

Fast Lanes on the Transportation Information Superhighway

Tips for Efficient, Comprehensive Internet Research

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In *40 Years of the U.S. Interstate Highway System: An Analysis of the Best Investment a Nation Ever Made*, published in 1996, Wendell Cox and Jean Love wrote, "Without a first-class system of Interstate highways, life in America would be far different" (1). They noted that the highway system has

- ◆ "Enriched the quality of life for virtually every American,"
- ◆ Saved lives and prevented injuries,
- ◆ Returned value for investment,
- ◆ "Positioned the nation for improved international competitiveness,"

- ◆ "Permitted the cherished freedom of personal mobility to flourish," and
- ◆ "Enhanced international security."

At approximately the same time that President Dwight D. Eisenhower signed the Federal-Aid Highway Act of 1956, computer networks were being used for airline reservations and for a defense system. These networks were rudimentary, however, and it wasn't until 1969 that the Advanced Research Projects Agency (ARPA) of the U.S. Department of Defense implemented ARPANET, a connection of computers at several government and university research locations. This is commonly considered the beginning of the Internet.

From this small, exclusive network based on technically dense programming, the protocols and interfaces evolved that now are activated at the click of a mouse. In the beginning, the Internet was textual and accessed by known computer site addresses—the Internet Protocol or IP addresses—or through rough directories. Tim Berners-Lee developed a graphical interface for CERN, the European Council for Nuclear Research, that changed electronic file access points to hyperlinked icons and words. In 1993 this interface became public and the World Wide Web of hyperlinked Internet resources became the tool of the masses.

Paradoxical Directions

The benefits of the literal superhighways as described by Cox and Love and the benefits of the figurative information superhighway have many similarities. The information superhighway has enriched lives by making so much quality information readily accessible, has returned value for investments of time and money, and has permitted freedom to flourish through the almost overwhelming ethic of freedom of expression on the Internet. The free exchange of information has contributed to the improvement of life. The web's enhancement of international security, however, may be debatable.

The one statement that can be paraphrased without hesitation is that without the Internet, “life in America would be far different,” both at work and at leisure.

Many cartoonists have taken on the subject of the web, caricaturing both the high praise and the dire warnings voiced about the new medium. The truth may be between the two extremes. The cartoon below depicts the dichotomy of the Internet—the road forks in two paradoxical directions. The Internet can be a well-paved superhighway with excellent signage and worth traveling, or it can be a potholed detour with no roadside assistance and an undesirable destination.

The best-planned trip on this highway can turn

unexpectedly into a nightmarish dead end. A little preparation and knowledge can save time and effort—and help a search from becoming the equivalent of roadkill on the information superhighway.

Staggering Growth

Since the 1990s the growth of the Internet has been staggering. With no coordinating body and with web publishing relatively easy, information about almost anything and anybody can be found on the web.

According to the Internet World Stats website, growth in usage between 2000 and 2005 has been 160 percent worldwide (2). Approximately 68 percent of the United States, 36.8 percent of Europe, 49.2 percent of Oceania and Australia, 12.5 percent of Latin America, 8.9 percent of Asia, 8.3 percent of the Middle East, and 1.8 percent of Africa are connected to the Internet.

Search Engines

The most popular way to navigate the web is with a search engine. Most search engines use spiders or web crawlers, automatic programs that follow the hyperlinks from a web page to collect websites. In this way, the spider creates a web of ever-expanding pages, which grow exponentially.

Web users have their own favorite search engines. A few of the more popular include the following:

- ◆ Google (www.google.com);
- ◆ Altavista (www.altavista.com);
- ◆ Yahoo (www.yahoo.com);
- ◆ Teoma (www.teoma.com); and
- ◆ A9 (a9.com).

Google, which indexes more than 8 billion websites, is so widely used that its name has become a verb synonymous with “search”—people say they will “google the web.”

A recent development is the separation of scholarly content to enable specialized searches. Google Scholar (scholar.google.com) is an example.

Another way of searching the web is with a metasearch engine, an interface that employs several search engines at the same time. These include

- ◆ Excite (www.excite.com);
- ◆ Izito (izito.com);
- ◆ Vivisimo (vivisimo.com); and
- ◆ Webcrawler (www.webcrawler.com).

