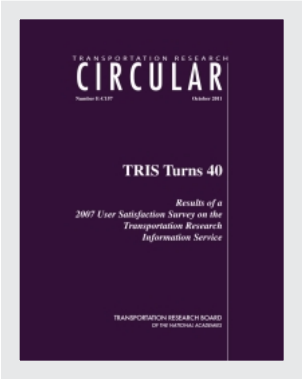

TRIS Turns 40: Results of a 2007 User Satisfaction Survey on the Transportation Research Information Service

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TRIS Turns 40

Results of a 2007 User Satisfaction Survey on the Transportation Research Information Service

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TRIS Turns 40

Results of a 2007 User Satisfaction Survey on the Transportation Research Information Service

KEN WINTER
Virginia Center for Transportation Innovation and Research

LAURA WHAYNE
Kentucky Transportation Center

for the
TRB Library and Information Science for Transportation Committee

October 2011

Transportation Research Board
500 Fifth Street, NW
Washington, DC 20001
www.TRB.org

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Transportation Research Board
500 Fifth Street, NW
Washington, DC 20001
www.TRB.org

Javy Awan, Production Editor; Jennifer Correro, Proofreader and Layout; Jennifer J. Weeks, Layout

Contents

Preface

The purpose of this Transportation Research Circular is to document the results of an online survey of users of the Transportation Research Information Services (TRIS) database, conducted in November 2007. To help readers fully understand the results of the survey, this circular provides background details and information on the history and evolution of TRIS, and includes information on several different versions of TRIS, as well as discussing TRIS usage patterns and enhancements over a 40-year period. When combined with the 2007 survey results, this background information provides the necessary context to understand the impetus for the creation of TRIS, how it evolved over time, and ways it could change in the future. The authors reflect on overall TRIS user satisfaction levels, changes in user demographics, and modern database user expectations. Finally, the authors discuss several opportunities for enhancing TRIS.

The authors would like to thank a number of transportation professionals and other stakeholders for their assistance in developing the instrument for the survey instrument used in this study, including Rita Evans, Director of the Harmer E. Davis Transportation Library at the University of California, Berkeley; Barbara Post, Information Services Manager, TRB; Roberto Sarmiento, Director of the Northwestern University Transportation Library; Sandra Tucker, TRB LIST Chair and Associate Professor, Texas A&M University; and Amanda J. Wilson, Director of the National Transportation Library.

In addition, the authors thank the group of transportation librarians, transportation professionals, researchers, and consultants who served as a sounding board and review panel for the draft survey results and an early draft of this circular. This group included May Kay Christopher, MKC Associates; Bonnie Osif, Pennsylvania State University; Sue Sillick, Montana Department of Transportation; Barbara Harder, B. T. Harder, Inc.; and Karen White, FHWA.

The authors also thank Cheryl Lynn, Associate Principal Research Scientist, and Linda Evans, Editor, both of the Virginia Transportation Research Council, for their assistance in reviewing the initial survey results and making organizational and editorial recommendations for this report.

Finally, we thank Barbara Post for her tireless dedication to maintaining and improving the TRIS database.

—Ken Winter, MLIS
Chair, Library and Information Science for Transportation Committee
April 2009

PUBLISHER'S NOTE: In early 2011, TRB and the Organisation for Economic Co-operation and Development launched TRID, integrating TRIS with the International Transport Research Documentation (ITRD) Database. The world's largest and most comprehensive bibliographic resource of transportation research information, TRID is produced and maintained by TRB. For more information, see http://www.trb.org/informationservices/abouttrid.aspx.

Summary

This circular presents the results of a 2007 user satisfaction survey of the TRIS database, which had three objectives: to understand who uses the TRIS database and what they use it for; to determine user satisfaction; and to give users a way to recommend enhancements to TRIS. To administer this 20-question online survey, TRB sent a direct e-mail to all members of Division A Technical Activities Committees and student attendees of the 85th and 86th Annual Meeting of the Transportation Research Board, and the survey was posted on the TRANLIB and AASHTO RAC listservs for a total possible population of 7,717. There were 327 valid responses, a response rate of 4%. Respondents indicated high overall satisfaction with TRIS: 76% indicated high levels of satisfaction with TRIS' ability to help them at work; 88% said they believed they made better decisions or were more effective because they used TRIS; and when asked if they would recommend TRIS to other transportation researchers, 96% of all respondents said yes. The most recommended change was the addition of more links to freely accessible full-text content and better options for acquiring documents that could not be made accessible online. Respondents were generally unable to comment on TRIS' citation coverage by mode or by function, but did mention a desire for better "international coverage." Demographics revealed increasing levels of use by academicians, and decreasing use by state departments of transportation (DOTs) and federal agency employees relative to total use when compared to results of the last TRIS user survey conducted in 1976. While 91% of all respondents used the TRIS online version of the database, only 28% said they use TRANSPORT, and only 13% said they used File 63. In conclusion, the authors present nine opportunities for guiding TRIS into the future, noting that from the time the survey was conducted in 2007 to the time the circular was drafted in 2009, TRB had made progress on nearly half of these opportunities. The nine opportunities are as follows:

1. Develop a strategic plan for the management of TRIS;
2. Conduct periodic studies to better understand user needs;
3. Collect additional feedback from core users;
4. Explore mutually beneficial collaborative opportunities;
5. Address harvesting, digitizing, and deep archiving;
6. Consider developing enhanced versions of TRIS;
7. Reexamine existing relationships with commercial vendors;
8. Develop relationships with libraries to fill citation gaps; and
9. Complete the OCLC linking project for TRIS Online.

Introduction

In November 2007, TRB's Library and Information Science for Transportation Committee (ABG40) and TRB's Information Services Committee (B0002) collaborated with TRB's Information Services department to conduct a TRIS user satisfaction survey. This was the first survey of TRIS users since April 1976 when a written questionnaire was completed by 510 people.

The 2007 survey had three objectives: (*a*) to determine who uses the TRIS database and the purposes for which they use it; (*b*) to determine user satisfaction with TRIS; and (*c*) to provide users with a way to recommend enhancements to TRIS. This circular explores the evolution of TRIS, analyzes the results of the 2007 survey, examines recent improvements to TRIS, identifies issues TRB may want to consider in the management of TRIS, and describes nine opportunities that may be helpful in envisioning the future of TRIS.

For more than four decades transportation researchers and practitioners have relied on TRIS to help discover and improve upon existing research, and to find the applied transportation information necessary to keep current and to make informed business decisions. TRIS has a long history of use by professionals at TRB's sponsoring agencies, who are generally considered to be the core users. TRIS was created to serve the needs of those customers. Today, however, TRIS is used by a broad array of students, practitioners, researchers, scientists, and even the general public. Because TRB's mission is "to provide leadership in transportat*i*on innovation and progress through research and information exchange" (*1*), and because that is the context in which TRIS was originally conceived and has since been funded, this survey sought the perspective of those current and future core users.

While there may be tens of thousands of TRIS users worldwide, the 2007 TRIS user satisfaction survey targeted only a small, representative sample of those users, drawn from TRB sponsors and affiliates, including state DOTs, federal agencies (the component administrations of the U.S. DOT), and other organizations and individuals interested in transportation research and information. The sample included students, an important subset of users that will directly influence future directions for TRIS.

Overview

The TRIS database is the preeminent online bibliographic database for transportation research. The Highway Research Information Service (HRIS, precursor to TRIS) was created in 1967 by the Highway Research Board (HRB). In a 1965 article describing the new "automated storage and retrieval system," Special Projects Manager P.E. Irick and W.N. Carey, Jr., then Deputy Director of HRB, noted that the HRB had long provided information services to highway departments, universities and others through the Research Correlation Service. They also noted that financial support for the development of the HRIS service came from state highway departments through the NCHRP and from the Bureau of Public Roads. "The new HRIS simply provides an automated and extended arm to this long-established service, recognizing that information in highway technology is now developing faster than it can be assimilated and disseminated by conventional methods" (*2*).

Fast forwarding 40 years, we find that TRIS today contains more than 727,000 citations that refer to transportation-related books, articles, dissertations, reports, conference proceedings, and technical papers. TRIS also contains a significant number of citations to transportation-focused material that cannot be found easily through any other conventional channel but that is typically original and timely in nature. This includes reports issued by University Transportation Centers (UTCs), DOTs, or any federal or state agency whose primary function is not publishing.

TRIS contains abstracts of published articles and reports, or summaries of ongoing or recently completed research projects relevant to the planning, development, operation, and performance of transportation systems and their components. It provides international coverage of ongoing research projects, published journal articles, state and federal government reports, conference proceedings, research and technical papers, and monographs. TRIS coverage includes the following aspects of air, highway, rail, maritime and waterborne transport, mass transit, and other transportation modes:

- Policy, planning, and administration;
- Government information;
- Energy, environment, and safety concerns;
- Materials, design, construction, and maintenance technology for facilities, vehicles, and vessels;
- Operators, operations, traffic control, and communications;
- Physical and economic performance characteristics; and
- User and socioeconomic concerns.

NUMBER OF CITATIONS INDEXED IN TRIS

As noted earlier, by 2009 TRIS contained more than 727,000 records of published research. That included 242,000 records of technical reports and books and 492,000 records for journal articles and conference papers. Those citations contain more than 44,000 hypertext links to full-text documents. Some of these links require the end user to have a subscription to publisher content or to be a TRB sponsor in order to view content online. Regular additions of newly indexed articles from more than 450 core transportation journals are added to TRIS monthly. In 2007

alone, a record-breaking 43,500 records were added to TRIS—an increase of more than 1,000 records over 2006 despite budget cuts that year (*3*).

Recent and long-standing strategic partnerships between TRB and other parties continue to increase the quantity and quality of citations in TRIS. They include the recent addition of 19,000 records of environmental impact statements contributed by longtime content partner Northwestern University and the addition of more than 3,000 records of transportation-focused masters and doctoral dissertations. In addition, since 2007, TRIS records for articles printed in the *Transportation Research Record* from 1996 to the present have been enhanced and now include links to full-text electronic versions of those articles.

Such large additions and enhancements to TRIS indexing have resulted in a significant average increase in the number of citations added to TRIS each year for the last 20 years, as shown in Table 1.

UNIQUE VISITORS TO TRIS ONLINE: 2002–2008

In addition to total number of unique searches, increasing use of TRIS can be illustrated through the number of unique visitors to the TRIS Online version of the database. Table 2 shows the unique visitors to TRIS from 2002 through 2008.

For the 2002 calendar year, the average monthly unique visitors totaled 7,114 per month, or 85,369 unique users per year. By 2004 that number had gradually risen to 8,070 per month, or 96,840 per year. After implementation of the Sitemaps XML Protocol (described later in this circular), the monthly average jumped to 38,585 and the yearly average to 462,424 for 2007. In the first 6 months of 2008, monthly averages were at 90,772 unique visitors, with a projected annual rate for 2008 of nearly 1 million unique visitors a year.

MILESTONES: INCREASED ACCESS, USAGE, AND SELF-SERVICE

TRIS use has increased as it has become more directly accessible to its end users, increasing dramatically at four milestones in its history: (*a*) in 1973, when remote access was first explored;

TABLE 1 TRIS Online: Total Citations and Full-Text Links, 1975–2008[a]

Year	Total Cites	Avg. Cites Added Yearly	Total Links
2008	717,000	31,000	45,900
2005	622,395	26,000	20,000
2000	491,316	23,940	4,500
1995	371,360	27,313	0[b]
1990	234,795	16,939	0
1985	150,099	12,011	0
1980	90,045	5,509	0
1975	62,500		

NOTES:

[a] Data extracted from TRB Annual Reports and verified for accuracy with TRB staff.

[b] Links to full-text content online were not practical before 1995, when the web was in its infancy.

TABLE 2 TRIS Online Unique Visitors, 2002–2008[a]

Year	Monthly Average	Year-End Total[b]	Year-End % Change
2002	7,114	85,369	n/a
2003	7,452	89,427	4.75%
2004	8,070	96,840	8.28%
2005	8,514	102,163	5.44%
2006	12,612	75,711	–25.89%
2007[c]	38,535	462,424	610.77%
2008	75,525	906,244	195.97%

NOTES:
[a] Unique Visitors is a monthly count of unique IP addresses authenticated using domain names or cookies. A unique visitor to TRIS who visits multiple times in a single month from the same IP address would be counted only once in the statistics that the NTLcollects. Therefore, a single IP address is counted no more than 12 times per year.
[b] Yearly total is a sum of monthly unique visitors, including crawlers that index TRIS for other sites.
[c] The Sitemaps XML protocol was implemented in March 2007, allowing Google to index 95% of the contents of TRIS Online in the following 6 months.

(*b*) in the 1980s and 1990s, when partnerships were formed with commercial database vendors to make TRIS remotely accessible to many end users for the first time; (*c*) in 2000, when TRB and the NTL at the Bureau of Transportation Statistics (BTS) introduced the freely accessible web-based version TRIS Online; and (*d*) in 2006–2007 when the bibliographic content of the TRIS Online database was opened for indexing to Google and other search engines. Each milestone was precipitated by technological changes that resulted in increased access and self-service by end users.

