sustained funding, and that the time and costs of startup must be minimized.

Recommendation 3. The coordinating structure should be located within the Research and Innovative Technology Administration (RITA) at USDOT.

USDOT is the federal headquarters for nationwide multimodal transportation activities. The direct involvement of Secretary Mineta in the establishment of RITA and its mission to generate greater collaboration, information sharing, coordination, support, and advocacy for research make it an appropriate entity to house the proposed coordinating structure. RITA is also responsible for NTL and BTS, the main transportation statistical agency. A well-managed coordinating structure and a harmonized

system of TKNs will complement the functions of both NTL and BTS and provide natural outlets through which federally conducted research and related databases in the modal administrations at USDOT can be distributed widely to users.

If adequately funded and supported, NTL could manage the coordinating structure; information coordination is clearly part of the library's mission. However, the committee is concerned about the recurring lack of support for NTL on the part of BTS and USDOT. Alternatively, the coordinating structure could be housed within another office in RITA. The committee recommends that RITA and USDOT administrators study the options carefully and place the coordinating structure where it can best obtain the funding and support it needs to carry out its leadership role.

Governance

Finding: Developing a strong, effective, and accountable coordinating structure requires a governance arrangement to provide policy direction, long-range planning, and oversight. The TKNs may also benefit from forming a separate organization outside USDOT to address local network issues.

The experience of national-level information providers in other sectors can be emulated in seeking an appropriate governance arrangement for the proposed coordinating structure. The Governing Board of the National Library of Medicine (NLM), for example, provides policy direction and oversight and acts as a champion for NLM programs and services to Congress. The association formed by Local Technical Assistance Program centers—the National Local Technical Assistance Program Association—could serve as a model for a grassroots organization of TKNs.

Recommendation 4. Existing legislation should be changed and RITA charged with establishing a governance body for the coordinating structure by broadening the focus and membership of the current Advisory Council on Transportation Statistics, which would become the Advisory Council on Transportation Information. The council should have responsibility for long-range strategic planning and annual reporting to Congress.

Council members should represent key information providers and users (e.g., federal agencies, state DOTs, universities, private companies) and the regional TKNs. The council should also include experts in information, communications, and computer technology drawn from outside the field of transportation. The council's key activities should be to review long-range strategic plans, monitor the coordinating structure's performance, examine annual evaluations prepared by RITA, and report annually to Congress on how the coordinating structure is working. Elements of this recommendation, such as the composition and broadened focus of the advisory council and added reporting functions, require revision of current legislation.

Recommendation 5. External peer reviews of the activities of the coordinating structure and the TKNs should be conducted.

These reviews should be undertaken periodically by an independent group of experts to provide a neutral assessment of the progress of the coordinating structure and its networks.

Recommendation 6. The TKNs should consider organizing a representative nonprofit association external to USDOT.

This association should not duplicate the coordinating structure, but provide an opportunity to generate grassroots support for the TKNs, facilitate communication on local and operational issues (e.g., cooperative purchasing arrangements), and act as a checks-and-balances mechanism outside of USDOT.

Funding

Finding: The lack of sustained funding and ownership in the development of a nationwide transportation information management system has been a critical problem in the past, hindering the provision of the support needed to develop a coordinating structure with a national vision to meet the information service needs of transportation users.

The lack of a separate budget and continuity of funding has hampered the ability of NTL to carry out its mission and sustain many of its initiatives (e.g., expansion of TLCat, network development). Many other components

of a transportation information management system—TRIS, the Thesaurus, cataloguing and collection development—are handled by TRB and through informal arrangements among transportation librarians from key academic and state DOT libraries, with no systematic means of supporting an overarching coordinating function or funding system improvements.

Recommendation 7. The proposed transportation information management system should be funded for the first 3 years by annual federal grants of \$3 million to \$5 million. After the first 3 years, annual federal grants should be increased to \$5 million to \$8 million, with a required local match for network operations, leveraging a total annual program budget of \$7.5 million to \$13 million.

The committee recognizes that federal funds, particularly RITA's current budget, are constrained. Thus, its recommendations for federal funding, in particular, are focused on the next reauthorization of the surface transportation legislation. However, movement on this recommendation could begin well in advance. With leadership, for example, the TKNs could begin organizing on their own, perhaps through increased contributions to the pooled-fund Transportation Library Connectivity project or through a new pooled-fund project providing additional state and university funding for network development.

With these caveats in mind, the committee recommends that a 3-year federal grant program be used to set up the coordinating structure, initiate its critical programs, and provide pilot grants to help establish the regional and federal TKNs. TKNs receiving pilot grants should be required to develop metrics and examples of the cost savings and other benefits of networked information services.

After the first 3 years, federal grants should be increased, but matching funds should be required from nonfederal sources (i.e., pay to play) to help support network operations; in-kind contributions should be acceptable. Sources for the match might include Title 1 surface transportation grants received by every state; information services could be made a reimbursable expense with the rationale that information supports engineering and construction projects and thus should be a reimbursable cost of doing business. Funds from University Transportation Centers could also be used to support TKNs in the regions in which the centers are located. The coordi-

nating structure's funds would be used to help finance continuing network development and expansion, underwrite individual projects with national application (e.g., information infrastructure, tool building, and products for network use), and support professional capacity building and a program of research. Network funds would be used to finance staff support, member travel to local meetings, collection coordination and development, reference services for regional users, and professional development for members.

As a general principle, federal funds should be used to support national projects identified by the coordinating structure and its membership and for startup and development of the TKNs, both regional and federal. They should also be used to support a small core staff at the coordinating structure that would grow with its programs and services. Required matching funds should be used, to the extent possible, within the regions where they are raised to support individual TKN activities, projects, and services.

NEXT STEPS AND BENEFITS

The committee proposes, first, that SCOR support a follow-on project through the National Cooperative Highway Research Program to develop a business plan, including details of proposed functions and funding, for the transportation information management system recommended in this report. This effort should be of sufficient duration to build support among potential funders and stakeholders (e.g., USDOT, AASHTO, the Council of University Transportation Centers, the American Public Transit Association, the Association of Metropolitan Planning Organizations) and secure the commitments necessary to ensure adequate funding. Second, USDOT and RITA administrators should determine what office will manage the coordinating structure, which should be established expeditiously and provided a budget in the amount recommended by the committee. Finally, the legislation for the Advisory Council on Transportation Statistics should be amended as soon as possible to broaden its membership, focus, and reporting functions so as to provide a strong governance body for the coordinating structure.

A critical benefit of the transportation information management system recommended in this report will be improved access for users to more complete, reliable, and rapidly delivered information. The network focus,

in particular, provides a winning strategy for leveraging resources, minimizing duplication, and stretching budgets for libraries and information services in today's business environment, in which transportation professionals are asked to do more with less. A more coordinated information management system should also foster sharing of expertise by training users in how to search for and locate information, as well as enabling librarians and other information professionals to remain abreast of rapidly changing technology advances. Most important, the proposed coordinating structure, supporting the TKNs at the federal and regional levels, should provide the long-overdue leadership needed to bring about a transportation information management system that will meet the information needs of the transportation sector well into the 21st century.

Introduction

The transportation sector contributes nearly \$340 billion to the U.S. gross domestic product (GDP), accounting for about 3 percent of the U.S. economy as measured by its value added (BEA 2005).¹ Today's transportation professionals depend more than ever on timely and reliable information and data² to carry out their work and meet the mission-critical goals of their organizations. Information technology has changed the scale and scope of information available to users, as well as the way that information is accessed and delivered; the Internet and web search engines—such as Google and Yahoo!—now bring information directly to users' desktops. However, the sheer volume of information can be overwhelming. In addition, transportation researchers and practitioners alike observe that technical reports, even those in digital form, are often difficult to locate and retrieve.

Given the amount of information and data available through the Internet, some transportation agencies are questioning the need for traditional libraries that operate primarily as centralized physical collections, and library budgets are often easy targets for cutbacks.³ In recent years, the

¹ Value added is a measure of the contribution of each private industry and of government to the nation's GDP. Value added is a net output measure, which is defined as an industry's gross output (e.g., sales) less its intermediate inputs (e.g., raw materials, energy) (U.S. Bureau of the Census 2005).

² The study committee distinguished among data, information, and knowledge. Data consist of facts, measurements, or statistics, which can be thought of as the raw material of information. Information is data organized in a form useful for analysis and decision making. Knowledge is information that has been combined with experience, context, and interpretation that make it possible to understand and draw implications from both data and information. At the same time, for purposes of conciseness, this report often uses the term "information" more loosely to encompass data as well.

³ A library is defined as a bibliographically organized collection of materials and resources such as print, electronic, and audiovisual materials and computer software; such collections should be available to users. A library should be staffed with trained personnel to assist users in locating and securing resources and information (Thomas and Cherney 2003).

headquarters library at the U.S. Department of Transportation (USDOT) and several state department of transportation (DOT) libraries have been downsized. Others have been closed or have had to justify their value aggressively. The status of the National Transportation Library (NTL), authorized by Congress in 1998 (intended to be a digital collection only), also is uncertain.

Concerned by the above trends and growing user demand for information services better geared to new technologies, the Standing Committee on Research of the American Association of State Highway and Transportation Officials (AASHTO) requested that the Transportation Research Board (TRB) conduct a study to take a fresh look at how transportation information is managed and provided. To date, transportation libraries and other information providers have depended primarily on voluntary, informal contacts for the sharing and distribution of documents—ad hoc arrangements that may change with changes in personnel and funding. Effective management of information requires more consistent institutional arrangements for coordinating resources and sustained funding to ensure the location, identification, accessibility, and preservation of transportation information. Meeting the challenges of the future also requires new strategies for managing information that is increasingly electronic and widely distributed, and for which libraries are but one of many sources for the user.

STUDY CHARGE AND SCOPE

The expert committee formed by TRB to carry out this study was charged with providing strategic advice to the federal government and the states with regard to a sustainable administrative structure and funding mechanism for meeting the information service needs of the transportation sector. Specifically, the committee was charged to

- Define the core services that need to be provided,
- Identify how they should be provided, and
- Suggest options for funding.

Although the state DOTs that requested the study through AASHTO are the immediate audience for this report, the committee recognized that the study must address the information needs of the broader user

community. In addition to the federal and state agencies involved in transportation, there are more than 600 transit agencies; nearly 400 metropolitan planning organizations; and countless public works officials in thousands of cities, towns, and counties, many supported by private contractors and consultants. Transportation-related private companies and professional associations represent a separate group of users, as do the students and faculty of colleges and universities involved in the education of transportation practitioners and researchers. The information needs of this diverse and decentralized user community extend beyond state and national boundaries as today's professionals seek to learn from and share with their counterparts around the globe.

This study is not limited to libraries but is focused on the provision of information services generally. Forward-looking librarians are working to improve the identification, collection, production, retrieval, and storage of information in both electronic and paper form. They are also joining with other information providers, as well as information technology and communications professionals, in knowledge management teams that are working to develop systematic approaches for filtering and adding value to the vast quantity of material now available on the World Wide Web so users can rapidly access relevant and reliable information.

The study covers all types of transportation information—from reports and journal articles to conference proceedings—as well as databases and statistical information in both the United States and abroad. The major focus is on the basics, however—on ensuring that narrative information, such as key reports, articles, and conference proceedings, is identified and made available (preferably in electronic form) and remains accessible to major user groups.

BACKGROUND AND IMPETUS FOR THE STUDY

Need for a Transportation Information Management System

Transportation professionals have long recognized the need for a network of information services and users, coordinated at the national level, to enable greater efficiency in the accessing and transfer of technical information generated and used within the transportation community. In 1972, a special committee of the Highway Research Board (HRB)—the

precursor to TRB—first articulated a vision and plan for such a transportation information system (HRB 1972, 1):

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.

The research community was defined broadly to include those involved in transportation administration, planning, engineering, and operation, as well as research and development. The system envisioned would have four main elements (HRB 1973, 2; see Figure 1-1):

- A transportation research community, broadly defined, that generates and uses transportation information;
- Information services that organize and provide access to transportation information;
- A mechanism to provide for coordination among individual services and between services and the user community—a Transportation Research Information System Network (TRISNET); and
- Financial support for information services and network coordination.

In the judgment of the HRB study committee, the most important objectives of TRISNET were to (a) establish and institutionalize a coordinating unit and (b) provide stable and broad-based financial support for components and activities vital to the network.

Accomplishments

Although TRISNET was never established, many important elements of that initial vision have been realized. For example, the Transportation Research Information Service (TRIS) database, a compilation of abstracts and citations of more than 620,000 records of completed research, has been funded by the state DOTs and administrations of USDOT for more than 35 years. The production and management of this data file is a service TRB provides to its sponsors.⁴ TRIS now contains links to full electronic

⁴ Major input to the database comes from records and abstracts prepared by TRB staff and contractors, records provided by the library of the University of California–Berkeley and the Northwestern University Transportation Library, and records and abstracts from the International Transport Research Documentation (ITRD) database.

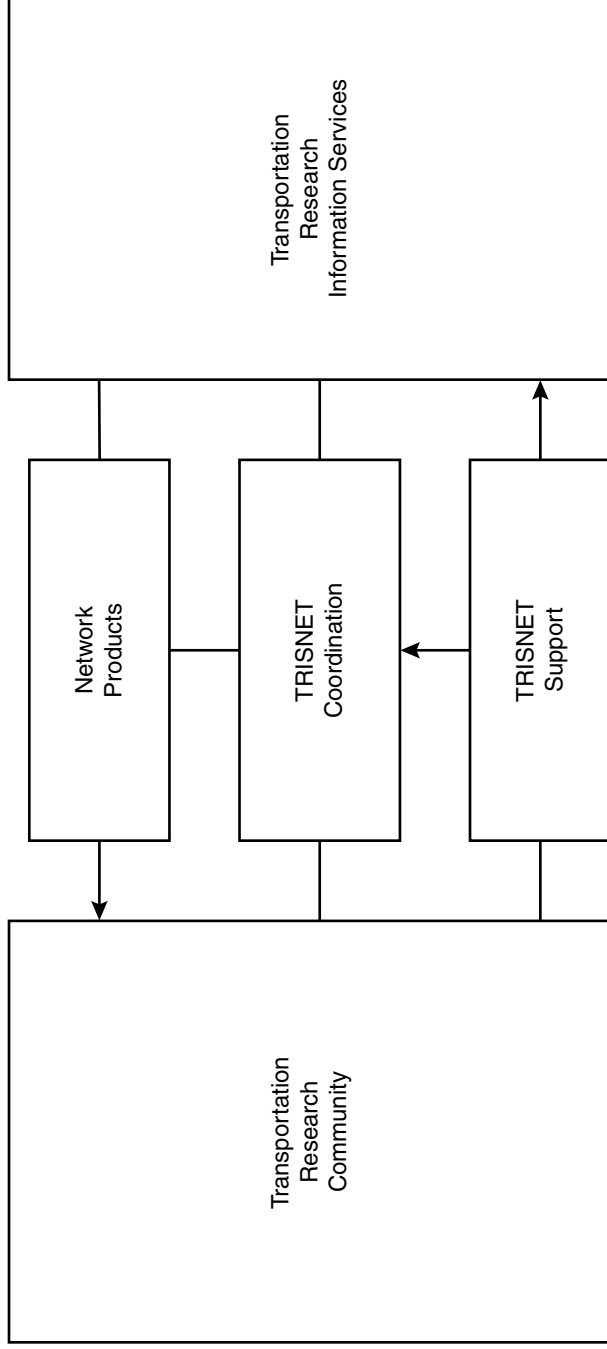


FIGURE 1-1 Original concept of a transportation information system. (TRISNET = Transportation Research Information System Network.) (Source: HRB 1973, 2.)

documents when available, and major elements of the system have been available on the Internet since 2000 on the website of the Bureau of Transportation Statistics (BTS).⁵ Another service is the Research in Progress database, a subfile of TRIS, which contains more than 8,000 records of ongoing transportation research projects. TRB also developed a Transportation Thesaurus under National Cooperative Highway Research Program (NCHRP) Project 20-32, completed in 1996, as a tool to improve and standardize the indexing and retrieval of transportation information. The Thesaurus was adopted by TRB for its indexing activities on TRIS and is maintained and periodically updated by TRB contractors. It is recognized by the Library of Congress and is used by the University Transportation Centers and many state DOTs and academic libraries in applying subject indexing terms to catalogue entries. NCHRP Project 20-70 will provide a web version of the Thesaurus for public use, integrate the Thesaurus into TRIS data entry, and enable TRB to maintain the authoritative version.