Invisible Web

The number of hits on a web search may be vast but does not include what is called the “invisible web” or the “deep web.” Not every web page is linked to other pages, making it invisible to the spider that is search-

“When you come to a fork in the road, take it” is a saying attributed to Yogi Berra. The forks in a web search can lead in paradoxical directions.

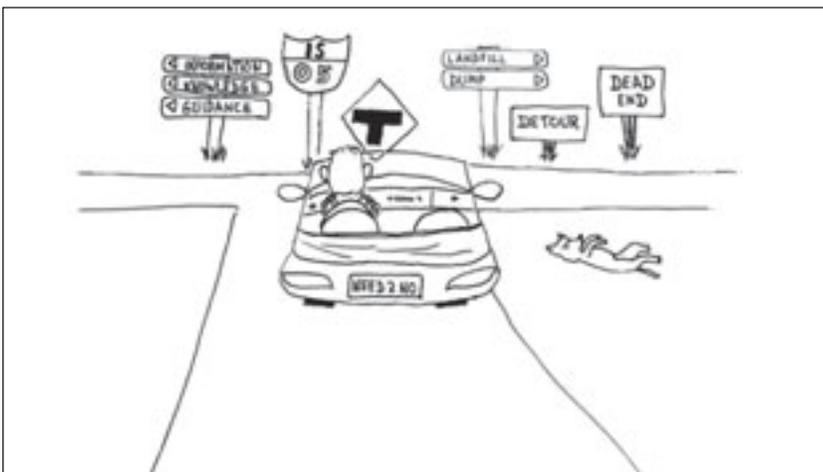


ILLUSTRATION BY T. O'SULLIVAN

ing the web. Many of these unseen pages can be extremely valuable.

For example, a database created on a topic may have no links to a web page. When a topic is searched, the records are generated dynamically in response to the query. No permanent record or links are made, and these records return to invisibility after the user is finished with the results. Specialized search engines have been created to access these sites and make these web pages searchable. These search engines include the following:

- ◆ Find Articles (www.findarticles.com);
- ◆ Complete Planet (www.completeplanet.com);
- ◆ Resource Discovery Network (www.rdn.ac.uk);
- ◆ Scirus (www.scirus.com); and
- ◆ Turbo10 (turbo10.com).

Choosing an Engine

Users should read the search tips and do some investigation into the search engine they use. Questions to ask include the following:

- ◆ How often does the search engine update?
- ◆ How precise is the search?
- ◆ What is the role of advertising on the site—does advertising have an effect on the order in which the results will be displayed?
- ◆ Does the search engine allow Boolean searches by adding “and,” “or,” and “not”?
- ◆ Does the search engine allow truncation and wildcards?

Search Tips

Learning one or two search engines well—along with their idiosyncrasies—is recommended. When a search is important or does not yield the results expected, running a second search engine may improve the coverage. Some sources of information, tips, and reviews of websites include the following:

- ◆ Infopeople (www.infopeople.org) offers tutorials, tips on evaluating resources, and charts on search engine characteristics;
- ◆ Phil Bradley’s Finding Information: Search Engines (www.philb.com/whichengine.htm) lists the best resources for a specific search; and
- ◆ SearchEngineWatch (searchenginewatch.com) has news, a blog, search tips, and more; some links are free, but others require paid membership.