Remote Access Is First Explored

The first milestone occurred in 1973, when the HRB conducted a demonstration project giving personnel from 19 U.S. agencies (mostly TRB sponsors) the power to search a small portion of the database remotely for the first time. Only abstracts stored since 1970 and research-in-progress studies newly acquired or updated since 1971 were searchable during this project. According to an article appearing in *Transportation Research Record*, the main objective of the demonstration project was to acquire feedback about the self-service search process as experienced by users (*4*).

By 1975 an estimated 590 searches were being done on the TRIS database annually (*5*). During this era the search process was slow, complex, and expensive, and typically involved mediation by information professionals or others trained in database searching. Users who wanted to search the database typically sent their search request to a TRB staffer, who performed the search and mailed the results back to the requestor. A 1976 article in *TR News* asserted that in 1976 45 sponsors asked TRB staff to run a total of 650 TRIS searches (*6*).

Partnerships with Commercial Database Vendors

The second milestone occurred in 1980 when TRB made the TRIS database directly accessible by entering into a commercial partnership with database vendor Dialog. Dialog offered access to TRIS through its remote database searching infrastructure to anyone willing to pay a fee.

Because database searching in this era cost users a fee based in part on connect time, and because this version required facility with arcane search commands, most users were transportation librarians as a service to patrons. An article in *TR News* that year summarized the rationale for providing users direct access to the database: "Online access gives suitably equipped users immediate turnaround for their information inquires and, perhaps equally important, the opportunity to reformulate search strategies into an optimum match has been made between the user's needs and the data-base contents" (*7*).

The total number of searches remained relatively low. By 1981 an estimated 8,874 searches of TRIS were being conducted annually. If use was an adequate indication, sponsor agencies and their employees appreciated self-service access to TRIS, which continued on an upward trajectory (*8*).

By 1995 TRB had partnered with a second commercial database vendor, SilverPlatter Information, Inc., which produced a second version of the TRIS database called TRANSPORT, which resided on a two-CD set that cost $1,795. The subscription was updated four times a year with a lag time of 2 months in the period covered.

TRANSPORT's user interface scored points with engineers, practitioners and librarians for being very user friendly, and several other features made it desirable. One TRANSPORT user explained the benefit this way: "the locally accessed CD-ROM form of the data allows the user to search at his/her own pace without accruing extra charges for connect time. As records are retrieved, they often reveal new search terms that may then be reentered by the user to further refine the specifics of the search. The ability to repeat this cycle one or many times without being charged for the intermediate retrievals or the additional connect time may result in tremendous savings" (*9*).

These commercial platforms increased TRIS use by providing researchers and engineers direct access. However, these early versions of TRIS were far more difficult to use than modern search engines like Google and as a result were mainly used by only the most intrepid researchers or, in many cases, by the library and information professionals supporting them. In this regard, though the information supply chain had been disintermediated from a technological standpoint there were significant barriers to access for the average transportation professional.

In 1992 the World Wide Web was created. By the late 1990s it had gained immense popularity among researchers and commercial database vendors as a new way to connect users with remotely hosted databases. Many TRIS users became interested in the possibility of web-based access and commercial vendors of TRIS moved quickly to develop web-based versions of TRIS—though these versions remained expensive fee-based tools.

TRB and NTL Introduce TRIS Online

TRB responded to this new opportunity in July 2000, introducing a publicly accessible web-based version of TRIS, called TRIS Online. TRIS Online was free to access, however, it did not include citations to international content (citations that appear in varying degrees in both subscription versions of TRIS). TRIS Online was the result of a memorandum of understanding (MOU) between BTS and TRB, signed at the TRB's 88th Annual Meeting in 1999 (*10*).

The MOU established a new partnership between TRB's Information Services Department and NTL, which had been created in 1998 by the by the Transportation Equity Act for the 21st Century (*11*)**.** Under terms of the agreement, TRB would be responsible for

collecting and managing the citations, while the NTL would be responsible for building, hosting, and maintaining the search interface, making it available via the NTL website.

It is critical to note the search functionality, the content, the availability of full-text links to full-text documents, and even the frequency with which the sources in TRIS are updated are different for each of the three versions of the TRIS database (Dialog's File 63, Ovid/Silverplatter's TRANSPORT, and the freely accessible TRIS Online). This is a point of confusion for TRIS users, administrators and policy makers, many of whom do not even realize there are three versions of TRIS currently available. For a brief side-by-side comparison of the three versions of TRIS, see Appendix A. Data provided by the NTL indicates that there were 2,130,295 searches of TRIS Online conducted in 2007.

TRIS Online Is Opened to Google

Use of TRIS increased exponentially again after the fourth milestone. The NTL initiated the Sitemap XML protocol for TRIS Online. In 2006, Google, Yahoo!, and the Microsoft Corporation released the Sitemap XML protocol, which was helped database providers expose previously invisible content to automated web crawlers.

Web crawlers (sometimes called spiders) are computer programs developed by search engines to gather and categorize information found on the Internet in a methodical, automated manner. Sitemaps are a simple way for webmasters to make records in dynamic databases available for searching. TRIS Online is an example of a dynamic database, because it typically returns results that are produced "on the fly" after each individual search. Crawlers usually discover pages from links within the site and from links on other sites. Sitemaps supplement this data to allow crawlers that support sitemaps to discover all URLs in the sitemap, thus finding and indexing those URLs using the associated metadata (*12*).

Without the XML protocol in place, Google and other search engines had been unaware of the existence of all but few static links to TRIS Online, such as the TRIS Online initial search screen. The hundreds of thousands of citations searchable by users of TRIS Online had thus been invisible to all searches initiated in Google and other popular search engines. So the move by NTL to implement this protocol had a dramatic effect of opening up TRIS Online, funneling searchers from Google and other popular web search engines to the collections represented in TRIS Online.

While using the protocol did not guarantee that every single citation in TRIS Online would be indexed by Google, it did effectively reveal all of those citations to Google users virtually overnight. Today, when Google users run a search that includes key terms found in TRIS Online citations, the Google search results pages returned to them will include direct links to those citations in TRIS Online. That partnership between NTL and Google and other search engine providers has exponentially increased the use of TRIS Online usage. Accordingly, total searches in TRIS Online rose from 2.1 million in 2007 to over 4 million searches in 2008.

PARTNERSHIPS FOR TRIS CONTENT AND ACCESS

Because TRIS has always been a collaborative database, TRB has not been solely responsible for creating the citation content of TRIS. Besides TRB's trained staff who index and abstract transportation journals, conference proceedings, technical reports, and books on aspects of

transportation, TRB has worked with partners to obtain information on transportation research. Over the years TRIS has had exchange and collaboration agreements with a variety of organizations including ASCE, National Safety Council Safety Research Information Service, the Science Information Exchange at the Smithsonian Institution, Maritime Technical Information Facility, the British Maritime Technology Database, the PATH Database from University of California at Berkeley, and International Transport Research Document (ITRD) database.

In the 1980s TRB formed agreements with the transportation libraries at Northwestern University and University of California at Berkeley to provide records of analytics for TRIS. The library cataloging term analytic refers to an individual record created for items that are also part of a larger set, such as individual articles from a journal. These catalog records are known as TLIB records in TRIS. These TLIB libraries make a significant contribution to TRIS by providing catalog records of journal articles not covered by TRB. Northwestern University and University of California at Berkeley have continued to expand their contribution to TRIS. They now provide records of theses and dissertations and in 2007 Northwestern supplied TRIS with 19,000 from its Environmental Impact Statement Database.

TRIS is continuing to expand its coverage through other partnerships. In the past 2 years, TRIS has expanded its international coverage by developing agreements to obtain records from the Transportation Association of Canada, ARRB in Australia, and SVO, the Swedish National Road and Transport Research Institute. TRIS is now also receiving records from the Virginia DOT Research Library at the Virginia Transportation Research Council.

LINKING USERS TO FULL-TEXT ONLINE DOCUMENTS

TRB has made a concerted effort to increase the number of full-text links available in TRIS, and began a long-term effort to add and maintain links to freely accessible full-text content for existing citations in the mid-1990s.

In recent years TRB has also begun adding links to TRIS records for articles from popular commercial research journal publishers such as Elsevier and Taylor & Francis. These links lead TRIS users to the full-text articles made available by the publishers, at which point institutional subscribers to the articles gain access. Non-subscribing TRIS users who follow those links are provided payment options as they are connected to the publisher's websites. This is a good example of full-text links added to TRIS that do not necessarily lead to free content.

In addition, TRB has worked to ensure that citations to its own publications (more than 1,500 in all) that are freely accessible online include links to those documents. That includes content like articles from *TR News*, TRB e-circulars, and reports generated through NCHRP, to name a few.

Citations to some TRB-published content include links to content that is freely accessible to TRB sponsors but which must be purchased by non-sponsors. One example would be electronic versions of documents published in TRB's Annual Meeting Compendium of Papers. Another example is digital versions of articles published from 1996 to present in the *Transportation Research Record*.

The TRIS User Satisfaction Survey

As previously noted, the 2007 survey sought first to understand who is using TRIS and how they use it. Second, the survey attempted to determine satisfaction levels. Last, the survey was designed to allow users a way to make recommendations for short- and long-term enhancements. With that in mind, the survey asked respondents what resources (online or otherwise) aside from TRIS they used to find information, and when references to articles, reports or other resources were discovered that did not include full-text online access, what mechanisms were employed to acquire the full text of the resources found.

SURVEY OVERVIEW

The survey included 20 questions in the following areas: demographics, usage, relevancy and impact, user satisfaction, and the future of TRIS. In addition, the survey included two questions asking if the respondent would be willing to participate in a focus group and whether the respondent wished to receive the survey results.

A number of multiple-choice questions on the survey allowed respondents to specify an answer or category other than specified, or to provide open-ended comments. Questions 8, 15, 17, and 18 were open-response questions, and question 19 invited respondents to provide any additional comments they cared to offer. Ultimately there were 959 comments garnered from these open-response portions of the survey. The complete survey instrument is provided in Appendix B.

SURVEY ADMINISTRATION

Methodology

In November 2007, the 20-question survey was administered by TRB using Zoomerang web-based survey software after a month of pilot testing. See Appendix B for the complete survey instrument. To target its sample, TRB sent a direct e-mail announcement of the survey to all members of TRB Division A Technical Activities Committees, and to student attendees of the 2006–2007 TRB Annual Meeting (7,353). An invitation to take the survey was also posted on the TRANLIB discussion list for transportation information professionals as well as the AASHTO Research Advisory Committee listserv (364 e-mail addresses) for a total survey population of 7,717.

After each respondent submitted answers, raw, unaltered data retrieved from Zoomerang was loaded into a searchable database built using InMagic DB/Textworks 10.0. While that proved useful to committee members at a subsequent meeting held at the TRB Annual Meeting in January 2008, it was decided to analyze the raw survey data using a statistical analysis software package as well to help run cross tabulations against demographic data and responses to some specific questions. The statistical software chosen for this purpose was SPSS 15.0 for windows, which was subsequently used to generate basic cross tabulations and tables. It should

be noted that the chi square test was not used due to limitations in sample size and its effect on the limitations of SPSS.

Limitations of the Survey

Survey results were limited by the typical constraints of an online survey, and included the reliance on self-reported data and volunteer respondents. Some limitations are

- Respondents volunteered to take the survey and did not constitute a random sample of users;
- Respondents were allowed to self-define their role, defining themselves as they perceived themselves, possibly based on their own self-image or their local organizational norms; and
- There was no mechanism to prevent people from taking the survey more than once.

Most problematic for the committee working with the raw survey data was a group of 18 complete responses where respondents indicated consistently through the survey (which had built-in check questions) that they had not ever used any version of TRIS. While it is realized that this is a TRIS user survey, upon discussion, the committee decided to include these results. However, results related to relevancy and impact as presented in this e-circular have been modified to remove those 18 responses for questions 14 and 16. Those questions were

- Question 14: Do you believe you make better decisions or are more effective because you use TRIS? (Note: Of the 18 respondents who said they never used TRIS elsewhere in the survey, 12 said “no” and six said “yes.”)
- Question 16: Would you recommend TRIS to other transportation professionals? (Note: Of the 18 respondents who said they never used TRIS elsewhere in the survey, six said “no” and 10 said “yes.”)

SURVEY RESULTS

Of the 7,717 individuals sampled, 362 respondents answered some or all of the survey questions. Of those responses, 35 contained only demographic information and were thus removed as incomplete responses. Those incompletes included 28 responses from people identifying themselves as being from the United States and one each from the following countries or territories: the Netherlands, China, France, Canada, Hong Kong, the United Kingdom, and Puerto Rico. The final number of valid respondents used in the analysis of the results was 327, or just over 4% of the target group. The percentages used in reporting the results of the survey here are based on these 327 respondents.

Demographics (Questions 1–4)

With regard to their place of employment (Question 1), 36% (a total of 119) of respondents indicated a college or university; 30% (98 respondents) said a state DOT; 17% (57 respondents) said a corporation or private company; about 5% (16 respondents) said a federal agency; 5%

(15 respondents) said a not-for-profit entity; and 3% (13 respondents) said a local or municipal agency.

With regard to their country of employment (Question 2), the overwhelming majority, 88% (289 respondents), indicated the United States; the other 12% (38 respondents) indicated one of 18 other countries representing a broad range of international regions (see Table 3). There were no respondents from some continents such as South America or Africa.