Collections of many U.S. transportation libraries are catalogued in the Online Computer Library Center (OCLC), which identifies where a document is located for participating users.⁶ Currently, the headquarters library at USDOT, the Volpe National Transportation Systems Center, the TRB library, most college and university libraries, and 20 state DOT libraries participate in OCLC (Baldwin 2004). In 2004 NTL, in cooperation with OCLC and in partnership with the Midwest Transportation Knowledge Network (MTKN) (see below), launched a special online catalogue of the collections of transportation libraries only (TLCat), which enables users to search multiple transportation library holdings in a single catalogue. Twenty-three transportation libraries plus NTL are now participating.⁷

Congress authorized USDOT to establish and maintain NTL—a collection of statistical and other information needed for transportation deci-

⁵ The primary exception is the ITRD database of English-language publications that are not freely available through the BTS website because of copyright issues.

⁶ More than 53,500 libraries worldwide use OCLC services to locate, acquire, catalogue, lend, and preserve library materials. Together, they cooperatively produce WorldCat—the OCLC online union catalogue that has just reached its billionth holding. More information on OCLC is available at www.oclc.org/.

⁷ In addition to NTL, TLCat members include 16 state DOT libraries—California, Connecticut, Illinois, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Missouri, Montana, Ohio, South Dakota, Tennessee, Virginia, Washington, and Wisconsin; two USDOT libraries—the Turner–Fairbank Highway Research Center Library and the Volpe National Transportation Systems Center

sion makers at the federal, state, and local levels—in 1998. Its mission is to improve access to and sharing of transportation data and information and to coordinate transportation libraries and other transportation information providers, both public and private, in that endeavor [Transportation Equity Act for the 21st Century, Title V, Section 5109(e)]. Intended to be a digital collection of noncopyrighted research reports, NTL provides the following core services: a small digital collection of documents and websites, publication of a sizable portion of TRIS on the web as TRIS Online, reference services, and sponsorship of TLCat and its provision to the public free of charge.

NTL has also provided seed funds to catalyze the creation of regional networks of libraries to catalogue and share resources. What later became known as MTKN was begun in December 2001 as a pilot project to develop a consortium of regional libraries in the states making up Region 3 of AASHTO (plus South Dakota) to share information resources and improve access to transportation collections for member organizations. NTL provided approximately \$300,000 over 2 years to support the following activities: finance one part-time staff member (for 1 year) to help set up the consortium, finance two annual meetings for consortium members, help fund TLCat, and support OCLC membership fees for member libraries (see Box 1-1). NTL continues to pay membership fees in OCLC/TLCat for most consortium members, but other NTL support has ceased. The Midwest libraries have continued to operate on their own, establishing MTKN as a nonprofit organization and providing the nucleus of what could become a group of similar regional networks throughout the nation (A. Mathison, Information Services Committee Meeting, TRB Annual Meeting, January 2005).

Finally, a state pooled-fund project on Transportation Library Connectivity has been launched to (a) provide technical assistance to participating state agencies on cataloguing documents for use in OCLC and converting them to online formats and (b) develop tools for collaboration

Library; three university libraries—the University of California at Berkeley Transportation Library, the University of Michigan Transportation Research Institute, and the Northwestern University Transportation Library; the Los Angeles County Metropolitan Transportation Authority Library; and the TRB Library. NTL is paying TLCat subscription fees through February 2006 for all but the Northwestern University Transportation Library and the state DOT libraries in California, Minnesota, and Virginia.

BOX 1-1

Midwest Transportation Knowledge Network

The Midwest Transportation Libraries Consortium, which became MTKN, was founded in December 2001 through the sponsorship of NTL and the efforts of Midwestern transportation libraries. Its mission was to “increase collaboration among the region’s transportation libraries and information centers so managers, engineers, and planners are better able to find and apply the most recent, credible, validated technical information to their current projects” (MTKN 2004). Today, members include the libraries of DOTs in nine states—Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Ohio, South Dakota, and Wisconsin; three university libraries—those of Northwestern University, the University of Michigan Transportation Research Institute, and the University of Minnesota Center for Transportation Studies; the corporate library of Hanson Professional Services; and NTL.

In 2004 NTL launched TLCat in collaboration with the libraries of MTKN and OCLC. MTKN members also played a role in helping NTL and the National Highway Institute develop a distance-learning workshop entitled “Working Smarter: Using the World Wide Web for Transportation-Related Research.” MTKN posted its website that year, helped strengthen libraries in three state DOTs and lobbied to keep a fourth, supported the state pooled-fund study discussed in the text, and conducted a member survey to determine next steps. After its 2004 annual meeting, MTKN incorporated as a nonprofit organization and revised its committee structure in support of new strategic goals, including facilitating the development of other regional networks and a national network; developing shared marketing and training tools through templates to be customized by each member; helping save libraries from elimination; mentoring new librarians; and developing new partnerships with other trans-

portation organizations, such as AASHTO and the Local Technical Assistance Program.

The benefits of MTKN include

- Multiplication of cost savings from finding transportation information more rapidly, more completely, and at lower cost than can practitioners;
- Improved access by practitioners to research and new technology;
- Pooling of catalogued transportation materials in a single catalogue through TLCat;
- Sharing of resources (rapid, low-cost interlibrary loans) and expertise in capturing, cataloguing, and disseminating information in printed and electronic formats; and
- Expert searching through means not accessible by general Internet search tools and instruction of interested practitioners in better search techniques.

SOURCE: MTKN 2004.

and marketing of information resources.⁸ Ten state DOTs and one University Transportation Center are participating.⁹

Over the years, the Transportation Division of the Special Libraries Association has also offered librarians the opportunity for professional networking. Founded in 1943, the Transportation Division currently has more than 200 member librarians from universities, corporations, and government who meet annually and sponsor periodic projects (e.g., publication of a directory of transportation libraries).

⁸ State DOTs, the Federal Highway Administration, and other appropriate agencies are encouraged to pool resources—typically state planning and research funds (SP&R) that have been set aside for this purpose, but also federal and private funds when appropriate—in cooperative projects to advance research, development, and technology transfer objectives. The Wisconsin DOT is the lead agency for the Transportation Library Connectivity project.

⁹ The following state DOTs are participants: Kansas, Louisiana, Minnesota, Montana, Ohio, Oregon, Pennsylvania, Tennessee, Washington, and Wisconsin. The Midwest Regional University Transportation Center is also a participant.

Gaps

Despite the above initiatives, the primary objectives articulated by HRB in 1972 for a mechanism to coordinate information services and provide stable funding for that purpose have not been met; transportation information providers continue to operate on the basis of ad hoc institutional and funding arrangements. Access to technical reports has improved but continues to be a problem nonetheless. For example, an update of an earlier study of the availability of technical reports in TRANSPORT—a major bibliographic database that comprises TRIS plus international holdings—found that 11 percent of the citations could not be located in libraries within the United States or Canada in the OCLC database or through the National Technical Information Service (B. Osif, personal communication, September 2005). This percentage is down from 37 percent in the 1996 study (Osif 2000, 14) but in the judgment of the author still represents a significant number.¹⁰ Moreover, more than half of state DOTs do not participate in OCLC (Baldwin 2004). Hence they may not make their reports available to others¹¹ or have ready access to documents and reports of other state DOTs or other libraries except through state libraries (for some states) or ad hoc arrangements.¹² For example, the two major transportation libraries at Northwestern University and the University of California–Berkeley will lend to non-OCLC libraries, but their primary mission is to serve their respective academic communities, not transportation libraries across the nation.

¹⁰ Library holdings of technical reports on five transportation topics were searched in TRANSPORT. The results of the original 1996 study for technical reports were as follows: zero holdings, 37 percent; one holding, 7 percent; two to five holdings, 11 percent; six or more holdings, 44 percent (Osif 2000, 14). The same search in 2005 yielded the following holdings of technical reports: zero holdings, 11 percent; one holding, 6 percent; two to five holdings, 4 percent; and six or more holdings, 78 percent. The TRANSPORT database is produced by the Organisation for Economic Cooperation and Development, of which the United States is a member, together with TRB and the European Conference of Ministers of Transport. It is an index of journal articles, technical reports, and conference papers on surface transportation systems.

¹¹ These state DOTs, however, may provide information about ongoing research if they participate in Research in Progress.

¹² A scoping study prepared in anticipation of this study provided substantial detail on current gaps in transportation information provision and access, including limited holdings of transportation documents; limited access to conference proceedings, international material, and unpublished technical and research reports; and lack of a permanent repository for transportation documents and archival functions. The reader is directed to Harder and Tucker (2003) for more detail.

NTL could have been the nucleus of the national transportation information system envisioned by HRB in the early 1970s. Without stable funding and support at USDOT, however, NTL has been able to operate only within a narrow definition of its mission, and its current status is uncertain. Its parent organization—BTS—has been moved to a new entity, the Research and Innovative Technology Administration. However, funding for BTS was reduced by 27 percent in the recent reauthorization of surface transportation programs, with as yet unknown implications for the initiatives and funding of NTL. For example, MTKN has continued without federal support, but without NTL seed funding, network development in other regions is proceeding slowly if at all.

The headquarters library at USDOT likewise has not taken a leadership role. It views its primary mission as serving USDOT staff and the modal operating administrations located at the headquarters building. Since the mid-1990s, the library has been downsizing, and its collection has been available to off-site users (including USDOT facilities such as the Turner–Fairbank Highway Research Center) through interlibrary loans only. The library considers itself a lender of last resort.

Many libraries serving state DOTs have one full-time equivalent or less professional staff; two-thirds have annual operating budgets below \$15,000 (Baldwin 2004). Other major transportation collections, such as those of the Port Authority of New York and New Jersey and the American Trucking Associations, were closed some time ago. An additional concern is the likely retirement of unprecedented numbers of senior state transportation agency staff, who will take long-accumulated knowledge with them. More than 50 percent of the state DOT workforce will be eligible to retire in the next 10 years, more than double the rate for the nation's entire workforce (TRB 2003, 3).

More generally, as compared with other major sectors of the economy such as health and agriculture, which support national libraries and broad networks of information providers, the transportation sector devotes relatively few resources to information services (see Figure 1-2). For example, current funding for NTL and TRIS represents 0.0007 percent of the transportation sector's share of GDP—far short of the 0.04 percent and 0.02 percent share devoted by health and agriculture, respectively, to support the National Library of Medicine and

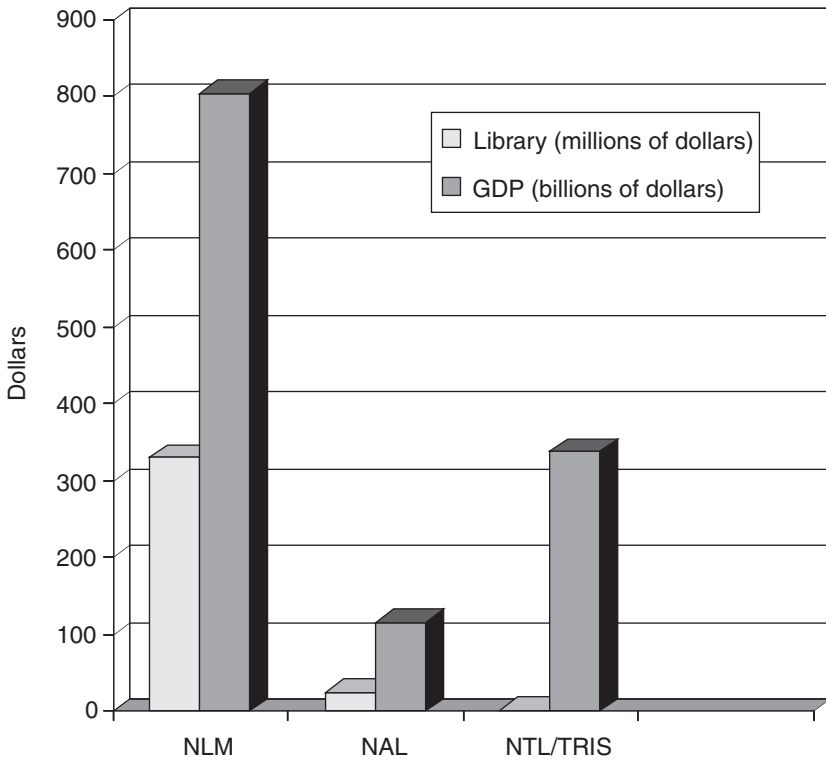


FIGURE 1-2 Comparison of 2005 budgets for selected national libraries and related information services with industry contributions to GDP. (NAL = National Agricultural Library; NLM = National Library of Medicine.) (Source: Budget estimates, library directors; GDP estimates, BEA 2005.)

the National Agricultural Library and their associated information services.¹³

Implications for This Study

Declining budgets for many traditional transportation library collections and library closures provided an important impetus for this study. The institutional building blocks for transportation information network

¹³ The budgets for NTL and TRIS were combined to make the comparison here more accurate. The budgets of both the National Library of Medicine and the National Agricultural Library include large bibliographic databases.

development in many U.S. regions—knowledgeable library and information professionals and the enabling infrastructure and technology—are at best unevenly funded. Libraries and other information providers need more than ever to coordinate and share resources and set priorities for the provision of information services. They also need new strategies for managing diffuse information that now reaches users from many different sources in addition to the library. Materials must still be identified and located, but they must also be managed so users can access and retrieve reliable and accurate information. New information technologies offer opportunities for organizing and delivering information in new ways. Forward-looking librarians are working with other information professionals to exploit these technologies so as to better manage and add value to the flood of information reaching users.