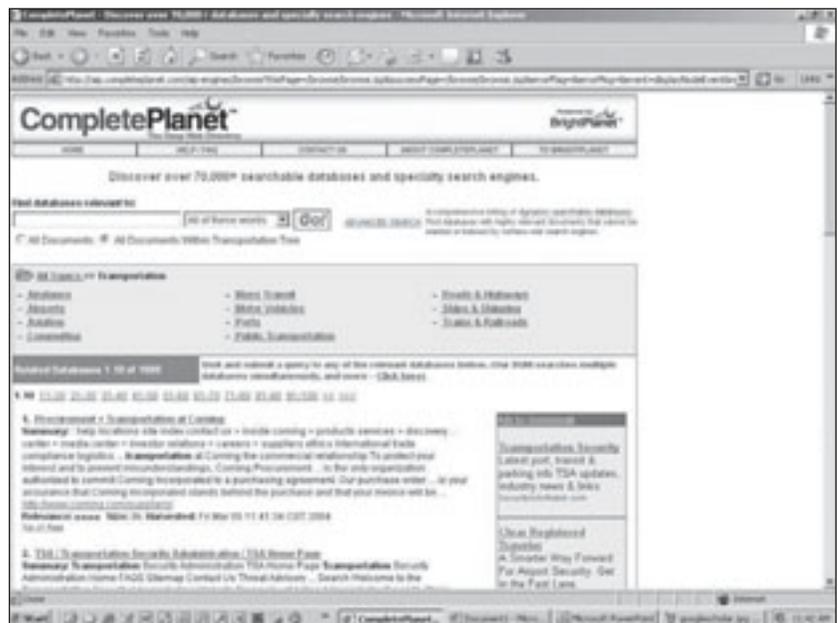
Getting results or hits from a web search is seldom the problem. The problem is the overwhelming flood of information that results from a typical search, which usually is only one or two words long. Many of the



results may not be related to the intent of the search and often the first hits are advertisements for products.

For greater accuracy, the search terms should be as exact as possible. The instructions for advanced searches give more precise ways to phrase and limit a search. These include limits by language, by the type of organization posting the web page—for example, .edu for an educational institution, or .gov for a government site—or by the country of origin.

Phrase searching and Boolean operators are other means to fine-tune a search. For tips on how to perform these tasks on the search engine in use, consult the help screen, which is usually a click away.



Web Portals

Another, often preferable way to search the web is to begin at an evaluated, specialized site. A specialized web portal will decrease the number of hits, produce more narrowly focused results, and provide a higher degree of confidence in the returned web pages, which have been evaluated by a person knowledgeable in the field and without any economic incentive to include marginal or biased sites. The following web portals are useful in transportation and related fields:

- ◆ National Transportation Library (ntl.bts.gov), which offers databases, data sets, full-text resources and reports, and more, and hosts Transportation Research Information Services (TRIS) Online;
- ◆ EEVL (www.eevl.ac.uk/), which serves as the Internet Guide to Engineering, Mathematics, and Computing;
- ◆ Firstgov (firstgov.gov), which provides a “gateway to government information”;
- ◆ Internet Public Library (www.ipl.org), which hosts general and specialized reference resources; and
- ◆ Science.gov, which is the gateway to the U.S. government’s science and technology information.

Free or Fee?

The web offers a range of resources, including full-text resources such as bibliographies, conference papers, databases, data sets, dictionaries, directories, encyclopedias, journal and magazine articles, maps, real-time video, technical reports, and white papers.

Although much of the web is free, a significant portion is not. Commercial presses publish most of the academic journals in transportation and related fields and make the contents available only at a charge. Citations from these titles may turn up on a web search but the full-text article or conference paper, in most cases, will not.

Books, handbooks, and many standards also are normally available only for a fee. Many printed resources are not yet in electronic format, although the trend has been to convert any materials that have a market.

Indexes and Abstracts

Indexes and abstracting databases provide formal access to many information resources in transportation. The major transportation databases are TRIS, International Transport Research Documentation (ITRD, www.itrd.org/), and Transport, which com-

Online Portal to European Research

COLIN HOWARD

The International Transport Research Documentation (ITRD) database is a cooperative worldwide database of published information on transportation and transportation research. Since 1972 the Road Transport Research Program of the Organisation for Economic Co-operation and Development has overseen the development of the ITRD to facilitate the sharing of published information and of ongoing research in the field of transportation.

More than 30 renowned institutes and organizations from more than 23 countries provide input to the ITRD database in one of four languages through the appropriate language coordinating center:

- ◆ English—TRL Limited, Crowthorne, U.K.;
- ◆ French—INRETS (Institut National de Recherche sur les Transports et leur Sécurité), Arcueil, France;
- ◆ German—Bundesanstalt für Strassenwesen, Bergisch Gladbach, Germany; and
- ◆ Spanish—Centro de Estudios y Experimentación de Obras Públicas, Madrid, Spain.

The sharing of research and experience through ITRD is intended to prevent overlap and reinvention, while making new ideas and technologies accessible in a timely way. More than 350,000 bibliographical references to the transportation research literature and to ongoing research are available electronically from ITRD via the Internet or other complementary channels such as the TRANSPORT CD-ROM.