With regard to their role or position (Question 3), research scientist at 23% (76 respondents) and engineer at 22% (71 respondents) were the largest groups (see Table 4).

TABLE 3 Respondents by Country of Employment

Country	No. of Respondents	Percentage
United States	289	88.4%
Canada	10	3.1%
Australia	4	1.2%
Israel	3	0.9%
United Kingdom	3	0.9%
China	2	0.6%
Greece	2	0.6%
Philippines	2	0.6%
Sweden	2	0.6%
Albania	1	0.3%
Denmark	1	0.3%
France	1	0.3%
Germany	1	0.3%
Ireland	1	0.3%
Italy	1	0.3%
Mexico	1	0.3%
Puerto Rico	1	0.3%
Switzerland	1	0.3%
United Arab Emirates	1	0.3%
Total	327	100%

TABLE 4 Respondents by Role or Position

Role	Total Respondents	Percentage
Researcher	76	23%
Engineer	71	22%
Student	43	13%
Library & Info. Prof'l	41	13%
Faculty Member	33	10%
Other	30	9%
Administrator	27	8%
Other Support Personnel	6	2%
Total	327	100%

With regard to their experience level (Question 4), 51% (168 respondents) indicated they had worked 15 or more years in transportation, 21% (68 respondents) indicated 6 to 15 years in transportation, 16% (51 respondents) indicated 1 to 5 years in transportation, and 12% (40 respondents) indicated they were students.

TRIS Usage (Questions 5–9)

Question 5 asked respondents to rate the ease of use of each version of TRIS they have experience using TRIS Online, a free web version; TRANSPORT, a fee-based version offered by vendor Ovid/SilverPlatter; and File 63, a fee-based version from vendor DIALOG.

Of all respondents, 91% reported using the free version, TRIS Online, with about 83% of those rating it as either extremely easy or easy to use.

Only 28% of respondents reported using TRANSPORT, with only 24% of those rating it extremely easy or easy to use.

Only 13% of respondents reported using File 63 with only 10% of these rating it extremely easy or easy to use.

When asked how often, on average, they had searched the TRIS database within the past 12 months (Question 6), 37% (122) responded a few times a year; 30% (97) responded monthly; 21% (70) responded weekly; and 12% (38) responded never.

Cross-tabulating responses to this question by place of employment (Question 1) and by role or position put a finer point on the results of Question 6. Those whose place of employment was a college or university reported searching TRIS most frequently, at 33%. Of that group, the highest percentage identified themselves as student (36%), followed by faculty member (28%), and then research scientist (24%).

Respondents from the college–university community searched TRIS more often than users from other sectors. Twenty-eight percent indicated they searched weekly, 37% said they searched monthly, and 27.7% said they search TRIS a few times a year.

The second largest class of TRIS users by frequency of use described their place of employment as a state DOT, which included 29% engineers, 21% researchers, 20% information professionals, 13% administrators, and 13% other. These users searched TRIS slightly less frequently than those at a college or university, with 24% reporting they searched weekly, 28% reporting they searched monthly, and 34% reporting they searched a few times a year.

Question 7 asked “What types of information are you looking for when you search TRIS?” Respondents were invited to check all answers that applied (all research on a topic, basic facts on a topic or issue, current state of the practice, historical materials, names of persons or organizations doing research on a topic, overview of a specific topic, verification of a citation, and other) (Figure 1). As may be seen, the most frequent response was all research on a topic, followed by current state of the practice.

Question 8 asked “When you get results from TRIS that do not include a link to an online source, what are the MOST TYPICAL methods you employ to get the documents cited?” This open-ended question generated 299 responses, the most responses of any open-ended question on the survey, which may reflect TRIS users’ interest in this issue. Some respondents only listed one method employed, but many listed multiple methods (typically two or three strategies) in their preferred order.

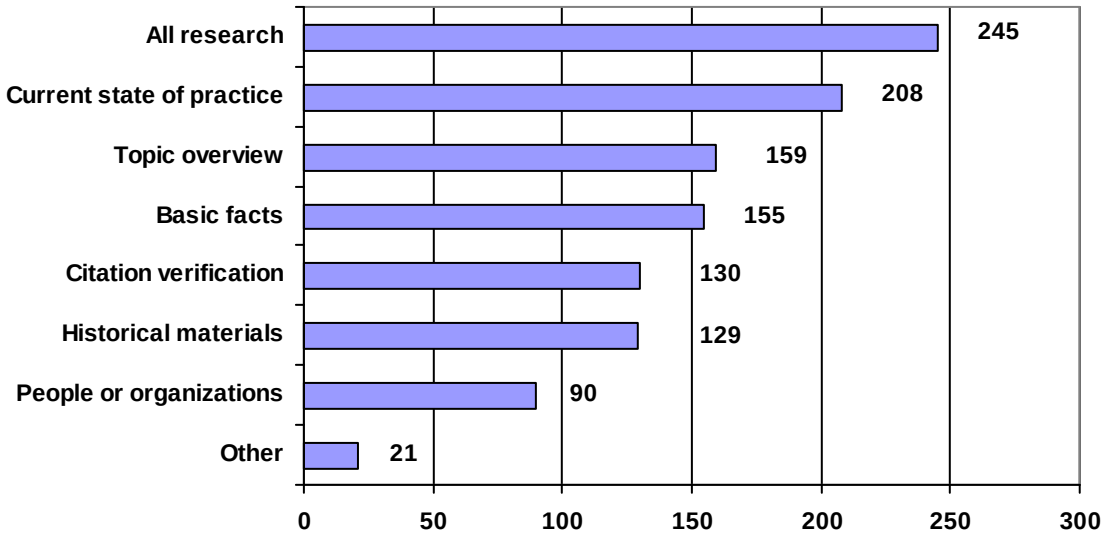

FIGURE 1 Types of information searched on TRIS.

Respondents overwhelmingly indicated a desire to move directly from the citations they find in TRIS through a link leading to the full text of the document cited, or to have a clear indication of how they might otherwise acquire documents discovered in TRIS. It was no surprise that most showed a preference for being able to click on links in TRIS records and connect to online full-text content of the sources cited instantly and without any fees. The request for more links to full text was repeated throughout the survey in open response sections as well.

An enlightening finding was the number of times libraries, librarians, and library-specific services (such as Interlibrary Loan or document delivery) were cited as a means for acquiring items discovered in TRIS for which no full-text link was provided. In this regard, libraries were mentioned more frequently for fulfillment than search engines by a narrow margin; however, it should be noted that the survey question did not ask respondents to actually rank the sources for fulfillment of full-text documents. It should also be noted that most likely not all survey respondents have access to a library capable to fulfilling requests through InterLibrary Loan. However, all respondents did have access to search engines (Figure 2).

One-hundred-eighty-three respondents (61%) listed libraries as one way they acquire documents found in TRIS under these circumstances (143 listed libraries first as the most typical method employed to get the documents, another 40 listed libraries as a second method used).

One-hundred-seventy-two respondents (58%) listed search engines as one way they acquired documents found in TRIS under such circumstances (134 listed search engines first as the most typical method employed to get what they needed, 36 respondents listed this method second, and two respondents listed it third).

In 75 of 172 cases (44% of the time) Google or a Google product (such as Google Scholar) was mentioned by name, making it the preferred brand of search engine. In addition, in several instances functions like “search within search results” or “follow citations” (both powerful features of the Google Scholar interface), were mentioned as highly regarded features.

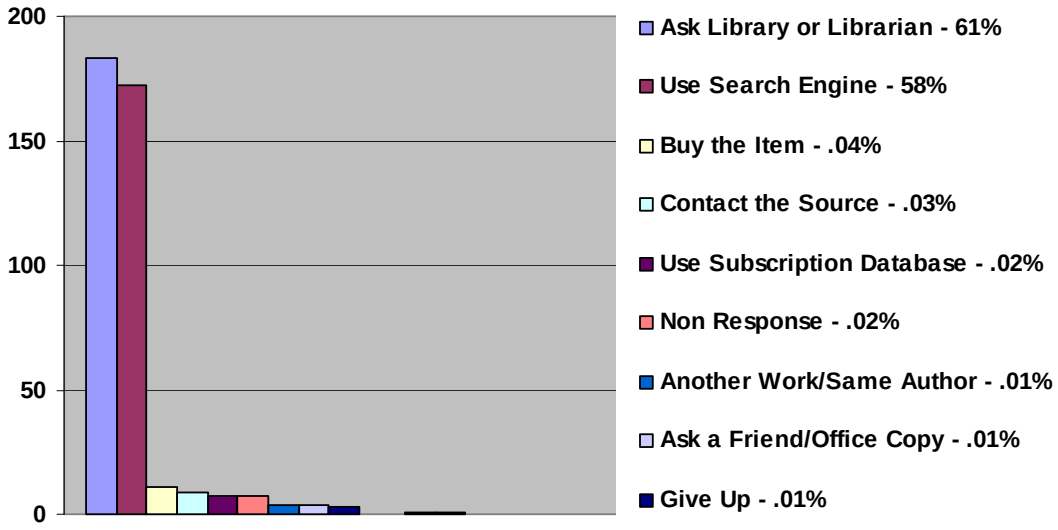

FIGURE 2 Most typical method employed to obtain documents cited when no link was provided in results of TRIS search.

Interestingly, in only 38 instances were any other strategy (aside from using a library or search engine) mentioned at all. Those other strategies included

1. Buying the item (listed 11 times, .04%);
2. Contacting the source (listed nine times, .03%);
3. Using a subscription database (listed seven times, .02%);
4. Seeking another source on the same or similar topic that did have a link (listed four times, .01%);
5. Asking a friend or seeking an office copy (listed four times, .01%); and
6. Giving up (listed three times, .01%).

Question 9 asked "What other resources do you use when searching for transportation information?" Respondents were given 12 items to choose from, including an "other" open response option, and could select more than one choice. A total of 297 respondents answered this question, making it clear that most TRIS users also use a variety of other resources when searching for transportation information. The most commonly selected choices were

1. General Internet search engines (selected 265 times, 99% of all respondents);
2. My Library's Online Catalog (selected 180 times, 61% of all respondents);
3. Free indexing/abstracting services (selected 132 times, 44% of all respondents);
4. NTL Catalog (selected 102 times, 34%); and
5. Research in Progress (RiP) (selected 92 times, 31%).

The other or open response option garnered 53 responses. The most commonly cited source was a librarian or library catalog (listed 16 times, 30%), followed by a variety of specific databases by name, including Compendex, Worldcat via FirstSearch, TranWeb, Science Direct, Lexis/Nexis, Pubmed, PsychInfo, ITRD, and TRANSPORT, (listed 12 times, 23%), then a

variety of specific websites, including AASHTO, FHWA, TRB, BTS, Environmental Protection Agency, ICE London, and FTA (listed nine times, 17%) and finally search engines (listed four times, 53%).

TRIS Relevancy and Impact (Questions 10–15)

Questions 10–15 asked respondents to assess the relevancy and impact of TRIS by asking them to describe the extent to which they believed the information found in TRIS fulfilled their needs. This section asked people to comment on their self-perceived ability to work more effectively by using TRIS. It also asked them to rate the coverage of citations indexed in TRIS by mode and by function.

Figure 3 shows the breakdown of responses to Question 10, which asked respondents to assess TRIS' relevancy to their discipline. Of four possible responses indicating general satisfaction, 41% responded extremely relevant and 46% said TRIS was usually relevant for a total of 87% of all respondents indicating general overall satisfaction with TRIS' relevancy. A total of 11%, 31 respondents, said TRIS was only sometimes relevant and 2%, 7 respondents, said TRIS was not relevant at all to them.

It is worth noting that six of the 31 respondents who said TRIS was only sometimes relevant said in other parts of the survey that they had never used any version of TRIS. In addition, six out of the seven respondents who said it was not relevant at all had never used it, according to their responses in other parts of the survey.

When respondents who reported they had never actually used TRIS were removed, there were 26 respondents who reported TRIS was only sometimes relevant or that it was not relevant at all. This class of respondents could be seen as dissatisfied with the relevancy of TRIS. Adding all respondents in those two categories together, seven respondents reported their role as engineer, seven were other, five were researcher, two were faculty, two were students, two were information professionals, and one was an administrator.

Question 11 asked respondents if the information they found in TRIS helped them to perform their job more effectively. As shown in Figure 4, 76% of respondents indicated general overall satisfaction with TRIS' ability to help them at work. An additional 18% responded that TRIS helped them perform their job somewhat well and only 6% replied responded not well at all. It is worth noting that six of the 17 respondents in the not well at all category also reported elsewhere in the survey that they had never used the TRIS database.

Perceptions of Modal Coverage (Questions 12–13)

Responses to Questions 12 and 13, which asked respondents to comment on their perception of TRIS' level of coverage by mode were inconclusive. Answers tended toward rating modal coverage in TRIS as good more often than fair and rarely rated it poor. A remarkably large percentage of respondents choose don't know when asked to rate coverage of such modes as aviation (77% don't know), marine (81% don't know), and pipelines (88% don't know). One exception was their rating of the mode highways—72% rated highways coverage good and 15% rated it fair, while 11% responded they did not know and only 1% rated it poor.