INFORMATION MANAGEMENT IN THE INFORMATION AGE

The web and Internet search engines, such as Google and Yahoo!, have revolutionized the way information is identified and accessed. Large numbers of users, transportation professionals among them, search on line as their first and sometimes sole means of accessing information. For example, a 2003 survey of the directors of University Transportation Centers found that web-based resources and online catalogues were considered most important in conducting transportation research (LIST 2003).¹⁴ A recent survey by the Pew Foundation found that the vast majority of Internet searchers were satisfied with their searches and searching skills (Fallows 2005). Nevertheless, relatively few searchers (one out of six) could distinguish between sponsored (i.e., paid-for) and unsponsored search results, and approximately half of Internet users reported searching no more than a few times a week and said they could return to more traditional ways of

¹⁴ Nearly 92 percent of the directors who responded to the survey used web-based resources in conducting their research; 67 percent, online catalogues; 58 percent, articles and reports not available locally; 50 percent, books requested for purchase from a library; 42 percent, reference from a librarian; 42 percent, subscription purchases requested from a library; 33 percent, commercial online databases; and 13 percent, other (e.g., trade journals, TRIS). Percentages add to more than 100 percent because respondents were instructed to check all relevant answers.

finding information (Fallows 2005, i).¹⁵ Information literacy has become an issue as users must be able to locate, evaluate, synthesize, and use information effectively across a range of media. This requires skills in using technology, communication networks, and electronic resources.

Ready access to online information may help explain the closure or downsizing of some traditional libraries. Cost-conscious managers ask why the personnel costs and space requirements of running a library are necessary when users can simply summon up the information they require at their desktops. In the absence of a convincing case for the value of library professionals and services, many libraries are viewed as costly line items and easy targets for budgetary cutbacks (Osif 2004).

How are librarians and information professionals responding to these challenges? Many are reinventing themselves. In some settings, particularly corporations, physical libraries are being replaced by a virtual library or libraries, but staff still organize and host content for users (Outsell 2004) (see Box 1-2). In other settings, forward-looking librarians are joining with other information providers and information technology and communications professionals and reaching out to users—marketing themselves as sophisticated human search engines who can add value by assisting users in locating the information they need and keeping them abreast of the latest developments in their fields (Brody 2004) (see Box 1-3). A recent environmental scan conducted by OCLC of issues and trends affecting libraries, museums, archives, and related organizations summarized several key changes in the way librarians and other information professionals view their role (OCLC 2003):

- *Service provision:* Libraries are evolving from centralized locations of physical collections to service providers that make information services available to users wherever they reside.
- *User orientation:* Libraries are focusing less on cataloguing and collections than on reaching out to users to determine their information needs and the best ways of meeting those needs.
- *Knowledge management:* Librarians and information professionals view themselves as adding value by turning information into useful

¹⁵ The youngest users (those between 18 and 29 years of age), however, are more avid, committed, and trusting searchers than older users (Fallows 2005, v).

BOX 1-2

Parsons Brinckerhoff's Knowledge Management System

With some 9,000 employees distributed in 200 locations on six continents, Parsons Brinckerhoff (PB), a consulting engineering firm, has developed a corporate knowledge management system for electronically sharing information and networking worldwide. At the core of the system, PB professionals are organized by discipline (53 disciplines in total) in people networks known as practice area networks (PANs). Each PAN is organized by a coordinator—a PB practitioner in the discipline responsible for the updating of information on the PAN for circulation to network members, as well as for related reference and archival activities. PB consultants are also linked by numerous electronic libraries on the intranet. Staff are organized by name and areas of expertise for querying; archiving and indexing of Q&A professional exchanges allow easy access by others to this reference source. Such basic information as standards and specifications are also available through the intranet, as are the technical data of the PANs. A quarterly technical journal, *PB Network*, posted on the World Wide Web as well as the intranet, enables PB professionals to share innovative ideas and lessons learned in transportation, engineering, and other technical disciplines.

PB's information system also draws on the company's Research and Innovation program. Internal funds are available to teams of engineers for conducting research in areas of strategic interest to the firm. A Knowledge Management Task Force composed of PB consulting professionals and information technology support personnel guides the development of the knowledge management system.

SOURCE: Personal communication, J. S. Chow, Deputy Director, Office of Professional Practice, February 4, 2005.

BOX 1-3

Wisconsin Department of Transportation's Research, Development, and Technology Transfer Program

Through its Research, Development, and Technology Transfer (RD&T) program, the Wisconsin DOT guides the selection of annual research projects to meet the department's strategic needs, coordinates funding, tracks progress, and encourages implementation of results in practice. A full-service transportation library and responsive information services are integral to the program.

RD&T program managers add value to research conducted both by the Wisconsin DOT and externally for the department's technical staff in a number of ways. They prepare synthesis reports on topics of broad interest that summarize what is known from research; provide abstracts of key studies from reports, journal articles, and research in progress; and identify where such reports and articles can be located. Two-page report briefs are prepared for selected research projects summarizing the research problem, objectives, methodology, results, applications, and benefits. Finally, a monthly e-newsletter identifies items of interest—upcoming conferences and research reports, both domestic and international—to Wisconsin DOT professionals. Related web resources and transportation e-newsletters are also identified.

knowledge and by working collaboratively to coordinate information services and deliver them to different user groups.

- *Professional capacity development*: Information provision no longer stops with the collection and distribution of transportation materials but involves educating users in how to identify and access relevant information, as well as keeping librarians and information professionals abreast of advances in their field.

- *Marketing and communications:* Librarians and information professionals are becoming more proactive, raising awareness of the role of libraries and available information services, increasing the visibility of library and information professionals, and demonstrating the value of their services.

THE VALUE OF INFORMATION

One of the primary complaints of transportation librarians and information professionals today is a lack of appreciation of the value of information in general and of libraries as information providers in particular, especially on the part of top managers who hold the purse strings. Like research, good information is often taken for granted, and its benefits are not always evident. The services offered by librarians—reference and research, document retrieval from international sources, literature reviews, collection development, full-text article retrieval, and other subscription services—are frequently not known. This is particularly true at the leadership level; turnover among CEOs of state DOTs is high, and many top managers are unaware of the role played by librarians or information professionals in the highly filtered information they receive. Similarly, researchers and practitioners may overlook or bypass the library, particularly when users must come to a central location to access information.

As noted, librarians and information professionals are responding by becoming more proactive, moving beyond the reference desk to offer information to users and add value by synthesizing and repackaging that information on the basis of user interests and expertise. (Box 1-4 provides several examples of information identified and synthesized by librarians and information professionals that has proven of value, and in some cases has contributed to significant cost reductions, for state DOTs.) User interests and competency in accessing information, however, can vary widely. For example, transportation researchers are often adept at using the web to conduct literature searches. They may look to the library for access to electronic journals and full-length reports and for updates on new reports in their fields of interest. Transportation practitioners, by comparison, are often less likely to spend time on computer searches. Compared with scientists, for example, engineers rely more on internal reports

BOX 1-4

Examples of the Value of Information for Decision Making

Transportation professionals readily agree on the need for reliable, accurate, and timely information to assist them in making better investment choices for a safer and more efficient transportation system. Yet perhaps because information is so fundamental to decision making, they are often hard pressed to explain how such information has supported particular decisions and how it may have saved time, costs, and even lives. The following examples illustrate the ways in which summaries of current research and best practices in a wide range of subject areas prepared by librarians and information professionals have enabled transportation agency staff to make more informed decisions. The examples are drawn from a Wisconsin DOT report (CTC & Associates LLC 2005) and a Federal Highway Administration (FHWA) report, *Value of Information and Information Services* (FHWA 1998).

Safety

- Syntheses on “Improvements to Graduated Driver License Programs” and “Best Practices for Promoting Older Driver Safety” enabled the Wisconsin Bureau of Transportation Safety to consider a number of enhancements to existing programs with the potential for further reducing crashes among drivers in these high-risk age groups. For example, state legislators have proposed banning cell phone use by novice drivers. The syntheses provided valuable background information on states that have implemented and enforced similar restrictions.
- A synthesis prepared for the Wisconsin DOT bureau director of highway operations after a suicide attempt on the Tower Drive Bridge in Green Bay, Wisconsin, on various approaches taken or contemplated by other cities to discourage jumping from bridges helped the department quickly review options

and take action. The information helped staff determine that safety fencing, initially the preferred option, would create bridge and winter maintenance problems and would not be an effective solution. The Wisconsin DOT ultimately decided to install signs on the bridge with telephone numbers for crisis counselors.

Engineering and Materials

- A New York State DOT Bridge Deck Task Force sought a new concrete mixture for bridge decks that would reduce permeability and the potential for cracking. A thorough literature search identified a new concrete mix with a much longer service life. The new mix was adopted as the standard for bridges throughout the state, with an estimated annual life-cycle cost savings of nearly \$9 million.
- The Illinois DOT saved approximately \$300,000 through access to research at Louisiana State University on heat strengthening of steel bridges. Considered the only scientifically validated work in this area at the time, the research saved the state unnecessary expenditures.

Design and Construction

- A synthesis on “Accelerated Construction Techniques” assisted managers in the Wisconsin DOT in quickly exploring the benefits of these techniques and requesting that FHWA conduct a workshop on the topic for a project in Milwaukee. The synthesis and the workshop helped staff assess the appropriateness of these techniques for departmental projects and may lead to their more widespread adoption.
- An information synthesis on “Implementing Design–Build,” compiled from FHWA, AASHTO, and other states, was used by a DOT-wide department–industry task force to help tailor and implement a construction program for Wisconsin with a significant design–build component.

(continued on next page)

BOX 1-4 (*continued*)

Examples of the Value of Information for Decision Making

Environment

- A synthesis on “Mitigation of the Secondary Impacts of Transportation Projects” identified innovative and successful practices around the county for reducing the negative environmental impacts of transportation projects. The synthesis helped the Wisconsin DOT select topics and experts for a peer exchange on this issue and provided documentation of practices in other states that the Wisconsin DOT can use to revise its own environmental mitigation policies.

and interpersonal and informal means of communication than on written professional materials (Tenopir and King 2004).¹⁶ Engineers may look to the library for abstracts of relevant research reports and syntheses of best practices, as well as regulations and design codes that are digested, packaged, and readily accessible through desktop website portals.

Librarians are also joining together with information technology and communications professionals as embedded members of research and project teams to broaden their visibility as knowledge managers and integral partners in meeting the mission-critical goals of their organizations (King 2004) (see Box 1-5). When libraries become part of a broader research and knowledge management group, they may have a better chance of securing resources than when they appear as a budget line item.¹⁷

¹⁶ Survey results indicate that internal reports account for 27 percent of total reading per year for engineers, but only 13 percent for scientists, who read more professional books and scholarly journal articles (Tenopir and King 2004). Engineers spend an estimated 18 percent of their time receiving input through interpersonal means (e.g., informal discussions, meetings) as compared with 13 percent for scientists.

¹⁷ A recent survey of library reporting structures in the 50 states, conducted by the director of the Minnesota DOT library in February 2005, found that the most common arrangement (26 states) is for the library to be part of a research unit. In other states, the library reports to an administrative unit (five states) or to another division (e.g., planning, communications) (five states). Five states use the services of a university library, and nine reported not having a library or did not provide any information.

BOX 1-5

Technology, Research, and Innovation at the Virginia Department of Transportation

The Virginia DOT has organized its research unit—the Virginia Transportation Research Council (VTRC), which includes the DOT library—an Office of Information Technology Applications, and an Office of Knowledge Management under the direction of a Chief of Technology, Research, and Innovation, who reports directly to the Commonwealth Commissioner of Transportation.

VTRC is one of the nation's oldest state-sponsored centers for the study and development of advanced transportation-related engineering technology and improved management and operational practices. Since its inception in 1948, the council has operated under the terms of a joint agreement between the University of Virginia and the Virginia DOT. In addition to five research teams and two support units, VTRC houses the Virginia Transportation Technology Transfer Center, funded jointly by FHWA's Local Technical Assistance Program and the Virginia DOT.

Early in 2003, the Knowledge Management and Technology Transfer Office was created to support the Virginia DOT in identifying, organizing, and disseminating the right knowledge to the right people at the right time. Specifically, its charge is to

- Identify and capture critical business knowledge;
- Develop and provide tools and techniques to support knowledge creation, identification, and sharing across the organization;
- Facilitate learning from past and current professionals; and
- Develop and share best practices in project management and critical business processes.

The Knowledge Management Office is currently engaged in several new initiatives. For example, it is working with project

(continued on next page)

BOX 1-5 (*continued*)

**Technology, Research, and Innovation at the
Virginia Department of Transportation**

managers to discuss what succeeds and what does not in managing construction projects. Best practices will be collected and made available on an intranet site that formats them and places them in a searchable database for easy access by all Virginia DOT project managers. A longer-term project is to map the knowledge of the organization. That effort involves steps to identify groups to which employees turn for information, as well as the expertise represented within the groups; collect any knowledge that can be put into written format; and identify experts or groups that can be called upon as resources when employees have questions. When a question is answered by these experts, the part that can be captured in written form and shared will be made available on the Knowledge Management intranet site. In addition, discussion groups, or “communities of practice,” will be established among experts within the same function to ensure that their knowledge is shared with each other and with the organization as a whole.

Finally, librarians and information professionals are attempting to counter management concerns about the cost of managed information services by identifying the costs in user time and efficiency of not having well-organized information resources. To do so, they must be skilled in both quantifying the value of information services and increasing their own visibility. As an example, the Wisconsin DOT research and library staff now ask users who have requested syntheses of current research and best practices on a specific topic to complete a brief survey quantifying the benefits thus derived, if possible, and specifying ways in which the information may have led to improved practices and savings in time, money, and even lives.

ORGANIZATION OF THE REPORT

The remainder of this report considers how, in a rapidly changing environment, transportation libraries and information professionals can best organize and fund themselves to meet user needs. In Chapter 2, models for managing information services in other sectors are reviewed. Drawing on this experience, the committee presents its proposal for a system of transportation knowledge networks served by a national-level coordinating structure and identifies core functions and services for both. In Chapter 3, the characteristics necessary for successful operation of the proposed coordinating structure are defined, the pros and cons of alternative institutional arrangements are discussed, and a recommendation is made for locating the coordinating structure and providing a suitable governance arrangement. Finally, Chapter 4 reviews funding options for the coordinating structure and the transportation knowledge networks, proposes a funding strategy, and ends with a brief discussion of next steps.