Each record contains an informative abstract from the literature published worldwide on transportation, including reports, books, journal articles, and conference proceedings. A second type of reference covers research in progress.

More than 10,000 references are added each year. Each record is available in one of the four official languages—English, French, German, or Spanish. The quadrilingual thesaurus allows all records to be searched by the term’s code, which is the same whatever the language of the abstract.

Membership is not required for searching the ITRD database. ITRD Online is available through STN International (www.fiz-karlsruhe.de/). ITRD is combined with the Transportation Research Information Services (TRIS) Database on the TRANSPORT product available from Ovid Technologies (www.ovid.com).

For more information, visit the ITRD website, www.itrd.org.

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bines the TRIS and ITRD databases.

Thorough coverage may require consulting other databases. Compendex—or the Computerized Engineering Index—covers all areas of engineering, going as far back in the literature as 1884, and indexing journal articles and conference papers with some coverage of reports, dissertations, and books. The database is available through several vendors.

The National Technical Information Service (www.ntis.gov) indexes technical reports published since 1967. Most of the reports are from the United States, but many international reports are included. The Society of Automotive Engineers indexes publications from around the world in SAE Global Mobility. Other specialized databases cover materials, aerospace, environment, and related subjects. Librarians can help determine which databases are available and how to gain access when the specialized need arises.

In general, these databases are searchable by author, title words, subject words, or a combination of these, and the search can be limited by year. Except for TRIS, all of these databases require a subscription, either to the individual database or through a fee-based vendor such as Dialog or STN, which host several databases.

Many databases provide an alerting service. The user creates a profile, and an automatic notice is sent via e-mail when new records are added to the database that meet the user's criteria.

Library Consortia

A database search produces a list of records for articles, conference papers, conferences, book chapters, reports, websites, and the like. The record will provide a link to the full text of an item or to the information for finding the article. If an article is not available locally, most organizations can request a copy or a loan through consortial networks, or they will purchase a copy. Libraries cannot collect all of the resources necessary for their patrons and therefore have joined together to collect, organize, and lend materials to meet research needs efficiently.

The Midwest Transportation Knowledge Network (MTKN) is an example of a transportation consortium: "A network of state department of transportation and academic transportation libraries in the Midwest, . . . the network is a forum to pool resources [and] share expertise and best practices" (3).

TLCat is a specialized transportation catalog of the holdings of the MTKN plus other transportation collections, with a guest link from the NTL website (<http://ntl.bts.gov/link.cfm>). TLCat allows transportation researchers and librarians to locate libraries with the items needed and to request a loan.



Electronic Libraries

Documents, reports, white papers, books, data sets, and more are increasingly available in full text on the web. Many state departments of transportation (DOTs) are publishing reports electronically, and several transportation magazines are available for free on the web.

Another trend is that searchable reference titles are being made available in full text in electronic collections. These services are fee-based and place links to a large number of pertinent titles and specific information from the computer's desktop. Three collections that address engineering are

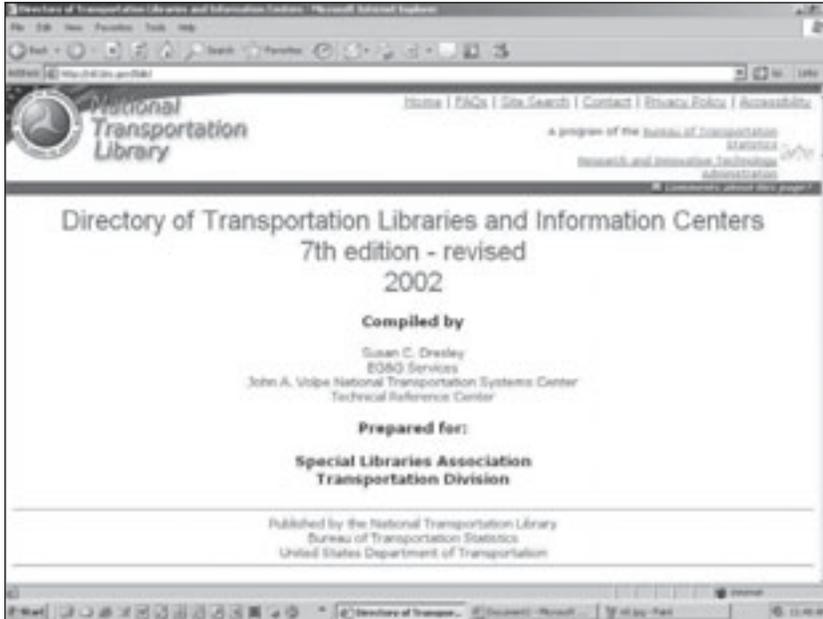
- ◆ ENGnetBASE from CRC Press (www.engnet-base.com);
- ◆ The Digital Engineering Library from McGraw-Hill (www.digitalengineeringlibrary.com/); and
- ◆ Knovel (www.knovel.com).