When asked to rate TRIS by function a similar but less pronounced pattern emerged. For almost every function listed except the administration and planning function, the most common response was don't know with none of the six functional areas receiving more than a 2% rating

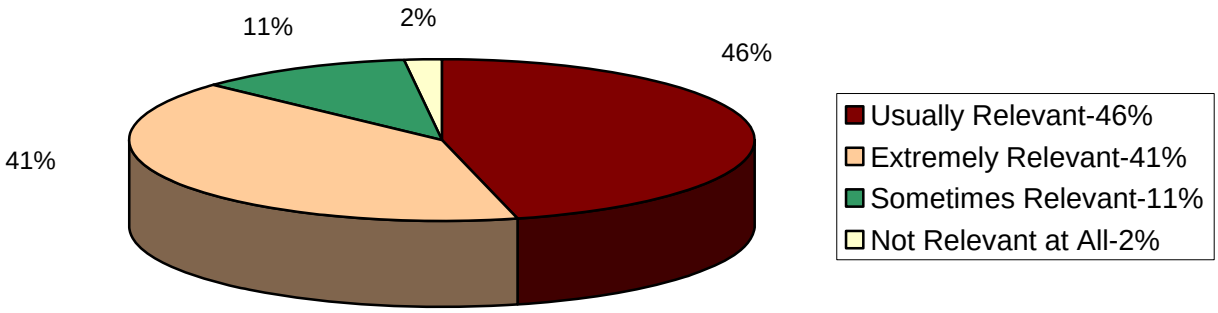

FIGURE 3 Relevancy of information in TRIS to respondent's discipline.

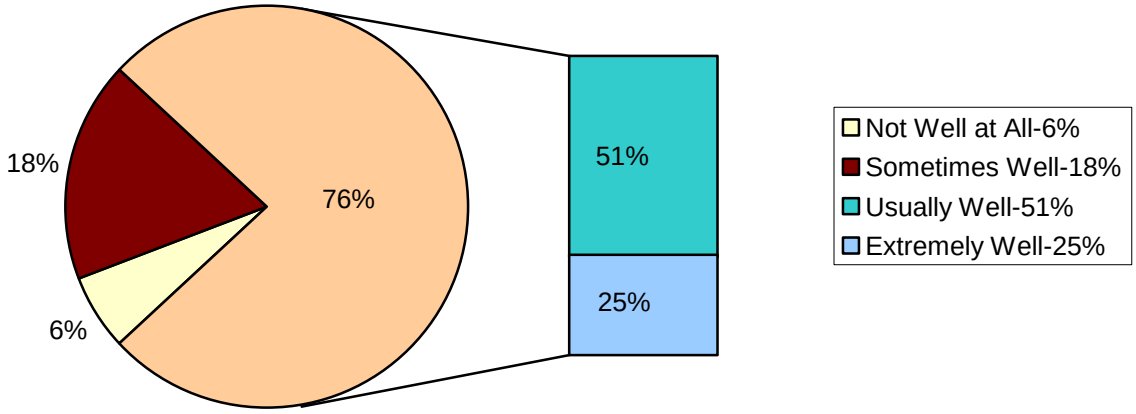

FIGURE 4 Relevancy of information in TRIS to helping respondent's job performance.

of poor. Highest rated functional areas were planning and administration (42% good) and safety and human factors (38% good).

Question 14 was a simple yes-or-no question that asked respondents if they believed they made better decisions or were more effective professionally because they used TRIS. A total of 282 respondents answered this question, although 12 of those respondents said elsewhere in the

survey that they had never used any version of TRIS, reducing the total number of valid responses to this question to 270.

As shown in Figure 5, of the 270 valid responses to this question, 88% (238 respondents) said yes, while only 12% (32 respondents) said no. Of the 32 respondents who said no to this question, eight reported their work role as researchers, seven said they were engineers, seven reported their role as other, five said they were students, three said they were faculty, and two said they were information professionals.

Question 15 invited respondents to offer any additional comments about the relevancy of TRIS. There were 62 comments in this section. Few of them dealt with relevancy. About half were expressions of gratitude or similar endorsements of satisfaction.

Nine comments specifically focused on the need for more links to full-text access. Another nine comments focused on interface-related issues including the following: better search methods, better exporting of citations to bibliographic management software (such as EndNote), ability to e-mail citations, better ability to limit and refine searches, and suggestions for adding functionality that would allow information to be rated or packaged. Six comments requested changes in coverage (four asked for more comprehensive coverage, two for more international coverage). Finally, three suggestions referenced the desire to either integrate TRIS with Google somehow, or to emulate Google's search capabilities.

User Satisfaction with TRIS (Question 16)

Question 16 could be viewed as the ultimate question of the survey: Would you recommend TRIS to other transportation researchers? There was an overwhelmingly positive response, with 96% of all respondents who said they had used TRIS answering yes, while only 4% of those who had used it answering no.

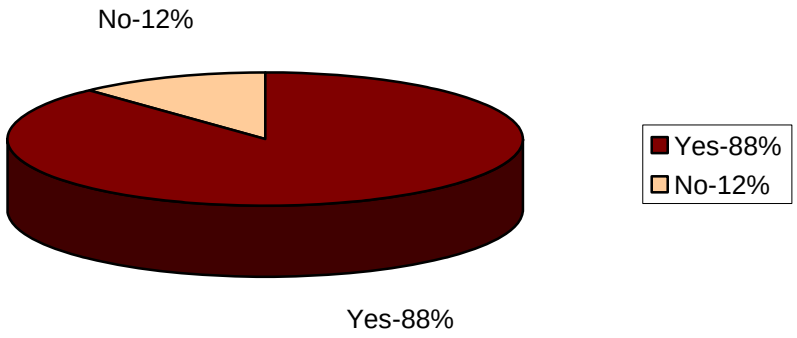

FIGURE 5 Respondents who said they made better decisions or were more effective because they used TRIS.

The Future of TRIS (Questions 17–19)

The final questions on the survey invited respondents to suggest ways to improve TRIS for the future. All questions were open response. Collectively they yielded 313 responses. Question 17 asked "What new types of information would you like to see TRIS cover?" and received 103 responses, 15 of which were non-responses (typically responses like I don't know or no suggestions). In addition, six respondents stated that TRIS coverage is adequate as it is.

TRIS Coverage

About a third of all responses detailed extremely specific requests that were diverse and far ranging, with no clear patterns emerging. Those responses included requests for better coverage in the following areas: land use planning, intelligent transportation systems, bicycle–pedestrian, operations research, traffic safety, knowledge management, human behavior, transit policing, road rehabilitation, conflict management, crime prevention, thermal interaction and microcracking, national economics, sociological aspects, intellectual property–legal, materials, security, railroads, high-risk research, urban issues, bridge design and construction, multimodal prediction, and infrastructure management.

A few topical patterns did emerge, however. Safety was specifically mentioned many times and in several contexts. Broader and deeper international coverage was also mentioned several times. In some cases, requests for non-English publications (but with English-language abstracts) were made.

TRIS Interface

Responses related to the interface or search functionality of TRIS are particularly difficult to put into context since this survey allowed users to comment on three different versions of TRIS, each of which has a unique and remarkably different interface and functionality.

There were many comments throughout the survey requesting improvements to the TRIS interface, frequently requesting better search capabilities, a more user-friendly search tool or making comparisons to other search tools respondents appreciated (Google Scholar's ability to follow references was often cited, for example), search within a search, or be able to set up alerts. Several respondents mentioned a desire that TRIS also be capable of full-text searching on content that is electronically available.

Since the TRIS Online version had a usage rate of 91%, it could be assumed that the majority of suggestions for improvements of the interface relate to that version. However, based on the survey design and other limitations, it would be unwise to make that assumption. With that in mind, respondents' observations related to interface design and usability in general as presented in this e-circular are of limited use. Any interface changes would have to follow separate usability testing of specific interfaces, possibly through focus groups or follow-up surveys focused specifically on usability testing.

Recommended Changes to TRIS

Question 18 invited respondents to provide an open-ended answer to the question "If you could make one change to TRIS right now, what would it be?" There were 141 responses to this

question, garnering the second-highest response rate of any open-ended question on the survey. There were 15 non-responses to this question (including responses like none and I'm not sure) and six respondents said they would not suggest any changes to TRIS. There were four suggestions to remove duplicate records from TRIS, and a few responses that did not fit well into any specific category (such as suggestions for more emphasis on implementable findings in abstracts, data about market trends, and more concise indexing with fewer fields).

All other responses to this question fell into one of three broad categories: changes to interface–functionality of TRIS (50 comments), more full-text links–better fulfillment (43 comments), and citation coverage and scope (17 comments).

Changes to Interface and Functionality

If there is a basic way to describe the comments related to functionality, it would be represented by general observations that TRIS needs to be more user friendly, and have more advanced functionality, especially regarding its ability to narrow, limit, or refine searches, either during the initial search process or after initial search results are returned. Excerpts from respondent's comments that illustrate these observations are as follows:

- "The user interface is a bit behind…I would like to see more options in terms of sorting search results, ranking them by relevance, etc."
- "I would ultimately like to use one search engine to locate both past and ongoing research."
- "Additional ways to sort and/or present the information obtained from a search."
- "Better disaggregation of searching options—as with all systems there is usually too much that comes up and few good ways to cull the pile."
- "Improve the search engine, and provide better integration with other online electronic databases."
- "Improve the interface's functionality with easier subject browsing, easier saving of searches and individual records, and optional user accounts with search records."

There were also some specific features requested, such as the ability to follow references to other works through hypertext linking (a popular feature of Google Scholar), ability to e-mail marked records, ability to export citations to citation management software (the application EndNote was mentioned by name by three respondents), better sorting options (including ability to sort by contract number), ability to link to nontraditional media formats, ability to limit searches to peer-reviewed journals, ability to receive alerts, integrating with other databases (the ability for TRIS records to be revealed from Google searches was mentioned several times), ability to search within a search results set (another popular Google feature) and the ability to let users assign keywords to records (folksonomies) was even mentioned once.

Full-Text Links and Fulfillment Options

There were many comments that dealt in one way or another with full-text links and options for fulfillment (the ability to link to and browse the holdings of libraries, publishers, or booksellers in order to acquire an item) in the event that the full-text document is not available for free online. Many of the comments in this section (and in other sections) reveal an urgent desire for

free and unlimited access to full-text documents that are available through links embedded in TRIS records. Sometimes, but not always, that desire was accompanied by an understanding of technological, legal, or practical limitations associated with such requests. In other cases, free access to full-text online was perceived as an entitlement.

It should be remembered that the survey simply asked respondents what they would change if they could, not what was a realistic expectation or how expectations might be prioritized against requests from other users, or budgetary, legal, or any other considerations. In that regard, it might be best to treat responses in this category as "if I could wave a magic wand" responses.

Excerpts from these comments include the following:

- "More articles available with an online link."
- "An increase in full-text availability."
- "Free easy access to all transportation reports and manuals."
- "More online publications—the older publications could be scanned."
- "Have all sources directly retrievable electronically."
- "Please add full-text content if this has not already been done. Only full-text content will provide sufficient value for me to go back to looking at TRIS."

The following excerpts from comments in this same section reveal a similar desire for increased online access to full-text content, but with more moderate expectations:

- "Improve the information provided to get online access to the inaccessible documents. For example, suggest additional links to visit."
- "More electronic full texts, even if for a fee or subscription cost to access the full text."
- "Make more full-text versions available (which arguably is under control of the publisher and not TRIS)."

Finally, some comments related to links reflected an understanding that not all materials can be made available electronically online, free or otherwise. However, respondents still wanted an easy way to know their options for fulfillment, and they especially seemed to recognize the need to link not just to an online version of a report found in TRIS, but to link to libraries, vendors, and publishing agencies that might be able to provide the document.

The following comments address that perspective:

- "Many times these documents are not available online, so it would be helpful to know where they can be found."
- "Better information/links/resources to get the actual documents—currently easy to see what is out there but requires work to actually get the documents."
- "For items not electronically available, have a better listing of where printed versions are or how to obtain them."
- "Better links to material or more info on how to get into (when not available online)."

Citation Coverage and Scope

Finally, there were 17 comments to the question that dealt with scope of coverage. As with responses to Question 17, many of these responses reiterated highly specific coverage requests (such as human factors, ergonomics, or safety). There were more calls for better international coverage, more calls for modal coverage (more rail, more aviation, etc.), more up-to-date coverage, and more calls for more comprehensive coverage in general.

Issues to Consider in Moving Forward

FHWA's report "Value of Information and Information Services" astutely notes that "…transportation professionals require information that is not only accurate, timely, and relevant, but also presented and interpreted in a meaningful way. Among the primary sources of transportation information are books, technical reports, journals, data sets, directories, and the expertise of colleagues. These primary sources may be accessed through numerous secondary sources, ranging from library catalogs and databases, to help lines…and the World Wide Web" (*13*).

While the rapid development of the Internet has made direct access to the aforementioned primary source material cited by TRIS sound simple, today's practitioners know all too well the frustration of searching for, but not finding, a document, or finding a citation but not the full text (typically required to understand the issue at hand). Not everything published is accessible online free of charge. Commercially published content found in scholarly and trade journals is sometimes exposed through general Internet searches, but not always. Discovering a citation to a report or article and getting the actual content cited still typically represents two very different propositions, and the latter may require a library visit or a transactional fee.