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Abbreviations

BEA	Bureau of Economic Analysis
FHWA	Federal Highway Administration
HRB	Highway Research Board
LIST	Committee on Library and Information Science for Transportation
MTKN	Midwest Transportation Knowledge Network
OCLC	Online Computer Library Center, Inc.
TRB	Transportation Research Board

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Toward a Nationwide Transportation Information Management System

In this chapter the committee presents its proposal for a nationwide transportation information management system to help guide and manage the services required to meet the information needs of the transportation sector in the 21st century. The chapter starts with a review of models for managing information services from other sectors. Drawing on this experience, the committee presents its approach, tailored to the transportation sector, and outlines potential benefits. Next, the critical building blocks of the system—transportation knowledge networks (TKNs) and a coordinating mechanism—are described in turn, and their core functions and services are defined. The chapter ends with a brief discussion of what is necessary to implement the recommended system.

MODELS FOR MANAGING INFORMATION SERVICES

The committee examined the characteristics of national libraries and networks of information service providers in other major economic sectors—the National Library of Medicine (NLM), the National Agricultural Library (NAL), and the National Library of Education (NLE)—as potential models for the transportation sector. Also examined were nongovernmental consortia of library and information professionals, as well as other transportation networks. Special attention was focused on the organization and development of network structures in recognition of the important role played by networks in the information age and their potential for organizing the provision of transportation information.

National Library of Medicine

NLM is the gold standard of national libraries. The National Library of Medicine Act of 1956 authorized the creation of NLM to assist the

advancement of medical science through the collection, organization, and dissemination of biomedical information through widely publicized information services to health professionals.¹ In 1999, the NLM Board of Regents expanded the library's mission to encompass the general public.

With a current (FY 2005) budget of approximately \$330 million and a staff of 685 full-time federal employees supplemented by 500 contractors, NLM is the world's largest biomedical library (see Table 2-1).² It also contracts with eight regional libraries of medicine covering the United States—the National Network of Libraries of Medicine (NN/LM)—that, together with numerous academic and hospital libraries and an increasing number of public libraries, help bring NLM services to researchers, health providers, and the general public. One library—the New York Academy of Medicine—serves as a national training center and clearinghouse, providing training on NLM systems throughout the regions.³ NLM provides leadership for development of the network. NN/LM members, in turn, have access to interlibrary loan services, receive special NLM publications, are eligible to apply for various funding opportunities, and may be considered for service on the Regional Medical Library's Regional Advisory Committee. Total funding for NN/LM was \$11.5 million in FY 2005.⁴

NLM also operates several databases—the Medical Literature Analysis and Retrieval System Online (MEDLINE), a major bibliographic database freely accessible on the World Wide Web; MEDLINEplus, which targets consumer health information to the general public; and GenBank, which provides DNA sequence data, as well as other data—that are easily accessed through the NLM web portal.⁵ Finally, NLM conducts both intramural

¹ NLM actually began operation in the early 1800s as the Library of the Surgeon General under the Department of the Army. It was then transferred to the Public Health Service during the 1930s–1940s (NAL 2002).

² Table 2-1 provides information on the National Transportation Library (NTL) for comparison purposes.

³ NN/LM formalized its membership process in 1988 with two categories of membership. Full members must have their own collections, Internet connections, and regular staff, and they must provide information services to health professionals or the general public. Affiliate members must provide health information to users but do not have to meet the criteria for full membership. They might form a cooperative relationship with a full member, for example, for reference assistance or document delivery.

⁴ The average size of the basic contract of each Regional Medical Library is \$1.27 million.

⁵ Access is also facilitated by The Loansome Doc—a service that allows anyone to register with a library to order the full text, typically at a fee, of references retrieved in online searches of NLM databases.

and extramural research programs on computer and information technology applications in the health sciences.

NLM is part of the National Institutes of Health (NIH) of the Department of Health and Human Services (HHS) and reports directly to the NIH director. The library has benefited from congressional interest and the growing budget of NIH in recent years. Nevertheless, it does not serve NIH researchers and administrators directly; a separate library carries out this function.⁶ A distinguished board of regents appointed by the Secretary of HHS provides oversight for NLM, helps direct long-range planning, and advises the secretary on general policies with respect to the library's scope and services. It also serves as the advisory board for NLM's extramural grants program. Technical advisory committees oversee NLM and related information center operations.

Among the strengths of NLM are a broad and clear mandate, constituent backing and congressional support, financial stability, efficacious governance arrangements, a successful history of long-range planning, a national network of more than 5,000 libraries through which to provide its services, a research program that enables it to remain on the cutting edge of technology developments, and reliable and useful products (linked databases and user-friendly search capability) provided through a single portal—the NLM website. Although the transportation sector is unlikely to replicate either the budget or staffing levels of NLM, it could emulate many of the keys to its success, such as its strong network, effective governance arrangements, and useful products.

National Agricultural Library

Founded as the departmental library for the U.S. Department of Agriculture (USDA) in 1862, NAL was officially designated a national library by Congress in 1990.⁷ Its mission is to increase the availability and use of agricultural information for researchers, educators, policy makers, consumers of agricultural products, and the general public. In addition to its own collections, NAL coordinates a national network of state land-grant and

⁶ The current (FY 2005) budget of the NIH library is \$17.7 million, which supports a staff of 52 full-time federal employees and about 15 contractors. The library, which is a member of the NLM national library network, serves NIH as well as the hospital on the Bethesda, Maryland, campus.

⁷ Public Law 101-624, the Food, Agriculture, Conservation and Trade Act of 1990.

TABLE 2-1 Summary Statistics on National Libraries and Networks of Information Services Providers

Organization	FY 2005 Budget^a (\$ millions)	Separate Budget?	Federal FTE Staff	No. of Contractors
National Library of Medicine	330 (1.16)	Yes	685	500
Library functions	56.5 ^b			
Network support	11.5			
National Agricultural Library	25 (0.11)	Yes	168	68
Library functions	24.6 ^e			
Network support	0.4 ^f			
National Library of Education	9 (0.02)	No	6	2 primary contractors, 1 with several subcontractors
Library functions	9 ^g			
Network support	None			
National Transportation Library	1.2 (0.003)	No	4.5	9
Library functions	1.2 ⁱ			
Network support	None			

NOTE: AgNIC = Agricultural Network Information Center; AGRICOLA = Agricultural OnLine Access; DOE = U.S. Department of Education; ERIC = Education Resources Information Center; FTE = full-time equivalent; MEDLINE = Medical Literature and Analysis Retrieval System Online; MTKN = Midwest Transportation Knowledge Network; NIH = National Institutes of Health; TLCat = Transportation Libraries Catalog; TRB = Transportation Research Board; TRIS = Transportation Research Information Services; USAIN = United States Agricultural Information Network; USDA = U.S. Department of Agriculture.

^a Numbers in parentheses indicate the percentage of the department budget. FY 2005 budget authority is as follows: NIH, \$28.4 billion; USDA, \$21.9 billion; DOE, \$56.6 billion; U.S. Department of Transportation, \$43.1 billion.

^b Includes the costs of building MEDLINE, but not the computer support systems.

^c Includes books, journals, technical reports, manuscripts, microfilms, photographs, and images.

Collection Size	Users Served	National Network of Information Providers
8 million items ^c	Health professionals and the general public ^d	Yes—National Network of Libraries of Medicine
3.3 million items	Departmental library for USDA and the general public	Yes—USAIN and AgNIC
510,800 items plus 100,000 full-text items from ERIC	Departmental library for DOE and the general public	None currently active
No physical collection; 16,000 digital documents	Transportation professionals and the general public ^j	None ^h

^d NLM does not serve as the departmental library for NIH; the NIH library performs this function.

^e Includes the cost of indexing for AGRICOLA.

^f In FY 2005, NAL provided AgNIC with \$430,000 to cover two FTE positions, annual meeting arrangements, and a few small grants to member libraries. NAL does not fund USAIN operations but may fund (along with others) particular projects (e.g., a preservation program for agricultural literature).

^g Includes the full cost of ERIC, which is currently funded at \$7.8 million.

^h The MTKN pilot network has not been replicated in other regions, although it continues to operate without NTL funding.

ⁱ Does not include the cost of operating TRIS, which is provided and managed by TRB.

^j Provides reference services and free access to TLCat.

USDA field libraries—the United States Agricultural Information Network (USAIN); supports a bibliographic database, Agricultural OnLine Access (AGRICOLA), of citations to the agricultural literature; provides DigiTop, a digital desktop library that brings published information on agriculture and related sciences to the desktops of USDA employees; operates seven national centers that provide information on such key topics as alternative farming, animal welfare, and food and nutrition; and collaborates with universities and other partners in the Agriculture Network Information Center (AgNIC), which provides reliable web-based information and expertise on food, agriculture, and natural resources to national and international users.

In contrast to those of NLM, NAL networks of information providers operate more autonomously and receive limited financial support from NAL.⁸ For example, USAIN is a people network, not an electronic network, and all support is provided by the elected officers and shared among participating institutions.⁹ Over the years, USAIN has performed a wide range of activities that include offering opportunities for networking at annual meetings, providing a forum for member discussion of agricultural issues, and sponsoring conferences. AgNIC—an alliance of NAL, land-grant universities, and others—operates as a voluntary organization of equal partners with minimal overhead and bureaucracy. NAL provides the secretariat, comprising an AgNIC coordinator and an information technology specialist, and hosts the central AgNIC website. Members take responsibility for small segments of agricultural information, and at their own cost develop websites and reference services within specific subject areas. An executive board (consisting primarily of representatives of AgNIC institutions) provides administrative oversight, and a coordinating committee of representatives from each alliance member sets policy and operating procedures (e.g., standards for website design), determines subjects and content development for websites, and sets the agenda for outreach and dissemination efforts.

⁸ An exception is the specialized information centers that are funded directly out of the NAL services budget.

⁹ NAL may fund particular projects of USAIN, however, such as a preservation program for agricultural literature.

With relatively flat funding over the past decade and a current budget (FY 2005) of about \$25 million that supports a staff of 168 full-time federal employees and 68 contractors, NAL has, according to a recent assessment, operated satisfactorily as the USDA library but not met expectations as a national library (NAL 2002) (see Table 2-1). The assessment panel recommended new leadership and a significant increase in resources to support such services as a greatly enhanced AGRICOLA (similar to NLM's MEDLINE and PubMed), further development of AgNIC as the foundation of a digital library for agriculture, and establishment of a national grant program (along the lines of the NLM model) for innovative and collaborative digital projects in agricultural information systems.¹⁰ NAL was exhorted to "change its self-concept from being a place to that of performing customer-driven functions and . . . of being the hub through which every item can be obtained online anytime" (NAL 2002, E3).

A new director of NAL was hired in 2002. Although many of the assessment panel's recommendations have not yet been implemented or the necessary resources secured, the director views his role as providing the leadership and strategic vision required to reinvent NAL from a library focused on a building to a customer-driven operation linking people, services, and systems. In his view, accomplishing this goal will require a well-articulated vision, customer-users connected with the information they need, and strong stakeholder support. These objectives are being accomplished through such initiatives as convening a leadership council focused on the future of agricultural information, strengthening congressional relationships, and promoting NAL as coordinator of a national network of information specialists that serves a broader audience than USDA.

National Library of Education

NLE is a relative latecomer as a national library. The Department of Education (DOE) was founded in 1980.¹¹ The library served the department

¹⁰ The report recommended annual funding of approximately \$100 million for NAL to carry out these tasks and fully meet its congressionally mandated mission (NAL 2002).

¹¹ DOE traces its history back to 1867, when Congress created a non-cabinet-level department. The extensive book collection of the first U.S. Commissioner of Education formed the nucleus for the library.

only, although inadequately according to a study by the General Accounting Office (now the Government Accountability Office),¹² until 1994, when the Clinton administration signed into law a bill substantially expanding its mission and functions and designating it the National Library of Education.¹³ Under the authorizing legislation, NLE was to serve as the federal government's principal center for the collection, preservation, and effective utilization of education-related information; ensure widespread access to the library's facilities and materials covering all education issues and subjects; provide quality control; have an expert library staff; and use modern information technology with the potential to link major libraries, schools, and educational centers across the United States into a network of national education resources. The first NLE director sought to create a National Education Network, modeled on USAIN, to carry out the library's charge of promoting greater cooperation and resource sharing among libraries and archives with significant education collections. Unfortunately, NLE's ambitious mission was not accompanied by congressionally authorized funding.

NLE was reauthorized by the Education Sciences Reform Act of 2002, which specified a more focused mission.¹⁴ Today with a current (FY 2005) budget of approximately \$9 million, six full-time federal staff (three professionals and three support staff), two primary contractors, and numerous subcontractors, NLE operates as part of the Institute of Education Sciences, the research arm of DOE (see Table 2-1). The library collects and archives information on a wide range of topics related to education. It makes this collection available to DOE staff and contractors and to a broader audience through local libraries. NLE operates the Education Resources Information Center (ERIC), a large bibliographic database of education literature that can be freely searched on line, with links to about

¹² The 1990 study characterized the library as being of "limited usefulness" because many of its books were uncatalogued and inaccessible to users; thus the library was underused by DOE staff and researchers, many of whom were unaware of its facility and services (GAO 1991).

¹³ The National Library of Education was established by Part E of Title IX of the Goals 2000: Educate America Act, Public Law 103-227, 1994.

¹⁴ NLE was charged with four responsibilities: (a) collecting and archiving information; (b) providing a central location within the federal government for information about education; (c) providing comprehensive reference services to DOE employees, contractors, and grantees, along with other federal employees and members of the public; and (d) promoting greater cooperation and resource sharing among providers and repositories of education information in the United States.

150,000 free-text documents. Finally, NLE provides virtual reference services to DOE staff, other government agencies, and the general public. The current leadership has chosen to carry out the library's mission to foster cooperation and resource sharing among providers of education information through the ERIC program, working with the Online Computer Library Center's (OCLC's) WorldCat and selected libraries, as well as with secondary vendors of the ERIC database and content providers, to improve access to education information. The National Education Network is largely dormant.

Although some differences in function among NLE, NLM, and NAL are recognized, NLE has not achieved the comprehensiveness of either NLM or NAL, despite its designation as a national library. This may be explained in part by the fact that by some accounts, NLE has never been provided sufficient funding or personnel¹⁵ or received strong support from DOE leadership. The importance of these factors should be kept in mind in creating a transportation information management system.

Nongovernmental Consortia

The committee was briefed on two nongovernmental library consortia that could also serve as models for organizing the provision of transportation information. Although there are many other such networks, the two organizations—the Southeast Library Network, Inc. (SOLINET) and the Coalition for Networked Information (CNI)—represent two different approaches to networking. SOLINET has a sizable staff and provides numerous member services, while CNI is small and provides strategic leadership.

SOLINET

A membership-based, not-for-profit library cooperative founded in 1973, SOLINET provides leadership, cooperative initiatives, and a full line of services for some 2,500 libraries in the southeastern United States. It is the largest regional library network in the United States. Among the services provided to members are access to OCLC and various databases on a dis-

¹⁵ National Library of Education, History, archived information. www.ed.gov/LE/histnle.html. Accessed April 19, 2005.

counted basis, conferences and workshops, training, and opportunities for networking. Annual revenues of \$48 million (\$40.5 million of which is pass-through) support a staff of about 60. SOLINET's executive office develops programs, policies, and budgets, with oversight provided by a six-member board of directors. Three board members are elected from the membership, and three are experts drawn from outside the library community. Several advisory groups help guide the development of products and services.