These aggregated electronic libraries provide fast, full-text access to information. The majority of the works in these collections are handbooks, encyclopedias, manuals, and other reference titles.

Finding the Right Information

Evaluating the materials posted on the web is a crucial step, but not difficult. As with print materials, not everything published on the web comprises valid, reliable information. As with print, the criteria for web document evaluation are

- ◆ The credentials of the author or authors,
- ◆ The reputation of the publisher or host of the website,



- ◆ The timeliness and currency of the information,
- ◆ The reliability and accuracy of the information, and
- ◆ The absence of bias.

Because publishing on the web is easy, evaluating the resources can be a challenge. Many print books, reports, papers, and articles go through a rigorous editing process and professional review. The reader therefore must consider from the information available whether or not the evaluation criteria have been met: from URLs or web addresses, attributions of authorship, references, dates of submission and updating, and the text itself.

A web portal, or gateway, can function as a filter that goes directly to web resources that have been evaluated. EEVL, hosted at Heriot Watt University in Scotland, is one of the best portals for general engineering and technology, with some transportation links. The NTL, hosted by the U.S. DOT Research and Innovative Technology Administration, offers a wealth of information organized for transportation professionals, students, and the public. Along with TRIS Online, NTL includes a reference collection and TLCat, the online union catalog of transportation library catalogs.

In addition to these two portals, many state DOTs, university transportation or engineering libraries, and other organizations have useful sites. An excellent example is the Minnesota DOT Library (www.dot.state.mn.us/library), which has links to local, national, and international websites, publications, statistical information, and more. Bookmark-

ing these sites can save time sifting through the pages of hits that are routinely returned by a search engine.

A few other sites are worth noting for the evaluation of web documents:

- ◆ Directory of Transportation Libraries and Information Centers (ntl.bts.gov/tldir);
- ◆ The Internet Scout Project (scout.wisc.edu/), which provides objective, critical reviews of web resources;
- ◆ Librarians' Index to the Internet (www.lii.org), which has the motto "Information you can trust," and which acts as a directory of Internet resources; and
- ◆ WWW Virtual Library (vlib.org), which lists web guides to several topics.

Monitoring Misinformation

As the Internet has gained in popularity and evolved from a specialized and relatively exclusive tool of researchers to an icon on almost every computer desktop, reliability has become an issue. Rumors and misinformation abound. Common sense and some of the same evaluation criteria used in assessing print information are essential.

Several websites monitor Internet misinformation. These include

- ◆ Snopes.com (www.snopes.com/), which is especially useful for software virus rumors and various forms of misinformation that are common on the Internet; and
- ◆ Urban Legends and Folklore (<http://urbanlegends.about.com/>).

Other Web Services

Through RSS—which stands for Really Simple Syndication, Rich Site Summary, or RDF (Resource Description Format) Site Summary—a user can subscribe to a service that scans RSS-friendly web pages for items of interest; the service then sends the subscriber a brief notice via e-mail, usually with links to the full text. RSS functions as a semicustomizable news service and is valuable for keeping up-to-date on topics of specific interest. Travel alerts, road construction, and new projects are the kinds of topics suited to this service.

Blogs, or web logs, have gained notoriety as popular tools in politics. In the information world, blogs can be valuable for keeping up with a topic. Several librarians write blogs that are similar to an electronic library newsletter, reporting on new resources and services, and providing search tips and pertinent websites.