BEHAVIOR AND USAGE PATTERNS OF TRIS USERS

TRIS represents a 40-year investment by TRB through the funding of its sponsors. It is a valued asset to the transportation community and it has provided generations of transportation professionals with a trusted way to increase productivity, reduce duplication of effort, and help produce high-quality research faster and for less money than any other single online resource.

Ultimately, TRB may benefit from defining and exploring the fundamental differences between TRB sponsors (whose funding helps support TRIS), stakeholders (professionals who rely on TRIS to make informed decisions), and others (like the general public) who have simply used TRIS. Users who represent sources of direct funding should have the strongest voice in the present management and future development of TRIS.

Results of the 2007 survey indicate TRIS users (researchers, practitioners, and scholars) do not rely solely on TRIS when they search for information online. Further, the needs, expectations, and even the basic demographics of the typical TRIS user has changed since TRIS was created in 1967. An overwhelming array of free general search engines now compete with Intranet portals, internal agency websites, and a wide variety of freely accessible and fee-based research tools for the limited time and attention of transportation professionals. Many of these tools (retailer Amazon.com and search engine giant Google come to mind) deliver a rich user experience designed to enhance creativity, increase information sharing, and facilitate collaboration.

While the functions and features of these online resources are alluring, a weakness for the transportation professional looking for targeted information is the fact that its content is as vast as its potential audience. Google is designed to do a little bit of everything, for potentially everyone, on potentially any topic. Furthermore, it should never be forgotten that such tools are driven by commercial interests and are heavily influenced by popular culture and other trends.

Researchers are overwhelmed by the quantity of information accessible online. Today, when asked to pick the best starting point for Internet-based searches in terms of content, researchers often turn to TRIS as a trusted search tool for authoritative, relevant, and timely transportation information. When asked to pick the favored tool in terms of overall experience, however, searchers may be more likely to select Google.

"FREE" ACCESS TO FULL-TEXT CONTENT

Ultimately, access to quality peer-reviewed research is not free though it may seem so to those accessing taxpayer-funded research reports put online by a federal or state agency, or by university-based practitioners who are often unaware when they seamlessly gain access to expensive online subscription sources (paid for with tuition dollars) because they are automatically authenticated as part of an authorized user community that has paid for such access. Confounding the issue, some publishers do make selected content available online free of charge to anyone who can find it. TRB publications are a good example of this approach. What content, when, and how long it will remain online for free are mysteries to most in the research community and subject to the whims and vagaries of the publishers involved.

Some full-text electronic versions of recent federal or state research reports, policy documents, studies by metropolitan planning organizations, or technical papers are online because the publishing agency has gone to the effort of putting them there. Once there, they often have a brief and unpredictable online life span. In the transportation community, works published before 2000 are considered old in Internet years, and as such, are mostly absent from the Internet with few ongoing efforts at retrospective digitization by already overburdened transportation agencies.

Those who add and delete files from agency servers are typically information technology professionals dealing with practical issues such as server space and they typically have no notion of or regard for the preservation or long-term access required by practitioners. This is partly why new documents placed online from 2000 forward are apt to move around the web or be deleted from file servers after being posted for only a short period. Such unpredictable short- and long-term access to primary documents on the Internet is due primarily to the absence of a centralized authority over such content. No single entity or group has been tasked with, or has a mandate to ensure, that any documents are placed online, and nobody is responsible for ensuring reliable long-term access to transportation information. Unfortunately, that information increasingly is being published straight to the Internet and may only be provided in digital formats in the future—especially as agencies look to reduce costs (such as printing) during the current economic climate.

Meanwhile, information seekers using general tools like Google are frequently overwhelmed by the sheer volume of material they find online, most of it unrelated to their need. When they try to use such general search tools to find something as specialized as peer-reviewed transportation research reports, they typically find something quite different. They are often chagrined to discover that the majority of the surface web pages indexed by popular commercial search engines (a size estimated at 167 terabytes in 2003, no doubt much larger today) have no relevance to their needs (*14*).

In fact, much of this information is accessible on the Internet precisely because it cannot stand up to the rigors of peer-reviewed or even trade publications. Such self-published material is

often prone to hyperbole, represents the narrow views of commercial or special interest groups, and is therefore far less reliable and ultimately less useful than vetted research. In many cases, there is an inverse correlation between reliability and accessibility. All too often, the research that is most useful and most reliable is the hardest to actually locate and utilize.

The Internet is thus a blessing, because it provides such immediate access, and a curse, because that access is not focused. Today's transportation researcher must comb through a growing haystack of information that is less and less relevant to their professional needs to find a progressively smaller needle of authoritative and substantive information. Once they have identified a reference to something of value, they must then get the full document cited—something most online searchers expect to be just a mouse click away, but which is often not the case.

Secondary sources mentioned earlier [such as TRIS, professionally maintained databases, library catalogs, and clearinghouses such as the National Technical Information Service (NTIS) and the Canada Institute for Scientific and Technical Information] exist to help identify, locate, and borrow or buy the aforementioned primary source material. So while transportation researchers and professionals use general search tools like Google for general searches they still rely on specialized tools such as TRIS when they need to get serious transportation research done or make quick but informed technical or policy decisions.

Traditionally, researchers have understood and accepted the fact that bibliographic databases like TRIS can help them identify information pertinent to their needs as a first step. But it comes as no surprise that Internet search engines accessing the open web are still the starting point for most individual's research projects (*15*).

COPYRIGHT AND FREE FULL-TEXT CONTENT

TRIS users' expectations that all citations should have links to full-text resources needs to be explored by TRB. Copyright laws, and technical and practical reasons too numerous to describe will make full-text links for every citation an impossible expectation for TRIS to meet. However, TRB should consider finding ways to give TRIS users more options for finding and acquiring documents cited in the database. Furthermore, there is an opportunity for libraries to play a more active role in document fulfillment through library-to-library resource sharing (Interlibrary Loans), which would benefit patrons whose employing agencies have a library capable of offering that service.

Many respondents revealed overly simplistic beliefs about the availability full-text documents that can be found online. It may be difficult for the average TRIS user to differentiate between full-text documents that are available online for free because they were produced with taxpayer funds, as opposed to research that is licensed subscription content from for-profit publishers—both types of material indexed by TRIS. In some cases, respondents indicated their awareness of copyright restrictions and the practical limitations that make their desire for everything to be freely available online unrealistic. Despite that fact, many respondents still expressed that desire.

For many Internet users expediency overrules effort and it would be a mistake to underestimate the allure that the path of least resistance wields over online information seekers. That allure could lead current and future generations of TRIS users to focus primarily on

citations with links to freely accessible full-text documents, as opposed to citations to the best information, which might take more than a mouse click to acquire.

DEMOGRAPHICS OF RESPONDENTS

It has been more than 30 years since the last user satisfaction survey of TRIS was conducted according to an article that appeared in *TR News* in 1976. At that time "…of the 510 responses to this survey, 71 percent were from state transportation and highway departments and FHWA, and 13 percent were from academic or research institutions. More than 70 percent of the respondents were engineers who have been in their present work for an average of 12 years and who are engaged in planning, research and administration" (*16*).

If samples were representative for those two surveys, the user demographic for TRIS has shifted away from those who work at state DOTs to those who work at colleges or universities. We may not be able to make a meaningful demographic comparison here, because it does not appear that either survey used a random sample, but TRB should consider the possibility of a shift in demographics for TRIS users in the 40 years since it was created.

However, it does come as a surprise that the 2007 TRIS User Satisfaction Survey's highest response rate by demographic (36%) report that a college or university was their place of employment. Conventional wisdom surrounding TRIS is that state DOTs are responsible for the majority of its use, followed closely by federal agencies.

According to this survey, however, only 30% of respondents said they worked at a state DOT. The corporate–private company response rate of about 17% and response rates for not-for-profit agencies (5%) and municipal agencies (3%) may seem relatively predictable. However, quite unpredicted was the low response rate for federal agencies, which came in at 5%.

As noted earlier, most valid responses (88%, or 289 responses) were from the United States. Of the remaining international responses, more than half came from countries where English was an official or de facto language. Those included Canada, Australia, the United Kingdom, the Philippines, Puerto Rico, and Ireland. It is plausible then that TRIS is primarily considered an English-language resource and is primarily used by researchers from English-speaking countries.

The role demographic provided some valuable insights too. It was unexpected to have such a high response rate from students (12%) and faculty (9%), which if taken together would comprise 21% of all responses. If those numbers represent the overall population of TRIS users the academic community would thus represent a larger-than-expected percentage of TRIS users. In fact, it would show an approximate three-way tie between the three largest user groups: researchers (23%), engineers (22%), and academics (21%).

This finding would make sense in light of the UTC program (established under the Surface Transportation and Uniform Relocation Assistance Act), a government effort to strengthen the country's competitiveness in the global transportation industry. The UTC program, which authorized the establishment and operation of UTCs across the United States in 1987, was reauthorized and expanded by Congress in 1991 and reauthorized and expanded again in 2005. The program is managed by the RITA, U.S. DOT, and its mission is "…to advance U.S. technology and expertise in the many disciplines comprising transportation through the mechanisms of education, research, and technology transfer at university-based centers of excellence" (*17*).

In the 20 years since its creation, the UTC program has grown to include more than 80 colleges and universities in 42 states to advance education (*18*). Finally, this section of the survey noted that respondents tended to be more experienced than anticipated, with 51% reporting that they had been in the field for 15 years or longer. As an aging transportation workforce moves toward retirement, a fresh generation of transportation professionals will fill their places. TRB can take steps now that will ensure they will become TRIS users.

VERSIONS OF TRIS USED

The survey revealed that few users of TRIS choose the commercial interfaces TRANSPORT and File 63. While an overwhelming majority (91%) of all respondents said they used the TRIS Online version, only 28% reported having used the fee-based TRANSPORT interface and only 13% said they used the fee-based File 63 interface.

Some respondents said they used more than one version of TRIS. Twenty-seven percent said they use both TRIS Online and TRANSPORT, while 13% said they use both TRIS Online and File 63. Only 12% said they used all three versions. No respondents said they used only the two fee-based versions. These responses indicate that commercial versions of TRIS are losing market share and might not be viable much longer.

It is suspected that the predominant reason TRIS Online is used most frequently is because it is freely accessible, while TRANSPORT and File 63 both carry a significant subscription fee. However, it is noteworthy that respondents (including those who used more than one version of TRIS) most frequently said they believed the TRIS Online version was the easiest to use interface. Eighty-three percent of TRIS Online users called it either extremely easy or easy to use, while only 28% of TRANSPORT said the same for that version, and only 13% of File 63 users called that version extremely easy or easy to use.

In summation, TRIS users tended to use the TRIS Online more than other versions of TRIS, and those users tended to be located on a college or university campus. While students accounted for 13% (by role identification) and 12% (by experience level), overall they accounted for the highest frequency of TRIS use.

WHAT TRIS USERS WANT

Responses verify that respondents would like TRIS to be as comprehensive as possible and to have the most current citations to the latest research and technology trends possible. Respondents most frequently said they had a desire for all research on a topic, followed by current state of the practice for an issue, then by a topic overview.

Users reported searching TRIS to find historical material and people and organizations least frequently. However, it should be noted that such categories were not defined in the survey instrument. Historical material, for example, could have been interpreted as citations to older material, or as citations to material that discusses the history of transportation, or something entirely different. Based on open-response comments it seems fair to say that citations to material published more than 20 years ago (and possibly material as recent as 5 years old) could be considered historical material. This brings up an observation: the majority of the citations in TRIS today might be considered historical by the yardstick of publication date.

Regarding contact information for people and places, the most widely used version of TRIS (TRIS Online) according to survey results, includes this information already, though some users may not realize that fact. It is also plausible that respondents are more likely to turn to a general search engine like Google, to use a tool such as TRB's RiP (which has specific fields for organizations and persons and includes contact information in the form of mailing addresses, phone numbers, and e-mail addresses), or to search for such information at agency websites than through TRIS. While users might need to access such information on a regular basis, perhaps they believe search tools other than TRIS are a more efficient way to find people and places.

The overall theme of responses to Question 17 was the desire for TRIS to be more comprehensive. Sometimes that meant more comprehensive in terms of modal coverage (aside from highways, which generally were considered adequately covered by respondents), sometimes it meant more comprehensive in terms of journals covered (i.e., more journal titles) or more conference proceedings covered. Some respondents used comprehensive to refer to better international coverage, and some used it to refer to different and expanded formats (including both new formats such as videos and photos and even data) or better coverage of trade publications and newsletters).

TRIS RELEVANCE AND USER SATISFACTION

TRIS users seem to view it as a relevant tool that is both reliable and authoritative. Furthermore, they seem to believe that the information they find in TRIS fulfills many of their professional needs. Overall, they are satisfied with TRIS, but they still believe TRIS could do some things better.

When asked how relevant information found in TRIS is, 41% said extremely relevant and 46% said relevant, for a total satisfaction rating of 86%. Only 31 respondents (11%) rated TRIS as sometimes relevant, and only seven respondents (2%) said TRIS was not relevant at all. Further, cross tabulations indicate that six of the seven who rated TRIS not relevant said elsewhere in the survey that they had never used any version of TRIS. With this in mind, it seems clear that TRIS enjoys a high level of support from its true users.