CNI

Also a member-based and -financed coalition, CNI was founded in 1990 to provide programs related to the development and use of networked information for institutions representing higher education.¹⁶ In contrast to SOLINET, CNI is a small, staff-driven organization of six (three full-time) with an annual budget of approximately \$1.2 million. It provides strategic advice and expertise (but not services) to its membership on such issues as developing and managing networked information content; building technology, standards, and infrastructure; and developing new competencies and collaborations among professions and professionals. CNI is funded entirely by 200 dues-paying members. Its primary activities include preparation of white papers, provision of advice and expertise, monitoring of existing programs, and planning for new initiatives. It hosts two membership meetings per year that highlight the latest developments in networked information. The coalition is governed by a steering committee that includes three at-large members from outside the library and information technology community, who bring other expertise and breadth to the governance structure. The success of the organization is attributed to the loyalty of its members and the value added by its knowledgeable staff.

Local Technical Assistance Program Centers

The transportation community operates a network of Local Technical Assistance Program (LTAP) centers through the Federal Highway Admin-

¹⁶ CNI is a program of the Association of Research Libraries and EDUCAUSE, which provides oversight and support to the steering committee that guides CNI's activities.

istration (FHWA) that could be a model for organizing networks of transportation information providers if not in substance, at least in form. Begun in 1982 as the Rural Technical Assistance Program, LTAP was expanded to include local officials in urban areas (with populations of up to 1 million). The program is funded at \$55 million for FY 2005 through FY 2009 by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users.

From its initial 10 centers, LTAP has grown to become a nationwide network of 57 centers located in universities and state departments of transportation (DOTs), serving each state, Puerto Rico, and six regional centers that in turn serve tribal governments. The aims of the LTAP centers are to improve communications among relevant agencies, encourage technology transfer and adoption, and synthesize best practices (TRB 1999). A variety of activities—including information exchange and dissemination, technical assistance, and training—help centers accomplish these goals. The program also supports a national LTAP information clearinghouse operated by the American Public Works Association and publishes a newsletter.

Funding is shared. Each center receives annual FHWA funding of approximately \$100,000, which must be matched by equivalent or greater nonfederal funds. A National LTAP Association, with an executive committee drawn from local centers in each of the 10 U.S. Department of Transportation (USDOT) regions, meets annually and serves as a mechanism to facilitate communication and coordination among association members and other government, academic, and private institutions and associations.

Implications for Transportation

A well-conceived system for transportation information management must be tailored to the decentralized character of the transportation sector and user community, the uneven development of libraries and other transportation information providers and services across the country, and resource constraints at all government levels. Networks offer an appealing structure that conforms to the decentralized character of the transportation system. Moreover, as previously discussed, regional networks are an integral part of information delivery systems in other sectors, such as

health and agriculture. The transportation sector could organize similarly to bring information services to transportation users. Unlike health and agriculture, however, transportation does not have a system of strong libraries and information providers in each region; the institutional infrastructure to enable networked operations must be developed.

OVERVIEW OF A PROPOSED TRANSPORTATION INFORMATION MANAGEMENT SYSTEM

The information technology revolution provides an opportunity for transportation libraries and other information providers to organize and deliver transportation information in new ways. Networks are the organizing structure in the information age, and they can provide the backbone of a well-coordinated transportation information system. In its judgment, the committee believes that the model that best fits the decentralized transportation sector is a distributed network of customer-driven, managed TKNs linking information providers and users wherever they are located.

Although a decentralized model of knowledge networks is envisioned, the committee recognizes the need for a mechanism at the national level to coordinate and manage the activities of the TKNs. The absence of such an institutional arrangement has been recognized as one of the major shortfalls of the current piecemeal system of information provision to the broad and diverse transportation user community. A better system would include a well-funded and strategically focused coordinating structure at the national level to help build and guide the development of TKNs across the nation and to provide the necessary leadership and support so that users will obtain value from networked operations.

The coordinating structure and the TKNs can be conceived of as a pyramid, with the coordinating organization overarching a much larger system of TKNs in all U.S. regions and at the federal level (see Figure 2-1). Together, these entities would fulfill the vision the transportation community first set forth in the 1970s for a network of information services and users coordinated at the national level. To be successful, the TKNs and coordinating structure must encompass the breadth and diversity of the organizations, interests, and geographic locations of those professionals in

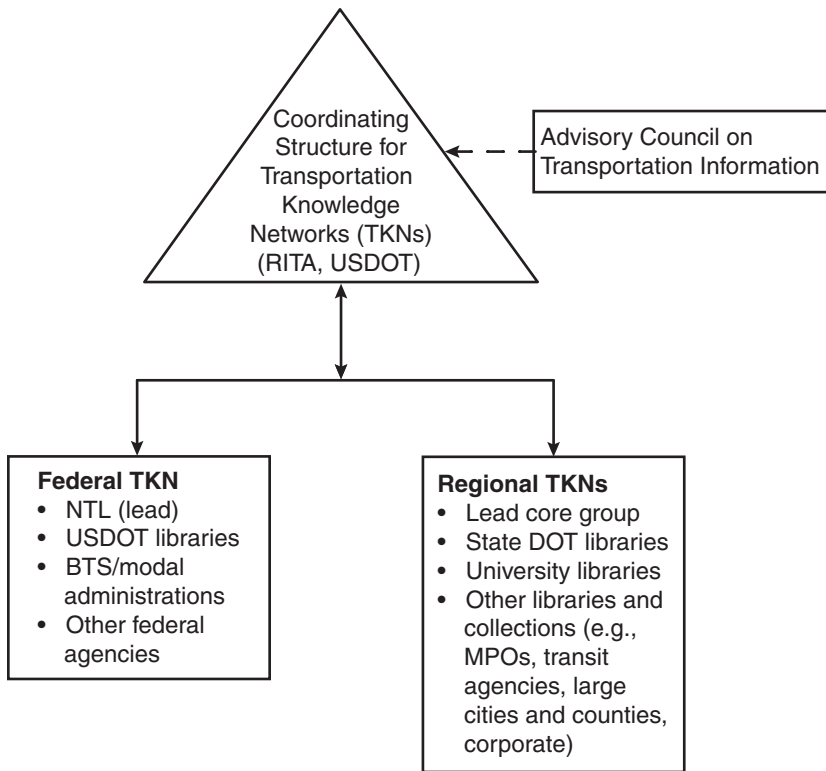


FIGURE 2-1 Proposed nationwide system for transportation information management. (BTS = Bureau of Transportation Statistics; MPO = metropolitan planning organization; RITA = Research and Innovative Technology Administration.)

transportation and related fields who will use their services. Thus, they must be

- Multisector, representing public-sector providers and users of transportation information (e.g., USDOT, state and local governments, transit agencies, metropolitan planning organizations), as well as universities and the private sector;
- Multimodal, including all transportation modes (highways, public transportation, rail, air, waterways, and pipelines); and
- Multigovernmental (local, regional, national, and international).

BENEFITS

The proposed system of TKNs and a coordinating structure should provide long-overdue leadership in the provision of information services to the transportation community. The national-level coordinating structure, in particular, would play a central role in helping ensure that information services are available in every region of the United States through networks of transportation information service providers.

A primary benefit of the above system that would distinguish it from the current system is improved user access to transportation and related information. Rapid delivery of reliable information can assist transportation professionals in decisions ranging from selection of better designs and materials for facility construction and preservation, to adoption of state-of-the-practice operating strategies, to identification of cutting-edge research and technologies for further study and application. The coordinating structure operating through the TKNs would help provide the information infrastructure and tools necessary for the delivery of such information—directly to the desktops of individual users where possible, through user-friendly, single-portal electronic gateways. Box 2-1 provides a description of how such a system would function from the user's perspective.

The new system should also help achieve efficiencies in the provision of information services through partnerships and collaborations, for example, by rationalizing library and collection holdings, creating centers of specialization (e.g., by subject area, mode), and coordinating the preservation and storage of printed and electronic materials. In today's business environment, in which transportation professionals are asked to do more with less, networking and coordination can help leverage resources, minimize duplication, and stretch budgets for libraries and information services.

Finally, the new system should foster sharing of expertise. This function would include professional capacity building for librarians and other transportation information professionals to help them incorporate new information technologies and remain abreast of rapidly changing technology advances. It would also involve basic training and technical assistance to help ensure, for example, that technical reports are catalogued, if not digitized, so they can be accessed more widely. More training would be developed for users in how to search for and locate transportation information more efficiently and rapidly.

BOX 2-1

Vision of a User-Focused Transportation Information System

“Users want . . . information in context, at the point of need . . . in the desired format for the need on hand.” (Outsell 2004, 6)

Envision state department of transportation employees working at their desks on time-sensitive projects or projects with long time scales:

- They identify a need for information and, because of good marketing in the agency, they know where to turn. They open their Internet or intranet browser to the library page or information portal and choose the service they desire, such as literature review, facts on file (common questions from across the country that are stored for easy retrieval), or reference requests.
- They find a front-end application that asks them how they want to search for information—geographically, topically, by title or author, or by other formats. This interface is visually engaging and easy to use. With a click, they are taken to that search tool, or this information is all on the first page.
- They type in their search phrase or point and click to icons and retrieve the desired information. The databases and systems that are being searched are noted while the search is under way (“now searching BIOSIS . . .”).
- They can clarify whether they want information in narrative form, tabular or geospatial data, or all of these. To help refine the search, questions that librarians typically ask users are programmed into the system.
- Once they come up with a list that reflects the information they are seeking, they can check boxes to say “I want to save this

(continued on next page)

BOX 2-1 (*continued*)

Vision of a User-Focused Transportation Information System

information” and create a customized list stored under their e-mail address or account.

- They can then retrieve the documents and data on the list, with highlights pointing to the specific text relevant to their search. Because the documents and data are tagged, they are able to find specifically what they are seeking. The behind-the-scenes effort to obtain, catalogue, index, tag, and store the information is not obvious.
- They are able to pull quotes from the documents, with prompts helping them understand copyright laws and appropriate uses and references.
- If a document is not available electronically, they are offered a menu for delivery: interlibrary loan (because of the Transportation Libraries Catalog or First Search, the location of the closest borrowing institution is known); electronic document delivery (from where and how much); purchase of paper copies (from where, how much, and how fast); or whatever the correct terminology is for the suite of options. In this vision, they will not have to pay \$800 for a full document if they want only a paragraph from it.
- When the site includes data references, they can easily understand the data platform and relevant uses.
- The results are provided to them in good English without cryptic abbreviations.
- Ideally, the system is somewhat fun or at least easy to use, and they understand the sources they are searching, how far those sources will take them, and when they will need to seek additional information.

DEVELOPMENT OF TKNs

Establishment of Regional TKNs

The committee believes that TKNs should be established in every region of the United States.¹⁷ The transportation sector has a working model for establishing regional networks in the Midwest Transportation Knowledge Network (MTKN)—the network of state DOT, university, and corporate libraries described in the previous chapter. MTKN could be replicated in other regions of the country. For example, regional networks could be developed on the basis of the four American Association of State Highway and Transportation Officials (AASHTO) regions. If these regions are too large, the 10 USDOT regions or some other regional grouping might provide more manageably sized regional coverage.

Each region should have a lead core group that would manage network development, interface with the other networks and the national coordinating structure, and play a role in network governance (discussed in the following chapter). For example, in addition to NTL, the primary leaders in developing MTKN were two state DOTs—Minnesota and Wisconsin; a university transportation center—the University of Minnesota Center for Transportation Studies; and the Northwestern University Transportation Library. The composition of the leadership group in each region should depend on the institutional strengths and resources of that region and would best be left to network members to determine.

Transportation libraries, information services, and professional capacity differ widely across regions. For example, one reason the Midwest was selected for a pilot network was the strength of its transportation libraries and librarians at both state DOTs and universities. This well-established group of library and information professionals already knew one another and were active in transportation and library organizations, thereby making it easier to coordinate and activate MTKN. Developing similar networks in other regions of the country may require more marketing, communications, and training. The MTKN model offers sufficient flexibility to tailor networks to local resources and needs.

¹⁷ The committee is not recommending a specific structure for the coordination of international information providers, but it views better coordination of and access to international information as a key function for the national coordinating structure (see the next section).

Over time, the coverage of regional TKNs could be broadened in several ways. They could be extended to include other data providers, such as transit agencies, metropolitan planning organizations, local governments, and consultants. In addition, network information content coverage could be broadened to capture statistical and geospatial data, as well as more traditional narrative information sources (e.g., books, reports, journal articles).

Establishment of a Federal TKN

A TKN is needed at the federal level to coordinate transportation information provided by libraries, collections, and related statistical programs and databases at federal agencies. NTL should take the lead in organizing this federal network as part of its mission to work with other transportation libraries and information providers. Other key participants should include the headquarters library at USDOT, the libraries and collections of the USDOT modal administrations, the Turner–Fairbank Reference Technical Center, the Volpe Transportation Library, and the transportation-related libraries and collections of other federal agencies (e.g., the U.S. Environmental Protection Agency, USDA, DOE). The planned move of USDOT to a new headquarters facility in the next few years offers an opportunity not only for relocating but also for rethinking departmental library operations. Consolidation or better coordination of library functions across the department should achieve operating efficiencies and free up funds that could be used for improving information services. In addition, providers of transportation-related statistical programs and databases—at a minimum, the Bureau of Transportation Statistics and the statistical programs of the major USDOT modal administrations (e.g., FHWA, the National Center for Statistics and Analysis of the National Highway Traffic Safety Administration)—should be represented in the federal TKN.

Mission, Functions, and Services of the TKNs

The fundamental mission of the TKNs at both the regional and federal levels should be to increase coordination and collaboration among transportation libraries and other information providers so that transportation

information users—managers, engineers, planners, and researchers—will be better able to find and apply to their programs and projects the most recent, credible, and validated technical information.¹⁸ The network should offer a forum to pool resources, collaborate in the development and provision of services, and share expertise and best practices.

The key functions and services provided by the TKNs should be user driven. The committee drew on numerous sources to identify user views on needed transportation information services and current gaps. These sources included interviews with a wide range of customers conducted as part of a scoping study undertaken in anticipation of this study (Harder and Tucker 2003),¹⁹ discussions with selected committees representing information service providers and users at the Transportation Research Board's (TRB's) 2005 Annual Meeting,²⁰ a roundtable discussion on this topic from the information provider and user perspectives at the first committee meeting, and discussions with members of AASHTO's Research Advisory Committee and the Standing Committee on Research of AASHTO at various committee meetings. On the basis of these discussions and its own judgment, the committee agreed on a core list of functions and services for the TKNs, summarized in Box 2-2.

DEVELOPMENT OF A NATIONAL COORDINATING STRUCTURE

Realizing the full value of the TKNs will require a mechanism at the national level to coordinate and manage their activities.