Blogs have proliferated but tend to be transitory. To find a useful blog, search the web and evaluate the content critically to see if it is worth bookmarking, or ask a librarian for recommendations.

List servers or discussion groups cover a range of topics. Most TRB committees have e-mail groups for their members to discuss committee activities. Interested parties must join the subscription list to receive and send regular e-mails within the group. Lists of interest can be located via

- ◆ CataList (www.lsoft.com/lists/listref.html);
- ◆ Tile Net (www.tile.net/); and
- ◆ Google Groups (<http://groups.google.com/>).

Keeping Up

Like smart travelers checking road updates from state DOTs, the smart Internet user keeps up with changes in the web. Periodic reviews of favorite search engines or database search tips are advisable to discover any changes to the sites. “What’s new” links are helpful. Register for updates if the service is offered.

Get to know your local librarian in person or by e-mail. If problems arise with a search or with a database, ask the librarian for suggestions—the librarian is probably a regular web user and can provide pointers to refine or refocus a search.

Savvy Usage

The Internet can be both a waste of time and a fantastic timesaver, the disseminator of time- and money-saving information, as well as of misleading information. This is the paradox of the web, inherent in the openness, freedom, and ease of access in this seemingly ubiquitous medium. Applying a little know-how can make the web yield a wealth of important information.

Savvy users learn to drive a browser on the information superhighway the same way they learn to drive a car—with knowledge of the rules, lots of practice, and constant evaluation of road conditions. Although not every item of information is available on the Internet—especially for free—many destinations are worth the effort to learn for efficient use of the Internet.

Some claim the information superhighway is the best thing since sliced bread—or since high-occupancy vehicle lanes or E-Z Pass. It puts a wealth of information at the desktop of anyone with access to a networked computer or to almost any device with network capability. From reading novels to finding motorcycle helmet laws in a particular state, the information is there.

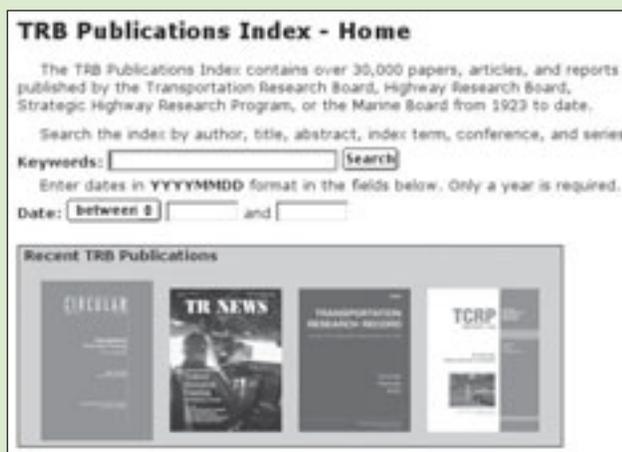
Others claim that the information superhighway is an overcrowded, poorly organized mess of pages with little of worth, and that determining what is and is not worth using is difficult. Both sides—and those in the middle—are right.

Making the information superhighway work is the same as making the Interstate system work. Know the destination and determine the highway to follow and

Publications Index Retooled

The Transportation Research Board (TRB) has launched a new and enhanced version of its online Publications Index at <http://pubsindex.trb.org> (or click on Publications Index in the left-hand menu on the TRB home page, www.TRB.org).

The TRB Publications Index is a searchable bibliographic database containing more than 30,000 records of papers, articles, and reports published by TRB and the Cooperative Research Programs, as well as by the Highway Research Board, the Strategic Highway Research Program, and the Marine Board, from 1923 to date.



Both simple and advanced query screens are available, allowing searches by author, title, series, conference, abstract, index terms, and date. The default keyword search automatically reviews several fields with a single query.

Links are provided from the bibliographic record to the full-text document—if it is available on TRB’s website—and to information about ordering the document. Search results can be displayed, downloaded, or e-mailed.

For more information about the TRB Publications Index, contact Barbara Post, bpost@nas.edu.

in what direction. Have a map, understand the road signs, and be alert to detours and warnings. Understanding what is and what is not on the web, the search tools, and the basic terminology—and having some sense of adventure—will make a journey on the information superhighway as efficient and useful as a drive along Route 80.

References

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