When asked how well TRIS helped them to perform their job, 76% responded either extremely well or usually well. Only 50 respondents said somewhat well and only 17 said not well at all. It is worth noting that six of the 17 respondents in this final category also responded that they had never used the TRIS database.

Question 14 asked respondents if they believed they made better decisions because they use TRIS and 88% of them said yes. Finally, the ultimate question of the survey, "would you recommend TRIS to other transportation researchers?" was answered as a definitive yes by 98% all respondents who had reported using TRIS on the survey.

INTERNATIONAL COVERAGE AND LANGUAGE CONSIDERATIONS

There has been a longstanding debate among library and information professionals in transportation as to how much international coverage should be included in TRIS, how that coverage should be added, and what issues might be presented by language barriers for non-English citations. The 2007 survey did not specifically ask respondents whether they wanted

more or less content that originated from outside the United States and certainly, there are many non-U.S. countries where the English language is a predominant language. The survey results did not record an overwhelming number of requests for more international coverage. There were 11 respondents who specifically mentioned a desire to have greater access to international citations.

Despite this desire for additional international content, it is not clear that survey respondents would have the resources to pursue the traditional translation of such items (if needed) or would have the desire to wait while this process is undertaken by a third party. Traditional translation of a single technical article can cost $1,000 or more, and may take a week or more. So while the desire to know what research has been conducted in other countries may exist (including countries where English is not an official language), it may prove impractical or too costly a way to transfer that knowledge in a timely fashion even if it is discovered in a TRIS literature search.

One intriguing option is server-side machine-assisted translation, with vendors such as Systran offering promising results for machine-generated translations created by the database user on demand (*19*). Systran provides the technology behind Yahoo! and AltaVista's Babel Fish web-based translation applications, and was the basis for Google's Language Tools (also known as Google Translate) until 2007. While far from perfect (running 60% to 90% accuracy ratings) such applications can help a researcher quickly get the gist of a foreign language article.

However, making such translation software work as described above could be challenging and expensive. It would require TRIS to host full article content in html, xml, or other common file formats—something it does not currently do. Also, that content would have to be stored on TRB's servers and be made accessible to TRIS users at the time they search. Currently, TRIS offers only article abstracts (not full documents) in html, with URL links typically leading to pdf files of the full-text documents, which are typically hosted on remote servers not under the control of TRB or the NTL (the exception being TRB-published content).

THE DESIRE FOR ONE-CLICK ACCESS

The results from this survey verify an overwhelming desire by respondents to not only discover citations to research on a topic or issue, but also to be able to click on a link to the full-text link at the point of discovery, and to access the complete document instantly, free of charge, from their computer's desktop. This desire for desktop access is consistent with user behavior for most modern databases, and reflects a significant shift in expectations by online searchers that has steadily increased for more than a decade. User expectations have been shaped by Google and other free web search tools, which are designed to allow the user to find, and more importantly, to link directly to, information of all kinds that has been made accessible on the Internet—typically by the owner, sponsor, or agency responsible for creating or publishing that information. What is the implication of that expectation for the future development of TRIS?

OTHER FULFILLMENT OPTIONS

Many respondents indicated a desire for another option—a way to know what libraries owned resources indexed in TRIS, thus pointing to a third option for fulfillment. In answering this question, respondents typically listed either their most preferred method to acquire content (if

they used only one method), or more commonly, the multiple methods employed, ranking their strategies in order of operation. The two top strategies reported were to search online using a free web search engine (like Google) or get the documents from a library. If it takes little time and costs no money, TRIS users may feel it is worth quickly googling the citation to see if it can be found online free of charge. But if that fails to yield the desired full text in a few minutes, it helps researchers to know they can exercise other options, depending on their timeframe, budget, and other resources. Researchers who have access to TRIS and access to a library that can effectively lend from its own collections and borrow from the collections of others libraries will be at a competitive advantage that will result in increased productivity and better decision making.

DUPLICATE CITATIONS

The most common complaint (though it went unmentioned by most respondents) was the issue of duplicate citations in TRIS. While few would argue that it is better to have an item listed twice than not listed at all, the existence of thousands of duplicate records can be confusing to some TRIS Online users. It may not be clear to users how such duplicate records occur in the first place, or that TRB staff regularly engage in database cleanup to find and remove duplicates.

TRB is aware of this issue and has been working to ameliorate it, finding and deleting nearly 4,000 duplicate records from TRIS since 2005 and developing a better duplicate checking algorithm to automate the duplicate detection process. However, because TRB does not control quality assurance for the databases vended by Dialog and Ovid/Silverplatter, these duplicates could not be removed from the File 63 or TRANSPORT versions of TRIS.

The problem of duplicate records is both inherent to a collaborative database such as TRIS, and a longstanding problem that was identified as far back as the 1976 survey. It has remained a source of frustration for some (especially information professionals) but in reality many TRIS users might be unaware the problem even exists. Regardless, TRB may want to consider new ways to help ensure TRIS remains as free of duplicates as possible.

For example, to help find and remove duplicate records, TRB could explore mechanisms to help users self-police TRIS. One respondent noted "…there should be an easy way for the user community to provide feedback on the accuracy and completeness of individual database records." But if such a mechanism were developed, would TRIS users engage in said policing activity?

MARKETING AND PROMOTING TRIS

The need for marketing materials, training, and elevated awareness of what TRIS is, its value to the transportation community, and how it is best used is another longstanding issue that has been noted since the 1970s. Again, while marketing was not mentioned excessively by respondents, the need for regular and ongoing user education was raised. There may be ways that TRB could partner with libraries or other groups to perform this work as part of a marketing or awareness campaign developed by TRB.

Work of this type is ongoing in nature, however, because the TRIS user base is continually changing. Ideas for marketing include self-paced tutorials, partnering with transportation libraries on a public awareness campaign (perhaps corresponding with National

Library Week), online webinars taught by TRB staff or TRIS experts, and possibly a train the trainer program whereby TRB staff teach library and information professionals how to give workshops to their colleagues on the use of TRIS.

TECHNOLOGY: WHAT WAS ASKED FOR—AND WHAT WAS NOT ASKED FOR

Wherever they go on the Internet, today users have options. They have come to expect Google- and Amazon.com-like features that let them create their own personalized searching experiences. These days, personalization of web workspaces lets users create accounts so they can manipulate search tools to fit their needs and preferences, and speed the search process in ways that make sense to them. Today web searchers can also engage in social bookmarking, can cross-link references, create lists, share content, and enhance database records by attaching their own content (photos, ratings, keywords, descriptions and more). In many cases, today's searchers rely on the opinions and expertise of their peers through rating, ranking and tagging. In the future they may be even more comfortable adding their own comments, reviews or other content to enhance professionally generated database content. Finally, as users grow in sophistication, they might expect to acquire or disseminate that content in the form of a rich site summary (RSS) feed, or an short message service, or e-mail alert.

Considering the modern Internet and database landscape, it was interesting to note that, for the most part, respondents to this survey did not request extensive technological enhancements. Features such as blogging, RSS, virtual reality, chat, instant messaging, wiki, social networking, or the ability to search TRIS from portable handheld devices were hardly mentioned. Instead, respondents seemed to take a more pragmatic approach, focusing on TRIS' content and comprehensiveness, with minor suggestions for interface improvements. The following are some technological enhancements that were mentioned or suggested (but just barely):

- Improved bibliographic citation exporting through citation management tools (the EndNote application was mentioned by name several times).
- Ability to manipulate citations and citation sets (including the ability to e-mail citations).
- Enhanced limiting options (including the ability to further refine a group of search results by searching within a search, and the ability to limit by new criteria such as peer-reviewed publications).
- The ability to save searches and the ability to set up patron-initiated alerts.
- Enhanced ability to do subject browsing, including frequently searched themes or areas, and to see what other searchers are searching for.

Conclusions

TRIS has maintained high visibility and is perceived as having high value for its core users in part because it was created with them in mind. It has been steadily maintained and enhanced over a 40-year period. During that time, TRB has adapted to changes in user needs and expectations in terms of the content, scope, and coverage of TRIS. TRB has also implemented a number of technological changes that have made TRIS more accessible and more functional.

First, TRB improved TRIS by making it remotely accessible through a demonstration project, then changed its content to be more multimodal and partnered with competent commercial database vendors to create multiple subscription versions of TRIS available to sponsors and other stakeholders.

Second, in 1985 TRB partnered with transportation libraries at Northwestern University and the University of California at Berkeley to increase the quantity and quality of citations in TRIS—a program that is still in place today.

Next TRB collaborated with the NTL to create a freely accessible version of TRIS (the TRIS Online database), and has since worked to enhance that interface.

TRB also began working to link TRIS users to free and subscription documents available directly at the user's desktop, and to help users find items held in libraries near them through its partnership with the OCLC library cooperative.

Finally, TRIS has made its contents visible to users of Google and other search tools, moving searchers quickly from a search initiated in Google to results located in TRIS Online. Previously, the searcher would have been required to initiate the search from a TRIS Online search screen to find citations. Today, every Google search is potentially a TRIS Online search. Because of these changes, TRIS use has greatly expanded—but so have the expectations of TRIS users.

SELF-SERVICE LEADING TO SELF-SUFFICIENCY

In 1976 there were 650 TRIS database searches on specific topics—mostly done by TRB staffers as a complicated and time-intensive service using specialized computer terminals only for employees of sponsoring agencies who requested assistance.

Since the rise of microcomputers in the modern workplace, the development of the World Wide Web, and TRB's decision in 2000 to make the TRIS Online version of the TRIS database publicly accessible for free, almost all searches today are done by the end user themselves, directly from their computer's desktop. Once a specialized domain, the online search experience has become disintermediated.

Total searches in TRIS Online alone (the only version of TRIS for which statistics were readily available) rose from 2.1 million in 2007 to 3.6 million searches in the first 6 months of 2008. If searches continue at their current rate through the remainder of the 2008 calendar year, TRIS Online will be searched nearly 7.4 million times.

TRIS USER DEMOGRAPHICS HAVE SHIFTED

Since the last user survey was conducted the user population for TRIS appears to have changed. While neither the 1976 survey nor the 2007 survey reported here used random sampling, the authors of this e-circular believe the results reflect a shifting demographic for TRIS users.

- In the 1976 questionnaire, 71% of respondents were from state highway departments and FHWA, while in 2007 only 31% of respondents reported working at a state DOT or a federal agency of any type. Federal and state agency use of TRIS may be shrinking relative to total TRIS use.
- In the 1976 questionnaire, more than 70% of respondents identified themselves as engineers. In the 2007 survey, only 22% identified themselves as an engineer. Engineers may no longer account for the majority of the use of TRIS.
- In 1976, more than 70% of the respondents were engineers who had been in their present work for an average of 12 years. In the 2007 survey, more than 73% of TRIS users who were engineers had 15 or more years of experience. As the transportation workforce has aged, so will the TRIS user population. Their replacements will be digital natives who may have no knowledge of TRIS and who have a whole new set of expectations.

MOST CORE TRIS USERS ARE HIGHLY SATISFIED

TRIS users responding to the 2007 survey seem highly satisfied with it and value it as a tool that supports their professional needs. Many acknowledge that building, maintaining, and improving TRIS over a 40-year period equates to an enormous investment. One respondent even called TRIS a national treasure. The following statistics from the 2007 survey show that value.

- Eighty-four percent of respondents said they believe they make better decisions or are more effective because they use TRIS.
- Eighty-seven percent of respondents reported high overall satisfaction with TRIS' relevancy to their work.
- Ninety-six percent said they would recommend TRIS to other transportation researchers.

However, even the most satisfied users frequently reported a desire for TRIS to be enhanced. The most requested enhancement to TRIS recorded by this survey was that more links to full-text documents online (presumably, though not always explicitly stated, these would be free documents—how they will be made free is rarely discussed), and full-text access. Also, for the most part, users were not requesting glitzy technological changes to TRIS, but were focused on the meat-and-potatoes aspects such as content, coverage, and authority.

USER EXPECTATIONS CONTINUE TO RISE—SOME ARE UNREALISTIC

A small class of respondents was harsh in their criticism and ultimately unrealistic in their requests for changes. One respondent's comment was typical for this hard-to-satisfy class of

users: : “[TRIS] is nowhere near a comprehensive, reliable index to transportation or even transportation research information. Those in charge need to rethink the entire effort, determine what needs to be done to develop a comprehensive, high-quality indexing and abstracting service focused either on transportation research or on the entire field of transportation, determine the costs of providing such a service and marshal the financial and staffing resources needed.”

Throwing 40 years of hard work away as a part of rethinking the entire effort is not a realistic approach. As TRB seeks ways to improve TRIS, it should think of evolution instead of revolution, focusing on maintaining TRIS’s strengths (such as scope, authority, and comprehensiveness), and mitigating its weaknesses to enhance stakeholder value.

TRIS cannot be all things to all users. The opinions that will matter most will be those of users whose agencies’ sponsorship created TRIS in 1967 and has directly funded its maintenance ever since. However, even if resources were unlimited and if even TRB made every suggested change garnered from this survey (many of which, it should be pointed out, are contradictory) to TRIS immediately and without regard to legal considerations, practical matters, or any other real-word factors, some TRIS users would still have complaints.