¹⁸ This section draws heavily on the overview and mission of MTKN as described on its website, www.mtkn.org/about.htm, accessed September 27, 2005.

¹⁹ The groups interviewed included executives of state DOTs; decision makers from other key transportation organizations, such as TRB, AASHTO, and FHWA; state DOT research managers; transportation practitioners (technical information users); regional and local transportation officials (e.g., metropolitan planning organizations, city managers, county engineers); technology transfer professionals; librarians and information specialists; academics; and private-sector customers. See Chapter 2 of the scoping study for a summary of user needs and Appendices A and B of the study for the interview plan and protocol and the results by customer group, respectively.

²⁰ TRB staff addressed the following TRB committees—Library and Information Science for Transportation, Conduct of Research, Transportation History, Technology Transfer, and Education and Training—as well as the TRB State Representatives.

BOX 2-2

Proposed Functions and Services of the TKNs

The committee envisions that network functions and services at both the regional and the federal levels would include

- Identification of key information provider and user groups,
- Sharing of information and services,
- Coordination of collections,
- Interlibrary loan,
- Sharing of catalogues through TLCat,
- Reference services, and
- Professional capacity building for members.

Mission

The primary mission of a coordinating mechanism would be to provide sustained leadership and harmonization for the TKNs. The coordinating structure could help develop collection and reference strategies to minimize duplication, manage appropriate document storage redundancy, take advantage of economies of scale, ensure interoperability across networks so that operations are seamless to users, and share best practices to obtain the greatest value from networked operations. For example, the coordinating structure could help realize economies of scale across the system of TKNs by working with them to develop policies for rationalizing library collections and to create centers of specialization that would reduce duplication in holdings across individual libraries and information providers. In addition, the coordinating structure could establish cooperative purchasing pools and pass along the savings from group discounts to member TKNs. The coordinating structure could also help ensure network interoperability by encouraging and supporting the development of common standards and protocols and common enabling information infrastructure technologies to support network operations.

NLM and NAL perform this coordinating function in the health and agricultural sectors, respectively. The committee reviewed a wide range of options for placement of such a coordinating structure in the transportation sector—the subject of the next chapter.

Functions and Services

In addition to its leadership role, the coordinating structure would play an important part in the development of the TKNs. Like NTL in its sponsoring of MTKN, the coordinating structure would provide seed funds and technical support for network development and assist in inventorying key data and information providers and other resources (in-kind as well as financial) that could be brought to bear in setting up the networks. Another, related key activity would be marketing and communications. The coordinating structure would act as a focal point for promoting the value of information and information services and attracting adequate resources for this purpose. It would also handle government relations, including links with international information providers.

In addition, the coordinating structure would perform several functions in direct support of the TKNs. It would have a convening function, bringing TKN members together to share experiences—at an annual meeting at a minimum. It would assist the TKNs in planning and setting priorities for networkwide projects and initiatives. It would also provide administrative support for TKN operations through a small core staff.

The coordinating structure would have responsibility for developing enabling information infrastructure and tools in support of network operations, such as appropriate user interfaces and one-stop search portals. It would help develop common standards and protocols, including policies concerning authentication of materials, storage and redundancy of materials, and security. The coordinating structure would conduct research to help librarians and information professionals remain on the cutting edge of technology innovations and best practices to better serve users. It would also survey users periodically to stay abreast of their changing needs. Finally, the coordinating structure would engage in professional capacity-building activities for TKN members and users more generally, including curriculum development and technical assistance to individual TKNs. Box 2-3 provides a summary of these core functions and services.

BOX 2-3

Proposed Functions and Services of the Coordinating Structure

The committee envisions that the functions and services of a coordinating mechanism to manage the activities of the TKNs would include the following:

- Leadership;
- Network building and seed funding;
- Technical assistance on identification and inventorying of key information resources and gaps;
- Marketing and communications;
- Government relations, including links with international information providers;
- Convening functions (e.g., annual meetings of TKN members);
- Planning and priority setting on networkwide programs and projects;
- Administrative support for the TKNs;
- Information infrastructure development and tool creation;
- Facilitation of the development of common standards and protocols;
- Research on new information technologies, best practices, and user information needs; and
- Professional capacity building and curriculum development.

Product Development

One way to raise awareness of the benefits of the proposed transportation information management system would be to develop a highly useful product that would require the cooperation of multiple information providers and demonstrably benefit users. The Transportation Libraries Catalog (TLCat), which was developed through a partnership among NTL, MTKN, and OCLC, is a good example of this type of approach. The first group catalogue for transportation professionals, TLCat has simpli-

fied and increased access to transportation information resources by state DOT research directors and other transportation officials. It has allowed them to find reports and other documents of participating transportation libraries in a single catalogue (OCLC Group Services 2004; MTKN 2004).

A similar tool could be developed by the coordinating structure as part of a marketing drive to encourage membership in the TKNs. For example, many transportation projects require consideration of environmental impacts, sometimes through formal environmental impact statements (EISs). A geographic information system–based tool could be developed to link regional and local data for environmental assessments. Additional information on regulations for EISs, analysis methods and examples, and contacts for further information could be provided as part of a one-stop portal available to practitioners at their desktops from a new website for the TKNs and coordinating structure.

FROM PROPOSAL TO IMPLEMENTATION

This chapter has laid out an ambitious proposal for a system of TKNs and a national coordinating structure that could help provide transportation leaders and practitioners alike with the information needed to make good decisions. Making the case for a more substantial and long-overdue investment in managing transportation information resources is not difficult. Turning the vision into a reality, however, requires good choices regarding administration and funding of the system, the topics of the following two chapters.

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Abbreviations

GAO	General Accounting Office
MTKN	Midwest Transportation Knowledge Network
NAL	National Agricultural Library
OCLC	Online Computer Library Center, Inc.
TRB	Transportation Research Board

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Administration

In this chapter, various options are considered for locating the national coordinating structure described in the previous chapter. Characteristics for successful operation are defined, the pros and cons of alternative institutional arrangements are examined in light of these characteristics, and the committee's recommendation for a sustainable administrative structure is presented. The chapter, drawing on the experience in other sectors and other transportation programs, then turns to a discussion of appropriate governance arrangements for guidance and oversight of the coordinating structure.

CHARACTERISTICS FOR SUCCESSFUL OPERATION

The coordinating structure will serve a national purpose for the transportation sector. Thus as a general principle, it should be located in an institution with a national transportation role. In addition, the following four characteristics, distilled from the models described in the previous chapter and briefings at committee meetings, are important for the successful operation of the coordinating structure:

- *Independence:* The coordinating structure must have a sufficient degree of autonomy to carry out its mission, plan, and set priorities. If the coordinating structure is located within an existing organization, it must have the backing of that organization's leadership to operate in this manner. If a new structure is created, the coordinating structure will start with a clean slate and the ability to define its own mission.
- *Close links with stakeholders:* Libraries and other information providers must maintain close links with stakeholders so they can tailor products

to meet user needs and requirements. Such links are particularly important in today's environment as information providers adapt to the digital age and supply many services directly to their customers. They are also critical, especially in the development phase of a new operation, to provide the strong commitment and sustained support necessary to surmount any start-up problems. Stakeholder support will be particularly critical if the coordinating structure is a new organization.

- *Sustained funding:* As discussed in Chapter 1, a lack of adequate resources has been a major impediment to realizing the full potential of the National Transportation Library (NTL) and creating more comprehensive networks of transportation information providers. Ad hoc funding arrangements have long characterized the provision of transportation information services generally. A successful coordinating structure requires sustained funding. Although it is highly unlikely that available funding for transportation information services will approach the levels of the health or even the agricultural sector at least in the short term, transportation could support a much broader and better-funded effort than is currently the case.
- *Minimization of time and costs of start-up:* Given the relatively modest amount of resources currently directed toward the provision of transportation information services (see Figure 1-2 in Chapter 1), it is particularly important to seek ways of minimizing administrative and overhead costs, thereby focusing funds on services and providing a good return on investment. Minimizing start-up time is also desirable; a more systematic approach for coordinating transportation information providers and services is long overdue.

COMPARISON OF OPTIONS

The committee considered three options for locating the coordinating structure: placing it at the U.S. Department of Transportation (USDOT), locating it within an existing nonfederal transportation organization, and creating a new entity (see Figure 3-1). The strengths and weaknesses of each alternative are discussed in light of the characteristics outlined above (see Table 3-1).

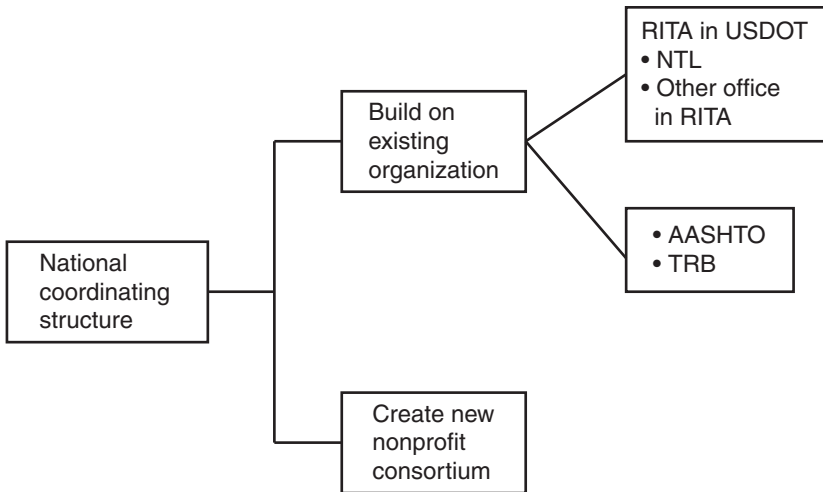


FIGURE 3-1 Options for locating the coordinating structure for a transportation information management system. (AASHTO = American Association of State Highway and Transportation Officials; NTL = National Transportation Library; RITA = Research and Innovative Technology Administration; TRB = Transportation Research Board; USDOT = U.S. Department of Transportation.)

Option 1: Locate Within the Research and Innovative Technology Administration at USDOT

USDOT is the federal headquarters for nationwide multimodal transportation activities and thus is a natural location for the coordinating structure, which would have a national transportation mission. More specifically, locating the coordinating structure within the new Research and Innovative Technology Administration (RITA) would make it part of a new agency with the attention of that agency's current leadership. The direct involvement of Secretary Mineta in the establishment of RITA and its mission¹ to generate greater collaboration, information sharing, coordination, support, and advocacy for research make it an appropriate entity in which to house the coordinating structure. RITA is also responsible for

¹ The Norman Y. Mineta Research and Special Programs Improvement Act, Public Law 108-426.

TABLE 3-1 Institutional Options for Placement of the Coordinating Structure

Option	Pros	Cons
Option 1: Locate within RITA at USDOT	<p>USDOT offers a multimodal focus, an opportunity for leadership support, and an innovative environment in a new agency—RITA.</p> <p>Close links exist with major stakeholders, primarily through NTL, BTS, and the Office of Research, Development and Technology.</p> <p>Could avail itself of existing staff and organizational support (e.g., building, telephones), thereby reducing lengthy start-up time and costs.</p>	<p>No guarantee of an independent position within RITA; subject to changing administrations' priorities.</p> <p>Adequate funding could be a problem, at least in the short term.</p>
Option 2: Locate within an existing nonfederal transportation organization	<p>AASHTO (Center of Excellence)</p> <p>Could establish a new Center of Excellence.</p> <p>Would have close links with a major stakeholder group—state DOTs.</p> <p>Could avail itself of some existing organizational support (e.g., building, telephones), thereby lowering costs.</p>	<p>AASHTO has no experience with many of the library-related functions of the coordinating structure; therefore, start-up could take time and would require new expertise.</p> <p>Could be difficult to reach other potential major customers (e.g., universities, transit agencies, metropolitan planning organizations, private sector).</p> <p>Direct financial support from AASHTO could be difficult to obtain if it involved increasing member fees.</p>

<p>TRB</p>	<p>TRB has experience with many proposed coordinating structure services; therefore, it provides the type of setting in which the coordinating structure could carry out its mission and could reduce start-up time.</p> <p>Has good links with stakeholders through its multimodal focus.</p> <p>Could avail itself of some existing organizational support (e.g., building, telephones), thereby lowering costs.</p> <p>As a separate organization, would be independent.</p> <p>Offers an opportunity to start with a clean slate and create an innovative environment and a clear and focused mission.</p>	<p>Cost of operations would be high.</p> <p>Securing funding could be a problem.</p>
<p>Option 3: Create a new nonprofit consortium</p>	<p>Would have no name recognition with stakeholders.</p> <p>Would involve longer start-up and potentially higher costs (no existing organizational support services on which to draw).</p> <p>Funding could be a problem, particularly federal support.</p>	

NOTE: AAASHTO = American Association of State Highway and Transportation Officials; BTS = Bureau of Transportation Statistics; NTL = National Transportation Library; RITA = Research and Innovative Technology Administration; TRB = Transportation Research Board; USDOT = U.S. Department of Transportation.

NTL and the Bureau of Transportation Statistics (BTS), the main transportation statistical agency. A well-managed coordinating structure serving a system of transportation knowledge networks (TKNs) would complement the functions of both NTL and BTS and provide natural outlets through which federally conducted research and related databases in the modal administrations at USDOT could be distributed widely to users. There is no guarantee, however, that the coordinating structure would secure the degree of backing and autonomy it would need within RITA to carry out its mission or that RITA itself will continue to have the support of USDOT leadership. Nevertheless, locating the coordinating structure within RITA offers promising conditions for a good start.

RITA also offers the potential for the coordinating structure to forge close links with key stakeholder groups. NTL, BTS, and the Office of Research, Development and Technology (which manages the University Transportation Centers program in RITA) are well known to key user groups, such as state departments of transportation (DOTs) and universities, that are critical to the development and support of a coordinating structure.

RITA also has staff, particularly at NTL, who are knowledgeable about many of the proposed functions of the coordinating structure. The coordinating structure could build on that staff and the organizational support already in place and thereby avoid lengthy start-up time and costs.

Adequate funding for the coordinating structure could be a problem in the short term. The BTS budget—the major component of RITA funding—was reduced by more than one-fifth in the 2005 reauthorization of the surface transportation legislation. With the support of the secretary, however, the new administration has the opportunity to reshape its programs and functions, of which the coordinating structure could be a part, and to secure more adequate funding in the next reauthorization.

Option 2: Locate Within an Existing Nonfederal Transportation Organization

The committee considered two alternatives under this option. The first is to establish the coordinating structure as a Center of Excellence within the American Association of State Highway and Transportation Officials (AASHTO), the primary professional association for state DOTs. This

alternative would ensure that the coordinating structure would have close links with a major stakeholder group—the state DOTs—which are all AASHTO members. Costs of operation could also be lowered because the coordinating structure, as part of AASHTO, could take advantage of existing facilities and support services (e.g., building, telephone system, information technology infrastructure).

One of the primary weaknesses of this arrangement, however, is AASHTO's lack of experience with many of the library-related functions of operating a coordinating structure. AASHTO has set up several Centers of Excellence in recent years to provide information exchange and partnership-building opportunities in various areas (e.g., the environment, intelligent transportation systems). AASHTO leadership could support a new center for the coordinating structure, but this would take time and require new expertise as AASHTO remains primarily a membership organization. Furthermore, it could be difficult for an AASHTO-based coordinating structure to reach other potential major stakeholders, such as universities, transit agencies, metropolitan planning organizations, local governments, and the private sector. Finally, providing financial support for an AASHTO-based coordinating structure could be difficult if it involved increasing AASHTO membership dues.

The second alternative under this option is to locate the coordinating structure at the Transportation Research Board (TRB). TRB has experience with many of the proposed services of the coordinating structure through its own library; its development and maintenance of the primary transportation bibliographic database, the Transportation Research Information Services (TRIS) database; and its preparation and circulation of extensive publications that form the core of many transportation library collections. Hence, TRB provides the type of setting in which the coordinating structure could carry out its mission. In addition, TRB is well known by the major stakeholder groups; has existing mechanisms in place to receive funds from multiple sources; and, with its multimodal focus, would be in a better position than AASHTO to reach out to a broad group of stakeholders. As with the AASHTO alternative, a TRB-based coordinating structure could take advantage of existing facilities and support services to reduce operating costs. A difference, however, is that start-up time could probably be reduced because of TRB's familiarity with many of the

functions of the coordinating structure. On the other hand, a primary drawback of this alternative is the possible higher cost of operating the coordinating structure at TRB.² The uncertainties of the annual appropriations process could also be a problem for sustained funding.

Option 3: Create a New Nonprofit Consortium

A final option is to start afresh and create the coordinating structure as a new organization. The primary benefit of this option is the ability to start with a clean slate. A nonprofit consortium could be established to carry out the functions of the coordinating structure along the lines of the library consortia discussed in the previous chapter. A new organization would enable the coordinating structure to start without existing organizational encumbrances, define a clear and focused mission, and operate independently.

Given such a new organization's lack of a track record and name recognition among stakeholders, however, generating sufficient visibility to gain broad stakeholder support could take time, and the outcome would be uncertain. Costs of operation would also be higher than with an existing organization, because costs would be spread over a smaller base. Moreover, obtaining funding, particularly federal support, could be a problem if USDOT continues to support NTL and its activities.

RECOMMENDED LOCATION

After reviewing each of the above options in light of the characteristics outlined earlier, the committee recommends the first option—locating the coordinating structure within RITA at USDOT—as the best course. USDOT in general, and RITA in particular, is the logical location for the coordinating function. With its multimodal focus, USDOT offers links to

² As a private nonprofit organization, the National Academies fully allocates all overhead and other indirect costs to program units. TRB would have some advantages of economies of scale and ability to integrate such an activity with TRIS, but governmental costs would probably be lower because all indirect costs are typically not charged back to operating units in federal budgets. The cost differential could be minimized if the operation of the coordinating structure were contracted out.

many key stakeholders. RITA houses two agencies—NTL and BTS—whose missions and activities are closely linked with the functions of the proposed coordinating structure, as is the mission of RITA itself. These synergies would likely reduce start-up time and operating costs. In addition, the new entity has the potential, at least in the short term, to prosper in an administration that currently has the attention and support of Secretary Mineta. In the committee's judgment, these benefits are more compelling than those of the other options and outweigh the potential limitations of locating the coordinating structure within RITA.

If adequately funded and supported, NTL could manage the coordinating structure. Information coordination is clearly part of NTL's mission. Moreover, NTL is well known to transportation librarians and information professionals and has good relationships with many stakeholder groups—an important asset. It has successfully undertaken several initiatives and possesses a core staff and facilities on which a coordinating structure could be built. Nevertheless, the committee was concerned about the historical lack of support for NTL by BTS and USDOT and its current uncertain status in the department. Alternatively, the coordinating structure could be located within another office in RITA, for example, the new Office of Research, Development and Technology. Either alternative would avoid lengthy start-up time and the costs of creating a new organization.

The committee chose not to recommend which entity within RITA should manage the new coordinating structure but believes this decision is more appropriately left to RITA and USDOT administrators. Nevertheless, the committee urges USDOT leadership to study the alternatives carefully and place the coordinating structure where it can best obtain the funding and support it needs to carry out its leadership role.

GOVERNANCE

Building a strong, effective, and accountable coordinating entity requires a governance structure to provide policy direction, long-range planning, and oversight. The experience of the National Library of Medicine (NLM), for example, illustrates the importance of a strong governing board in pro-

viding policy direction and oversight and in acting as a champion for NLM programs and services on Capitol Hill. The coordinating structure could benefit from a similar governance arrangement.

An Advisory Council on Transportation Statistics already exists to provide guidance and advice to the director of BTS.³ The committee believes its focus and membership should be broadened, and it should be retitled the Advisory Council on Transportation Information, with responsibility for oversight of the coordinating structure in addition to BTS. The membership of the current advisory council represents a cross section of transportation community stakeholders, who could provide guidance to the coordinating structure. A reconstituted council should also represent key information providers and users (e.g., federal agencies, state DOTs, universities, private companies), the regional TKNs, and the federal TKN, as well as experts in information, communications, and computer technology drawn from outside the field of transportation.

Key activities of the advisory council related specifically to the coordinating structure would include reviewing long-range strategic plans, monitoring the coordinating structure's performance, examining annual evaluations prepared by RITA, and reporting annually to Congress on how the coordinating structure is working. Elements of this recommendation, such as the composition and broadened focus of the advisory council and added reporting functions, require revision of current legislation.

Periodic external peer reviews of the activities of the coordinating structure should also be conducted. These assessments should be undertaken by an independent group of experts, such as the periodic commissions formed to review the activities of the National Agricultural Library, to provide a neutral assessment of the progress of the coordinating structure.

Finally, the TKNs could consider organizing a representative nonprofit association external to USDOT to address local network issues. Such an association should not duplicate the coordinating structure but would provide an opportunity to generate grassroots support for the TKNs, facilitate communication on local and operational issues (e.g., cooperative purchasing arrangements), and act as a checks-and-balances mech-

³ H.R. 3: Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users, Title V: Research, Subtitle F, Sec. 5601(o).

anism outside of USDOT. The Local Technical Assistance Program Association and the governance arrangements of the library consortia discussed in the previous chapter provide models for such a member-governed association.

This chapter has addressed two topics vital to the success of the coordinating structure: where it should be located and how it should be governed. The next chapter considers another critical factor—options for ensuring sustained funding of both the coordinating structure and the TKNs.

Funding Options

One of the main impediments to a more robust information management system for the transportation sector is a lack of secure and sustained funding. This chapter begins by describing the funding characteristics necessary to support the proposed national system of transportation knowledge networks (TKNs) and a coordinating structure. Potential funding sources are then described, and the committee's proposed funding strategy is presented. The chapter ends with a brief section on next steps.

FUNDING CHARACTERISTICS

The committee's review of other national libraries and networks of information service providers revealed several characteristics of their funding that appear to contribute to their successful operation:

- *Continuity of funding:* Sustained funding is probably the single most important characteristic for successful provision of information services. Most if not all information services (e.g., bibliographic databases, cataloging, digitization) require continuous funding to ensure that users will receive timely, complete, and up-to-date information. Resources are also needed to keep information professionals on the cutting edge of user needs and technology developments. The stop-and-start funding of the National Transportation Library (NTL) is a good example of the problems encountered when budgets are insecure. NTL started several initiatives in its first years of operation, but without a reliable budget, support for many of these activities, such as expansion of the Transportation Libraries Catalog and network development, has languished. Many other components of a transportation information management system—the Transportation Research

Information Services (TRIS) database, the Transportation Thesaurus, cataloging and collection development—are handled by the Transportation Research Board (TRB) and through informal arrangements among transportation librarians from key academic and state department of transportation (DOT) libraries, with no systematic means of supporting an umbrella coordinating function or funding system improvements.

- *Breadth of funding*: Continuity of funding is best ensured by a broad range of support rather than dependence on a single revenue source. Federal funds, for example, are critical to the operation of national libraries within federal agencies. Nevertheless, as administrations and funding priorities change, certain library operations, such as network development, may be at risk. This was the case with NTL and the Midwest Transportation Knowledge Network (MTKN). MTKN was a successful pilot project, but because of budget cutbacks, NTL has not been able to build on this success to develop similar networks in other regions.
- *Stakeholder buy-in*: Ownership of a transportation information management system by the major stakeholders is critical to successful operation, and such ownership can best be guaranteed through financial support. Federal funds are commonly used to leverage state, local, and even private support to finance a wide range of transportation programs; transportation information management should be no different. Matching requirements are a powerful tool to ensure that users value the services provided and participate actively in planning how those services can best meet mission-critical needs. Programs with matching requirements are also attractive to congressional sponsors and federal agencies because services and activities are shared responsibilities.

POTENTIAL FUNDING SOURCES

Information is what economists call a public good, which has the property that it is often underprovided.¹ Public goods exhibit the free-rider problem; that is, many of those who benefit from the good may not pay

¹ Public goods exhibit two characteristics. First, they are nonrival in consumption; that is, once they are provided, there is no additional cost or diminishment in benefit from another person consuming them. Second, they are nonexcludable; that is, it is very difficult if not impossible to prevent access to them (Rosen 2005).

for that benefit. This often results in failure to provide an optimal amount of the good, an outcome that may be remedied by government intervention and provision of the good. At this point, the issue becomes how much of the good to produce and how to allocate the costs involved.

A broad range of funding sources should be tapped to support a fully functioning information management system for the transportation sector (see Table 4-1). The Research and Innovative Technology Administration (RITA), which is responsible for the Bureau of Transportation Statistics (BTS) and NTL, is currently funded from Title V funds for Research, Technology, and Education in the surface transportation legislation. The coordinating structure, which the committee recommends be located within RITA (see Chapter 3) and which will serve a national purpose, could also be funded from this source. The committee recognizes that this funding source could be problematic given reductions in current funding for BTS, the major component of RITA's budget. Thus, the committee's recommendations are focused on the next reauthorization of the

TABLE 4-1 Sources of Funding for the TKNs and Coordinating Structure

Funding Source	Delivery Mechanism
Federal	
Title V funds from the surface transportation legislation	Congressional appropriation At agency (USDOT) disposition unless separate budget authority
State	
State Planning and Research funds	Set-aside or earmark
Title I state grants	Contribution to multiyear pooled-fund project
Other state funds	Reimbursable grant expense
University funds	
University Transportation Center funds	Set-aside or earmark
Other university funds	Contribution to multiyear pooled-fund project Tax on individual research projects for information support
Other funds	
Transit agencies, metropolitan planning organizations, local governments, private companies	Contribution to multiyear pooled-fund project Other gifting arrangement

surface transportation legislation, although movement toward funding the information management system recommended in this report could begin much sooner by drawing on other funding sources.²

Federal funds alone will not suffice to achieve the nationwide transportation information management system envisioned by the committee, particularly a robust system of transportation information providers organized in networks across the country. Federal funds can help support network development, but core funding from other major stakeholder groups, such as state DOTs and universities, is essential to ensure continuing support for the system's operations.

The primary source of state support for research, development, and technology is State Planning and Research (SP&R) funds; library and information services are clearly an eligible activity.³ State DOTs could agree on a voluntary set-aside of SP&R funds to support the TKNs and the coordinating structure, or states could elect to pool their SP&R funds in a multiyear pooled-fund project.⁴ SP&R funds, however, may be difficult to tap; in many states, the 25 percent earmark for research, development, and technology is already stretched thin in the budgets of research directors. In some states, other state funds are used to support state DOT libraries. Those funds could also be used to support the TKNs and the coordinating structure, but they may already be spoken for.

Another alternative is to investigate the feasibility of using Title I Federal-Aid Highway grants received by each state. Information services

² For example, the pooled-fund project on Transportation Library Connectivity described in Chapter 1 could be expanded or a new project started to provide additional state and university funding for network development.

³ Current legislation requires that states set aside 2 percent of the apportionments they receive from six surface transportation programs—the Surface Transportation, National Highway System, Bridge Replacement and Rehabilitation, Interstate Maintenance, Congestion Mitigation and Air Quality, and Highway Safety Improvement programs—to support SP&R activities. Of this amount, states must allocate 25 percent for research, development, and technology. SP&R funds are currently used to provide support for libraries and information services. Some states use these funds for their own libraries, for example, and some states support TRB's core programs, which include TRIS and TRB's library.

⁴ States are encouraged to pool their SP&R funds in cooperative research efforts to address regional and national issues and leverage funds. Such arrangements currently support the National Cooperative Highway Research Program at TRB; TRB core activities; cooperative state research, development, and technology programs; and other transportation pooled-fund studies. Pooled-fund projects are not currently used for planning and operations. Typically, they support investigation of well-defined technical problems.

could be made a reimbursable expense, similar to the way in which computers and other equipment are now considered support for grant-funded engineering and construction projects, on the basis of the idea that information support is also a cost of doing business that should be recovered. Title I grants often fund large construction projects. Therefore, a small percentage add-on for information support could generate substantial revenues.

Support for continuing network operations is also needed from university libraries with major transportation collections and University Transportation Center (UTC) libraries. At present, 52 UTCs receive federal funding under Title V of the newly reauthorized surface transportation legislation, and 10 universities are funded under Title III (Public Transportation) of the same legislation. In both cases, the universities must match federal grants dollar for dollar. University grant funds could be tapped in several ways—through a voluntary set-aside of some fraction of UTC budgets, contributions by individual universities and UTCs to a multiyear pooled-fund project, dedication of a university librarian to participate actively as an information provider and manager in the network, or even levying of a small tax on each UTC research project for information support (although the latter approach could pose the administrative burden of separating funds by purpose).

Regardless of what approach is selected to provide core funding from state DOTs and universities, funding could also be sought from a broader group of stakeholders, including transit agencies, metropolitan planning agencies, large city and county governments, and the private sector, as the TKNs develop and their membership is broadened. Although many of these entities may not have libraries, they may have information centers, and even a small contribution, given the large number of organizations involved, could help defray the cost of network operations.

The committee believes that recommendations concerning specific funding sources to support the TKNs and the coordinating structure are premature and need to be formulated in a follow-on effort (see the final section of this chapter). Nevertheless, in the following section the committee proposes a strategy encompassing several general principles with regard to funding, as well as funding amounts, that in its judgment should guide the start-up and development of the new system.

PROPOSED FUNDING STRATEGY

The TKNs and the coordinating structure should seek broad-based funding support from multiple sources to help ensure sustained operations. For the first 3 years, however, federal grants should provide the primary support for the start-up and development of critical programs and services of the coordinating structure (see Table 4-2). Pilot grants should also be made available to start up the regional- and federal-level TKNs. Those receiving pilot grants should be required to develop metrics and examples of the cost savings and other benefits of networked information services.