Moving forward, TRB has an opportunity to consider strategically the way TRIS will be managed. A systematic, proactive approach to that management could include defining scope and content parameters, reprioritizing staffing and budgeting, and discussing new mechanisms for weighing goals and objectives and prioritizing them with the costs and effects of specific enhancements.

TRIS can’t meet every need of every user, every time they use it. However, it has historically met the core needs of its core users, by systematically identifying and prioritizing those needs.

Opportunities

This study reinforces the need for TRB to identify and prioritize the needs and expectations of the core users of TRIS, and to find ways to make TRIS as relevant and trusted to them in the future as it has been in the past. Ideally, this would be done in a strategic way that is flexible enough to accommodate new technologies and opportunities as they arise and with high levels of transparency and accountability to TRIS stakeholders. TRIS must continue to evolve.

The following nine opportunities may inform the next wave of improvements for TRIS. It should be noted that in the time between the completion of the 2007 survey and the first draft of this e-circular (approximately 18 months), TRB began to systematically implement many of these ideas presented here, and may be considering other enhancements not mentioned here. These promising steps by TRB have had an immediate positive impact on the transportation community.

DEVELOP A STRATEGIC PLAN FOR THE MANAGEMENT OF TRIS

In 2007, TRB decided to develop a strategic plan for TRIS in light of changes in information technology. While evidence indicates that TRB has engaged in strategic planning for TRIS in the past, these new developments indicate they are redoubling their efforts for the future. That can be done best through a strategic approach to the management and development of TRIS. TRIS can be made more effective and more comprehensive, but only if TRB focuses on a truly strategic approach for making those improvements, allocates the necessary financial resources, and develops the necessary collaborative partnerships. Key professionals representing sponsors and institutions that have a stake in this process should be included in that process.

CONDUCT PERIODIC STUDIES TO IMPROVE UNDERSTANDING OF USER NEEDS

As part of the strategic planning process described above, TRB initiated a series of focus groups of TRIS users in late 2007 and early 2008. The purpose of the focus groups was to get specific feedback from users on their perceptions of TRIS and their thoughts for specific ways to improve the database. Information collected through focus groups should build upon the results of the 2007 survey, with special attention paid to current TRB sponsors and the needs of future sponsors (to the extent that they can be identified). Collectively, this information could be used as a building block in the foundation of a strategic plan for the future management of TRIS. Prior to 2007, the last user satisfaction survey was conducted in 1976, a 31-year gap. TRB should conduct surveys of TRIS users on a more frequent basis as part of its strategic plan for managing the database.

COLLECT ADDITIONAL FEEDBACK FROM CORE USERS

The user satisfaction survey results presented in this report shed light on many challenges for the future development of TRIS. Respondents showed many preferences and opinions. In some cases

respondents were not able to address key issues, based in part on the design and limitations of the survey instrument, and in part on the knowledge and experience of users. Most notable in this category is TRIS' coverage by mode and function, and most interface issues, especially in regard to the TRIS Online version of TRIS. TRB has little or no influence over the way commercial versions of TRIS (Dialog's File 63 and Ovid/Silverplatter's TRANSPORT) look or work. Follow-up efforts to build upon the results of this survey (including focus groups and follow-up surveys dedicated to these purposes) may help shed light on these issues. TRB may also want to consider other ways to elucidate those issues.

EXPLORE MUTUALLY BENEFICIAL COLLABORATIVE OPPORTUNITIES

Competition for the time and attention of transportation researchers, practitioners, and decision makers is not only natural it is inevitable. The Internet represents an enormous untamed space that offers an overwhelming array of options for information searchers. TRIS is only one of those options and even the most respected research databases with the highest brand recognition are discovering that due to its dominant market position, most researchers, students and practitioners start the online search process in Google.

More and more transportation libraries are collaborating with OCLC to help manage their collections and services, including discovery of library holdings and more streamlined resource sharing. OCLC, in turn, has collaborated with Google and other search engines to reveal library holdings to people using search engines. TRB recognized the fact that by collaborating with OCLC through dynamic linkages to library catalogs they can expose records indexed in TRIS Online to people who are googling transportation topics.

Collaboration in this regard would be less about the exchange of funds and more about the exchange of value, a symbiotic relationship in which the quality of each party's resources is enhanced by the collaborative relationship. To extract the most from this partnership, TRIS Online (or other TRIS database interfaces developed) may need to display "find it in a library" and other fulfillment options in ways that are more clear (and possibly more prominent) to the end user. Further, TRB may want to consider expanding partnerships of this nature to include fulfillment through commercial booksellers (like Amazon.com), or other technical document supply centers (such as the NTIS or the British Library's document supply services).

It is probable that commercial vendors would be willing to provide royalties to TRB for click-throughs that result in a commercial transaction. Funds generated this way could be used for the ongoing support of TRIS, moving it toward a position of greater self-sufficiency.

ADDRESS HARVESTING, DIGITIZING, AND DEEP ARCHIVING

TRIS users clearly want more links to full-text documents. Much of the current transportation research content is being produced and is being posted online for free. TRB does a good job of finding those URLs, but including links (which break, requiring constant maintenance) to digital documents and harvesting the actual digital documents are two different matters. We already know how often state DOTs and other agencies move documents around on the web, which causes links to break and hinders access to full-text documents. We have also seen that most agencies do not have a long-term strategy for continued access to such documents, and so they

frequently are deleted altogether—which eliminates access. If left unaddressed, this problem will get worse.

TRB and the NTL may want to consider a document harvesting program, which would require the consent of publishers in order to comply with existing copyright laws. It is possible that the NTL (which has already explored such a program) could also take on this responsibility. Since TRB and NTL have a record of accomplishment of working together, the opportunity to collaborate in this area may present itself.

However, a great deal of older content (especially that published before 2000) has either never been digitized, or has been digitized but never been made publicly accessible. One survey respondent commented "…perhaps there are ways to digitize valuable historical but non-copyrighted works as per question 17 above. One way to do this might be to have a 'Call for Classics' piece where survey respondents identify transportation documents from the past that are thought to have value. Then, TRIS could identify works that are not copyrighted (or contact copyright holders) and consider digitizing such works."

An opportunity exists for TRB to increase the number of full-text digital reports cited in TRIS by encouraging agencies to digitize selected older reports of high value and by contributing links to those documents to TRIS after they are placed online. TRB and the NTL could also encourage long-term archiving of those reports by helping support a national effort for long-term preservation and persistent, non-moving URLs. Such an effort could take the form of a nationally coordinated digital archive.

CONSIDER DEVELOPING ENHANCED VERSIONS OF TRIS

TRB should consider developing enhanced versions of TRIS Online that authorize users willing to pay fees (flat rate, or pay-per-view) based on Internet protocol address or other forms of secure authentication. Subscribers at different payment levels would have different levels of access to TRB and other content and enhanced database functionality.

TRB should consider creating new versions of TRIS accessible to anyone willing to pay for access. Different price points would be used for versions based on their functionality and features. Such a model would give non-sponsors a mechanism to pay reasonable fees to use enhanced versions of TRIS. Enhancements could be made to the functionality of the database, the scope of coverage, or the amount of full-text (including TRB publications) documents made available through varying fee structures.

Such a model would satisfy TRB's mission "to provide leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal" while generating revenue in ways that help TRIS be more self-sustaining.

Maintaining TRIS Online as a free resource available to the public to help the public answer transportation-related questions could continue much the way the MedlinePlus database is provided as a service to the public by the National Library of Medicine and the National Institutes of Health. These agencies also maintain MEDLINE/PubMed (which is primarily for health professionals), PubMed Central (a freely accessible database of full-text scientific literature), and the Loansome Doc Ordering system (which allows users to order full-text copies of articles from medical libraries).

TRB could also explore a federated search approach such as that is used by the Entrez Cross-Database Search System, a medical information portal that allows users to search many separate health sciences databases simultaneously. A second federated search option is the NLM Gateway, an online tool designed for the Internet searcher who is new to NLM's online resources and does not know what information is available there or how best to search for it.

NOTE: At TRB's 2009 Annual Meeting, TRB unveiled the TRISworld interface to TRIS. TRISworld combines the TRIS Database and English language records from ITRD database, providing TRB sponsors access to more than 720,000 citations. TRISworld became available to sponsors in March 2009.

REEXAMINE EXISTING RELATIONSHIPS WITH COMMERCIAL VENDORS

It may be time to reconsider existing partnerships with commercial vendors Dialog and Ovid/Silverplatter. It seems likely that TRIS Online has siphoned usage from the commercial versions of TRIS—File 63 and TRANSPORT—if for no other reason than it is available free of charge. The new TRISworld interface, which is free to TRB sponsors, may continue this trend.

It should be recognized that when access to TRIS citations was made free through TRIS Online, a whole new class of TRIS users (who might have no financial means or desire to support the maintenance and development of TRIS or sponsor TRB) emerged. It is not clear exactly what changes have occurred in the total number of searches performed in File 63 and TRANSPORT since those resources were created, but it is abundantly clear that use of TRIS Online as measured by unique visitors and number of searches has increased dramatically.

Because of the fees vendors charge users for accessing subscription versions of TRIS, and due to decreasing usage patterns (not to mention the fact that the free TRIS Online version has more than 45,000 links to full-text documents that are not in the commercial versions), it is somewhat surprising that these vendors still opt to host TRIS. They may decide to discontinue that relationship should they perceive a lack of profitability in it, and that might not be a bad thing if those relationships have outlived their utility.

It should be noted that while TRB and vendor Dialog manage the agreement creating the File 63 version of TRIS, the ITRD manages the agreement with Ovid/Silverplatter for the TRANSPORT version of the database. Therefore, TRB has no purview over that agreement.

DEVELOP RELATIONSHIPS WITH LIBRARIES TO FILL CITATION GAPS

The 1985, partnership TRB has engaged in with Northwestern University and the University of California at Berkeley (the TLIB libraries) is one proven method for filling vast gaps in coverage. Yet it is curious that more than 20 years later there are still only two TLIB libraries.

Now that TRIS Online has a more robust database structure and now that TRB is able to import Machine Readable Cataloging records from library catalogs (as well as data in XML), and now that more transportation (and other) libraries have online databases, there may be an opportunity to add more TLIB partners. That could lead to new pathways for TRIS content. It is not clear what incentives would have to be put in place for other transportation libraries to engage in this program.

COMPLETE THE OCLC LINKING PROJECT FOR TRIS ONLINE

TRB's 2008 partnership with OCLC is highly significant. When TRIS was created in 1967 it simply documented citations to known works. Later TRB began including references for ordering hard copy documents from NTIS and some publishers, and TRIS Online records began clearly indicating when the transportation libraries at the University of California at Berkeley and Northwestern University held an item.

Today, TRB has ensured that TRIS Online has evolved by showing searchers of this interface all Worldcat.org libraries (more than 10,000 library systems worldwide) that hold an item, linked directly from the TRIS Online citation. The link is labeled "availability" and states "find a library where document is available." Any TRIS Online user who clicks the link quickly sees the OCLC libraries that hold an item. Presently, less than 50% of the 710,000 citations in TRIS Online are linked to library holdings this way. TRB should keep working to link as many of the citations in TRIS as possible (and to apply this linkage to all new records added to TRIS).

While this approach for fulfillment may not seem to satisfy the need for instant gratification (in the form of direct, desktop access to full-text reports) that so many TRIS Online users have expressed, it is a practical strategy for fulfillment that does not violate copyright. However, there would need to be a significant investment of staff time to complete the project because TRB and OCLC have determined that there is no way to automate the linking process for these records. That means this class of records would have to be altered individually one record at a time.

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APPENDIX A

Three Versions of TRIS
A Side-by-Side Comparison

TRIS ONLINE
http://tris.trb.org/about/default.asp?p=trisonline

- Cost: Free of charge, accessible via web browser.
- Size: 727,000 records as of April 2009.
- Content: Citations with abstracts.
- International coverage: Contains no content (0%) from the ITRD database.
- Note regarding content: It should be noted that the BTS managed interface for TRIS Online; also searches the NTL Digital Catalog (comprised of more than 700,000 citations with abstracts and links to full-text documents and a database of records to thousands of transportation-related websites as of June 2008). While the default setting for the interface is to search TRIS Online only, if the searcher is aware of it, they can search only the NTL Digital Repository from the interface, or TRIS Online and the NTL Digital Repository at the same time.
- Coverage: 1968 to present.
- Updates: Monthly updates. Corrections (such as record de-duping) occur monthly.
- Full-text links: 40,600 as of June 2008.
- Vendor's description: "TRIS Online is a public-domain, web-based version of the Transportation Research Information Services (TRIS) bibliographic database. TRIS Online is published as a collaborative effort by the Transportation Research Board, part of the National Academies, and the NTL, part of BTS, Research and Innovative Technology Administration (RITA, U.S. Department of Transportation). TRB continues to produce and maintain the TRIS Database with funding by sponsors of TRB, primarily the State departments of transportation and selected federal transportation agencies. The NTL publishes TRIS Online on its website.

The TRIS Online database contains over half a million records of published transportation research including technical reports, books, conference proceedings, and journal articles. Currently there are almost 24,000 TRIS records with links to electronic copies of the full text. The time span covers literature from the 1960s to the present, with some coverage of prior years. Highway Research Board publications are covered back to 1923. TRIS coverage includes the disciplines of planning, finance, design and construction, materials, environmental issues, safety and human factors, and operations for the modes of highways, transit, railroads, maritime, and aviation. TRIS does not contain information on vehicle standards and specifications, patent information, market research, military transport, or news articles. TRIS focuses on transportation research.