Once these efforts are under way—after about 3 years—federal funds should be increased to expand the programs of the coordinating structure and support further start-up and development of the TKNs. At this point, however, federal funds for the TKNs should be matched on a dollar-for-dollar basis by nonfederal sources. In-kind contributions would be acceptable.

As a general rule, federal funds would be used to support national projects identified by the coordinating structure and its membership, as well as start-up and development of the TKNs, both regional and federal (see Table 4-2). They would also be used to support a small core staff at the coordinating structure, which would grow with its programs and services. Required matching funds would be used, to the extent possible, within the regions where the funds were raised to support individual TKN activities, projects, and services.

The committee recommends a federal grant program of \$3 million to \$5 million for the first 3 years, growing to a total program of \$7.5 million to \$13 million in subsequent years when federal funding for network development would be leveraged with required local matching funds. Table 4-2 provides greater detail on how the funds might be divided between the coordinating structure and the TKNs on the basis of the functions and information services identified for each in Chapter 2 (Boxes 2-2 and 2-3). For example, in the start-up years, federal grants would be used to establish the coordinating structure at RITA, build a small core staff, and provide seed funds and technical assistance for network development at the regional and federal levels. For illustrative purposes, the committee estimates that putting the coordinating structure in place would require a minimum of \$1.5 million annually for staff—a director, field librarians, information

TABLE 4-2 Proposed Transportation Information Management Program Funding

Time Period	Funding Source	Coordinating Structure	Regional and Federal TKNs	Total
Start-up (years 1–3)	Federal grant	\$1.5 million to \$2 million annually in federal funding for start-up, development of critical programs and services	\$1.5 million to \$3 million annually in federal funding for pilot grants to start the federal and regional TKNs	\$3 million to \$5 million annually to initiate program—all federal funding
	State/local match	None	None	
Longer-term (years 3+)	Federal grant	\$2.5 million to \$3 million annually in federal funding for expansion of critical programs	\$2.5 million to \$5 million annually in federal funding for expanded grant program to support activities of the federal TKN and to start and expand the regional TKNs	\$7.5 million to \$13 million annually to expand the program—federal and nonfederal funding
	State/local match	None	\$2.5 million to \$5 million annually in state, university, local, private, and in-kind matching funds to support and operate the regional TKNs	

technology personnel, marketing and administrative support—travel, annual meetings, product development, supplies, and overhead. Costs could be as high as \$2 million annually depending on the products and services provided. Pilot grants for development of the TKNs would probably require a minimum of \$300,000 annually for each network to support local staffing, meetings and travel for network members, and cataloguing.⁵ The funding requirements could be higher in regions where transportation libraries, information services, and professional capacity are weak. In addition, the annual total would depend on the number of TKN start-ups. Thus, the committee has recommended a range of \$1.5 million to \$3 million annually for this activity during the start-up period (Table 4-2).

After 3 years, once the basic structures had been established, the budget would grow accordingly to fund expansion of the TKNs and the supporting services and programs of the coordinating structure. Funds for the latter would be used to underwrite individual projects with national application (e.g., information infrastructure, tool building, and products for network use) and to support professional capacity building and a program of research. Box 2-3 in Chapter 2 lists the functions and services envisioned by the committee for a fully operating coordinating structure. The committee estimates that these functions could require an additional \$1 million to \$1.5 million in annual funding for the coordinating structure, for a funding total of \$2.5 million to \$3 million. Additional funds would also be required to support new networks and help expand networks established during the start-up period. Box 2-2 in Chapter 2 lists the function and services envisioned by the committee for fully operating TKNs. The committee estimates that a fully functioning TKN could cost a minimum of \$500,000 annually to support such functions and services as collection coordination and development, reference services for regional users, and professional capacity building for members. The total annual funding required for the TKNs would depend, of course, on the total number of regional networks and the functions and

⁵ Pilot grants from NTL for MTKN cost approximately \$150,000 annually, but the Midwest region had a strong existing transportation library infrastructure and active professionals who already knew one another. Moreover, this figure did not include NTL staff support or travel and reflects costs as of FY 2001–2002.

services each network decided to provide. On the basis of 10 regional TKNs—one in each USDOT region—and one federal-level TKN, the committee estimates a range of \$5 million to \$10 million to support the activities of the networks, assuming that federal funds would be matched by local contributions.

The committee recognizes that the funding levels cited here are rough approximations and should be refined in a follow-on effort. However, they do not appear to be out of line with funding for similar information services in other sectors (e.g., health and agriculture) or with the experience of NTL and MTKN.

NEXT STEPS

To implement the proposed transportation information management system, the committee recommends the following next steps. First, a follow-on project should be funded through the National Cooperative Highway Research Program to develop a business plan, including details of proposed functions and funding for both the TKNs and the coordinating structure. This effort should allow sufficient time to build stakeholder support and approach potential funders and stakeholders (e.g., USDOT, the American Association of State Highway and Transportation Officials, the Council of University Transportation Centers, the American Public Transit Association, the Association of Metropolitan Planning Organizations) for the necessary commitments to ensure adequate funding. Second, USDOT and RITA administrators should determine which office should manage the coordinating structure, and it should be established expeditiously and provided a budget in the amount recommended by the committee. Third, the legislation for the Advisory Council on Transportation Statistics should be amended as soon as possible to broaden its membership, focus, and reporting functions to provide a strong governance body for the coordinating structure.

Even if all these recommended next steps are taken, the committee believes the single most important factor in the success of the proposed transportation information management system will be leadership. In looking to the future, the committee hopes that the leadership of the

community of librarians and information professionals will step forward, as they have in the past, to see that a long-overdue institutional structure and sustained funding are put in place to serve the information needs of the transportation sector well into the 21st century.

REFERENCE

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Study Committee

Biographical Information

Francis B. Francois, *Chair*, is currently a private consultant. He retired in February 1999 after providing 18 years of leadership as executive director of the American Association of State Highway and Transportation Officials (AASHTO). Previously he was a member of the County Council of Prince George's County, Maryland, an elected position. As a registered patent attorney, he engaged actively in a patent and trademark law practice before joining AASHTO. Mr. Francois has been active in many local government associations. As AASHTO executive director, he contributed to many Transportation Research Board (TRB) activities, including serving as a member of the TRB Executive Committee and supporting the Strategic Highway Research Program. Mr. Francois has been a member of numerous National Research Council (NRC) committees, including the Panel on Statistical Programs and Practices of the Bureau of Transportation Statistics, the Committee for a Study for a Future Strategic Highway Research Program, and the Panel on Transportation of the Committee on Science and Technology for Countering Terrorism. He holds a bachelor of science degree in engineering from Iowa State University and a law degree from the George Washington University. He was elected to the National Academy of Engineering in 1999.

Gary R. Allen is chief of technology, research, and innovation at the Virginia Department of Transportation (VDOT), where he is responsible for all information systems technology for the department, including software development, applications, and operations. He also directs the Virginia Transportation Research Council (VTRC), a nationally recognized multidisciplinary transportation research organization, and recently created the VDOT Knowledge Management Office. Dr. Allen has held

numerous positions at VDOT, including director of research for VTRC; acting assistant commissioner for planning, research, and technology; and senior research scientist. He has participated on numerous TRB committees and has chaired and held membership in a number of National Cooperative Highway Research Program panels. He was a faculty member in the AASHTO Executive Institute for 10 years and presently holds a visiting professor position in the System Engineering Department at the University of Virginia. Dr. Allen has a bachelor of arts degree in economics from Berea College and a doctorate in economics from the University of Virginia.

Lance R. Grenzeback is senior vice president at Cambridge Systematics, Inc., a consulting firm specializing in transportation policy and planning. He has served as the program manager for many major consulting studies that have provided policy, program, and technical support to federal, state, and local governments and international clients. As the author of numerous studies, Mr. Grenzeback is both a user and a provider of information. His primary areas of interest include freight planning and intermodal policy, transportation operations, intelligent transportation systems (ITS), and economics. Mr. Grenzeback serves on two TRB committees—the Urban Freight Transportation Committee and the Regional Transportation Systems Management and Operations Committee. He is a charter member of ITS America. Mr. Grenzeback holds a bachelor's degree in government and a master's in city planning and economics, both from Harvard University.

Robert C. Johns is director of the Center for Transportation Studies at the University of Minnesota, which conducts research programs and provides interdisciplinary education programs for transportation students and training and outreach programs for transportation professionals and policy leaders. Before joining the university, Mr. Johns served in management positions for the Metropolitan Council of the Twin Cities Area, the Minnesota Department of Transportation, and the Atchison, Topeka and Santa Fe Railway. He is chair of the TRB Policy and Organization Group, which coordinates the activities for four sections and 30 committees, and is a member of the Technical Activities Council. He is former section chair of the Management and Leadership committees and former chair of the Committee on Strategic Management,

which helped establish an ongoing National Cooperative Highway Research Program project on the strategic issues facing the leaders of state departments of transportation. Mr. Johns holds a BS degree in engineering operations from Iowa State University and MA and MBA degrees from the University of Iowa.

R. David Lankes is executive director of the Information Institute of Syracuse, a research institute that encompasses the Gateway to Educational Materials, the Virtual Reference Desk, AskNSDL (the National Science Digital Library), and other functions. Sponsors of institute projects have included the U.S. Department of Education, the National Science Foundation, the Institute of Museum and Library Services, AT&T, the Online Computer Library Center (OCLC), and Microsoft. Dr. Lankes is also an assistant professor in the School of Information Studies at Syracuse University and adjunct instructor for the OCLC Institute in Dublin, Ohio. He is a visiting fellow at the National Library of Canada and has been a visiting scholar at Harvard's Graduate School of Education. Dr. Lankes received a master of science degree in telecommunications and a doctorate from the School of Information Studies, both at Syracuse University.

Charles R. McClure is Francis Eppes professor of information studies in the School of Information Studies and director of the Information Use Management and Policy Institute at Florida State University. His research interests include planning and evaluation of information services, federal information policy and standards setting for assessing digital reference services, and electronic records management, and he has published extensively on these topics. In addition to his teaching and research activities, Dr. McClure serves as a consultant to such organizations as the Federal Aviation Administration, the Federal Bureau of Investigation, the Detroit Public Library, and the North Carolina State Library. He received a master of library science degree from the University of Oklahoma and a doctorate in library and information studies from Rutgers University.

Nina McLawhorn is research administrator for the Wisconsin Department of Transportation, responsible for management and administration of the department's research, development, and technology program, from strategic planning to implementation of results and program

evaluation. She also represents the department in statewide, regional, and national activities, committees, and technical organizations. She formerly directed an eight-state gubernatorial effort to establish a \$100 million endowment to protect the Great Lakes. Ms. McLawhorn currently serves as chair of the AASHTO Research Advisory Committee (RAC) Region III and as RAC liaison on issues concerning the National Transportation Library. Ms. McLawhorn is also a member of the TRB Library and Information Science for Transportation Committee. She holds a bachelor of arts degree, with a concentration in political science and journalism, from the University of Wisconsin–Madison.

Michael D. Meyer is professor in the School of Civil and Environmental Engineering at the Georgia Institute of Technology (Georgia Tech), where he has taught since 1978. Before coming to Georgia Tech, he was director of the Bureau of Transportation Planning and Development at the Massachusetts Department of Public Works. As a researcher and educator, Dr. Meyer is a user of transportation information. He is a member of the American Society of Civil Engineers, the American Planning Association, the Institute of Transportation Engineers, and AASHTO. He currently serves on the TRB Executive Committee and has been a member of numerous NRC committees, including the Panel on Statistical Programs and Practices of the Bureau of Transportation Statistics. Dr. Meyer is a registered professional engineer in Georgia. He received a bachelor of science degree in civil engineering from the University of Wisconsin–Madison, a master of science degree in civil engineering from Northwestern University, and a doctorate in civil engineering from the Massachusetts Institute of Technology.

Ellen (Leni) Oman is director of transportation research for the Washington State Department of Transportation (WSDOT). She is responsible for identification, selection, management, and reporting of research projects for WSDOT and for coordination of research programs and projects with federal agencies, TRB, universities, and other research partners. She also is responsible for management of the department's library, identification of needed library services, and provision of these services within available resources. The library has a collection of approximately 40,000 documents and digital services that are used by all regions and offices within the agency. Before joining WSDOT, Ms. Oman held sev-

eral positions with the Washington Department of Fish and Wildlife. She is a member of AASHTO's RAC (vice chair of RAC Region 4), TRB State Representative for WSDOT, a member of the TRB Conduct of Research Committee and the TRB Steering Committee for the Conferences on Remote Sensing and Spatial Information Technologies for Transportation, and chair of the TRB Geospatial Environmental Information peer exchange. Ms. Oman is executive director of the Washington Transportation Center and a member of the board of directors of Transportation Northwest. She holds a bachelor of arts degree from Goddard College and a master of science degree in veterinary science from the University of Idaho.

Bonnie A. Osif is engineering reference and instruction librarian in the Engineering Library at the Pennsylvania State University. Her primary research interests include international transportation literature, teaching methodologies in an electronic environment, collaborative instruction, and science and technology literacy. Dr. Osif is a member of the American Libraries Association (ALA) and the Special Libraries Association (SLA) and has served on numerous committees of the SLA Science–Technology and Transportation Divisions. She was editor of *Sci-Tech News* for 5 years. Dr. Osif is a member of the TRB Library and Information Science for Transportation Committee and the Conduct of Research Committee. She received a master's degree in information science from Drexel University and an EdD in science education from Temple University.

Roberto A. Sarmiento is head of the Northwestern University Transportation Library, one of the world's leading transportation collections. He also served as principal facilitator for the development of the Midwest Transportation Knowledge Network, a consortium of 14 transportation libraries in the Midwest. This effort involved the creation of a transportation union catalogue, as well as the development of operational procedures and network structure for information access and exchange. Mr. Sarmiento is a member of SLA, where he currently serves as a member of the board of directors and is past chair of the Transportation Division. He is also a member of ALA and serves on the ALA Spectrum Advisory Council, an initiative to provide scholarships for people of color to study library science. Mr. Sarmiento is a member and

past chair of the TRB Information Services Committee and a member of the Library and Information Science for Transportation Committee. He received a bachelor's degree in geology from St. Louis University and a master's in library and information science from Dominican University.

Lisa Zeimer is a senior professional associate with Parsons Brinckerhoff Quade and Douglas, which she joined in 2002. She is knowledgeable about environmental regulations and requirements relating to highway and transit development and has been involved in managing the environmental analysis of numerous transportation studies. Ms. Zeimer has also been involved in the development of Parsons Brinckerhoff's knowledge management system as a member of the Knowledge Practice Program; lead on the development of virtual information libraries; and coordinator of the Environmental Planning and Analysis Practice Area Network, a network of 500 individuals. She is a certified planner with 21 years of transportation experience with various transportation and environmental planning firms. Ms. Zeimer is a member of the American Institute of Certified Planners, the American Planning Association, the National Association of Environmental Professionals, and TRB. She received her bachelor's degree in history and American studies from the State University of New York at Buffalo and her master's in urban planning from the University of Michigan.

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