TRIS Online includes material indexed and abstracted by TRB as well as the material entered by the transportation libraries at the University of California at Berkeley and Northwestern University.

Currently TRIS Online does not include RiP records or international records derived from the International Transport Research Documentation (ITRD) database.

TRANSPORT
http://www.ovid.com/site/catalog/DataBase/157.jsp

- Cost: Approximately $1,900 for one concurrent web user.
- Size: More than 650,000 citations as of April 2009.
- Content: Citations with abstracts.
- International coverage: Contains all international content (100%) of the ITRD database.
- Coverage: 1968 to present.
- Updates: Quarterly updates. Corrections (such as record de-duping) do not occur.
- Full-text links: None.
- Vendor's description: "TRANSPORT consists of two component bibliographic databases produced by the world's leading transportation research organizations. The International Transport Research Documentation (ITRD) produced by TRL Limited on behalf of the Organisation for Economic Co-operation and Development (OECD) based in Paris; and the Transportation Research Information Services database (TRIS) produced by the Transportation Research Board of the United States. Each database has a unique orientation. Together, the databases feature published research in transportation systems and their components: highways construction, traffic, transport, road safety, intermodal transport, environmental effects of transport, transport economics, transport policy, and social sciences of transportation. References nearly all include abstracts and are predominantly in English, though 30% of the ITRD records are in one of the French, German, and Spanish languages. The records are drawn from research reports, books, articles from journals and reviews, theses, standards, specifications, conference proceedings, and summaries of research in progress.
  - Access to 650,000+ records from 1968 to present, with 12,000+ added annually.
  - Cross database searching available with a range of Ovid's complementary databases including: INSPEC, ICONDA and many more.
  - Available on both of Ovid's premier software platforms: SilverPlatter and Ovid."
- Explanation: Subscribers to the TRANSPORT version of TRIS are able to search the ITRD database produced by TRL Limited on behalf of the OECD based in Paris; as well as the TRIS Database, produced by TRB, using Ovid's web-based search interface, called WebSpirs.

The ITRD database contains close to 400,000 citations providing strong coverage of European transportation research materials. Nearly all ITRD citations include abstracts and most are in English, however, 30% of ITRD records are in one of the following languages: French, German, or Spanish. Sources include approximately 850 journals from 40 countries as well as books, reports, dissertations, patents, standards and specifications, and conference proceedings.

One of TRANSPORT's strengths is the fact that it has strong "international coverage" of transportation research, though that coverage is primarily European. TRANSPORT is licensed on a "per seat" basis, with fees increasing as the total number of simultaneous concurrent users increases. Two versions are sold: 1968 to 1988 and 1988 to present. One weakness of TRANSPORT is the fact that it is only updated quarterly. In addition, unlike TRIS Online, TRANSPORT contains no online links to full text and updates and improvements to citations made in TRIS may not always appear in TRANSPORT due to the vendor's structure for quality control.

DIALOG FILE 63
http://library.dialog.com/bluesheets/html/bl0063.html

- Cost: $2.81 per dial unit/$1.08 per minute base…features such as alerts carry an additional cost.
- Size: According to the most recent information provided by Dialog, File 63 contained 557,000 records as of August 2002. It is estimated that the database contains close to 700,000 records today.
- Content: Citations with abstracts.
- International coverage: Contains only the English language international content, which comprises about 80% of the ITRD database, about 320,000 ITRD citations.
- Updates: Monthly updates. Corrections (such as record de-duping and enhancement) do not occur.
- Full-text links: None.
- Vendor's description: "Transportation Research Information Services (TRIS) is a composite file with records that are either abstracts of published articles and reports, or summaries of ongoing or recently completed research projects relevant to the planning, development, operation, and performance of transportation systems and their components. Users can search the entire TRIS database or restrict their searches to any combination of subfiles and record types. TRIS provides international coverage of ongoing research projects, published journal articles, state and federal government reports, conference proceedings, research and technical papers, and monographs. The major TRIS subfiles are as follows:
  - HRIS: Highway Research Information Service,
  - IRRD: International Road Research Documentation,
  - TLIB: Transportation Libraries: joint contributions by the Northwestern University Transportation Library and the University of California at Berkeley, Institute of Transportation Studies Library,
  - UMTRIS: Urban Mass Transportation Research Information Service,
  - ATRIS: the Air Transportation Research Information Service,
  - HSL: Highway Safety Literature,
  - MRIS: Maritime Research Information Service, snd
  - RRIS: Railroad Research Information Service.

  TRIS coverage includes the following aspects of air, highway, rail, maritime, and waterborne transport, mass transit, and other transportation modes:
  - Policy, Planning, and Administration,
  - Government Information,
  - Energy, Environment, and Safety Concerns,
  - Materials, Design, Construction, and Maintenance Technology for Facilities, Vehicles, and Vessels,
  - Operators, Operations, Traffic Control, and Communications,
  - Physical and Economic Performance Characteristics, and
  - User and Socioeconomic Concerns.
- Explanation: File 63 is one of 450 databases on all manner of disciplines and topics offered by vendor Dialog. Pricing for File 63 can be hard to understand. Access to TRIS on Dialog requires users to pay an initial sign-up fee to obtain a password and there is a per search charge. If subscribers prefer, they can now also enter into an annual subscription fee to access

File 63. Dialog's version of TRIS contains both published research and RiP records. It also includes only the English language material (approximately 320,000 citations) from the ITRD database. The Dialog search interface offers a powerful and precise command-base search capability on the web that tends to be used primarily by information professionals.

One of File 63's strengths is that (for an additional fee of $12.57 per run) users can set up current awareness searches using Dialog Alert. This automated feature can be run with any frequency desired. Users can thus save a search strategy as an alert and when the database is updated (monthly) or on another schedule (such as weekly, daily, or even intraday), the saved search is run automatically. New records discovered this way are automatically sent to the requestor. One primary weakness of File 63 is that, like its competitor TRANSPORT, it contains no links to full text. Another weakness is that any enhancements to records already in TRIS do not appear in File 63.

APPENDIX B

The Survey Instrument

Thank you for participating in this important survey, which is being undertaken jointly by the TRB and the Virginia DOT Research Library. This survey has three objectives:

1. To understand who uses the TRIS database and what they use it for;
2. To determine user satisfaction levels; and
3. To let users make suggestions for short- and long-term enhancements to TRIS.

Because you are a TRIS user, your opinions are vital to the ongoing development of this resource. Responses from this survey will be compiled, analyzed, and shared with TRB leadership. Your observations and recommendations will directly shape the future of TRIS.

Questions marked with an asterisk (*) are mandatory.

DEMOGRAPHIC QUESTIONS

1. *Select the category below that best describes your place of employment. (Note: A drop down list of the following choices was provided.)

- College or university;
- Corporation or private company;
- Federal agency;
- Local or municipal agency;
- Not-for-profit entity;
- State DOT;
- UTC; or
- Other: please specify.

Note: An open response box was provided for the respondent to specify other.

2. *Please indicate the country where you are employed. (Note: A drop-down list of all countries/territories, starting with the United States, was provided.)

3. *Select the role or position that best describes your position from the options below. (Note: A drop down list of the following choices was provided.)

- Administrator,
- Engineer,
- Faculty member,
- Information professional,
- Research scientist,

- Student,
- Other support personnel, or
- Other: please specify.

Note: An open response box was provided for the respondent to specify other.

4. *Indicate your experience level. (Note: A drop-down list of the following choices was provided.)

- Long-time professional (have worked 15 or more years in transportation);
- Professional (have worked 5–15 years in transportation);
- Early professional (have worked 1–5 years in transportation); or
- Student (graduate or undergraduate).

USAGE QUESTIONS

The following questions ask how you access TRIS and your opinion about its content. TRIS Online is a free web version the database. TRANSPORT is a fee-based version offered by vendor Ovid/SilverPlatter, and File 63 is a fee-based version from vendor Dialog.

Questions marked with an asterisk (*) are mandatory.

5. *For the version(s) of TRIS that you use, how would you rate the ease of use? (Note: This was a matrix question that allowed the respondent to select up to three check boxes, one for each version of TRIS he or she might have used. On the X axis were ratings of ease of use, and on the Y axis were the different versions of TRIS.)

X Axis (horizontal)

1. Extremely easy to use.
2. Easy to use.
3. Difficult to use.
4. Extremely difficult to use.
5. Don't use this version.

Y Axis (vertical)

- TRIS Online.
- TRANSPORT.
- File 63.

6. *On average how often have you searched the TRIS database in the last 12 months? (Note: A drop-down list of the following choices was provided.)

- Weekly.
- Monthly.

- A few times a year.
- Never.

7. *What types of information are you looking for when you search TRIS? (Select all that apply.) (Note: The following choices appeared with a check box next to them. The respondent could select as many as applied.)

- All research on a topic.
- Basic facts on a topic or issue.
- Current state of the practice.
- Historical materials.
- Names of persons or organizations doing research on a topic.
- Overview of a specific topic.
- Verification of a citation.
- Other (Please specify)

Note: An open response box was provided for the respondent to specify other.

8. When you get results from TRIS that do not include a link to an online source, what is/are the MOST TYPICAL method(s) you employ to get the documents cited?

Examples:

- I try to get the item(s) from a library.
- I try to buy the item(s) from the publisher or a bookstore like Amazon.com.
- I search for the full text online using a search engine like Yahoo! or Google.

Note: An open response box was provided for the respondent to reply.

9. *What other resources do you use when searching for transportation information? (Select all that apply) (Note: The following choices appeared with a check box next to them. The respondent could select as many as applied.)

- Free indexing/abstracting services (e.g., NTIS, ASCE Civil Engineering Database, etc.).
- General Internet search engines like Yahoo! or Google.
- My library's online catalog.
- NTL catalog.
- Other commercial indexing/abstracting products (e.g., Compendex/Ei Village, Cambridge Scientific Abstracts, Science Direct, Web of Knowledge, etc.).
- RiP Database.
- Other transportation library catalogs (please specify):
  - TLCAT,
  - TranStats,
  - Worldcat.org, or

- Other: Please specify.

Note: An open response box was provided for the respondent to specify other.

TRIS RELEVANCY AND IMPACT

The next set of questions assesses the extent to which you believe the information you find in TRIS fulfills your needs.

10. *How relevant is information you find in TRIS to your discipline? (Note: A drop-down list of the following choices was provided.)

1. Extremely relevant.
2. Usually relevant.
3. Sometimes relevant.
4. Not relevant at all.

11. *Rate how well the information you find in TRIS helps you to perform your job. (Note: A drop-down list of the following choices was provided.)

1. Extremely relevant.
2. Usually relevant.
3. Sometimes relevant.
4. Not relevant at all.

12. *How would you rate the level of coverage in TRIS by mode? (Note: This was a matrix question that allowed the respondent to respond to nine categories of information. On the X axis were ratings of his or her perceived level of coverage, and on the Y axis were nine modal categories.

X Axis: Satisfaction Level

1. Good.
2. Fair.
3. Poor.
4. Don't know.

Y Axis: Coverage by Mode

- Aviation.
- Highways.
- Intermodal.
- Marine.
- Motor Carriers.
- Pedestrians and bicycles.

- Pipelines.
- Public transportation.
- Railroads.

13. *How would you rate the level of coverage in TRIS by function? (Note: This was a matrix question that allowed the respondent to respond to six categories of information. On the X axis were ratings of his or her perceived level of coverage, and on the Y axis were six functional categories.

X Axis: Satisfaction Level

1. Good.
2. Fair.
3. Poor.
4. Don't know.

Y Axis: Coverage by Function

- Construction and maintenance.
- Planning and administration.
- Energy and environment.
- Materials.
- Soils and geology.
- Safety and human factors.

14. *Do you believe you make better decisions or are more effective because you use TRIS? (Note: Radio buttons with the following choices were provided.)

- Yes.
- No.
- Please comment.

Note: An open response box was provided for the respondent to comment.

15. Please provide any additional comments about the relevancy of TRIS. (Note: An open response box was provided for the respondent to comment.)

SATISFACTION QUESTIONS

The following questions assess the degree to which you feel TRIS satisfies your information needs.

16. Would you recommend TRIS to other transportation researchers?

- Yes.

- No.
- If no, why?

Note: An open response box was provided for the respondent to reply.

THE FUTURE OF TRIS

The final questions ask for your input on how to improve TRIS for the future.

17. What new types of information would you like to see TRIS cover? (Note: An open response box was provided for the respondent to reply.)

18. If you could make one change to TRIS right now, what would it be? (Note: An open response box was provided for the respondent to reply.)

19. Are there any final comments you would like to add? (Note: An open response box was provided for the respondent to reply.)

CONCLUSION

20. Would you be willing to participate in a "follow up" focus group to gather additional information?

- Yes, my e-mail address is: _____.
- No.

21. Thank you for taking time to respond to this survey. If you would like to receive the results of this survey please provide your contact information here:

- Please e-mail me the results. My e-mail address is: _____.
- Please mail me the results. My mailing address is: _____.

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Advisers to the Nation on Science, Engineering, and Medicine

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