



Roberto A. Sarmiento, Northwestern University Transportation Library

Effective Literature Searches and Literature Reviews: Tools and Tricks for the Trade

TRB Library and Information
Science for Transportation
Committee
(ABG40)

Introduction to the problem

- Request for help at TRB 20 13
- MinDOT official unhappy with literature review results and presentation of results:
 - Unevenness
 - Quality
 - Confidence
 - Challenge: Need to develop a guide on how to do and present literature reviews!

What was done by the Committee?

- A *real* community need
- Never done before!
- LIST, CoR and MinDOT partnership to solve problem
- Definitions: Develop a common language
- MinDOT contract for “How to put it all together”
- LIST Committee to develop sections on “How to search”, “Where to search” and editorial/content Review teams
- From first conversation to final product in 2 years

The cast of “It takes a village”

How to Search

Janet Saunders Daly
Andrew Meier
Ken Winter
Hong Yu

Where to Search

Rita Evans
Jane Minotti
Barbara Post
Bob Sweet

Project Review

Andrea Avni
Paul Burley
David Jared
Birgitta Sandstedt

How to Put it All Together

Patrick Casey
Greg Landgraf

Definitions

John Cherney
Leighton Christiansen
Michael Wendt

Project Leadership

Roberto Sarmiento
Susan Sillick

Final product = TRB E-Circular

**Literature Searches and Literature Reviews for Transportation
Research Projects:**

How to Search, Where to Search and How to Put it All Together

<http://www.trb.org/Publications/Blurbs/172271.aspx>

What do we have today?

- Chairs of the 3 major sections:
 - Janet Daley - How to search?
 - Bob Sweet - Where to search?
 - Pat Casey - How to put it all together
- Share with us their best tips and resources on how to perform and present an outstanding literature review
- For additional details or more sources please consult e-circular mentioned above

Finally, it is our sincere wish that this presentation - in conjunction with the e-circular - be used for the production of better literature searches and the presentation of their results for the benefit of the transportation community.

Thank you!

Comments or questions to: r-sarmiento@northwestern.edu

Today's Presenters

- Janet Daly - How to search?
- Bob Sweet - Where to search?
- Pat Casey - How to put it all together

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How to Conduct an Effective Literature Search

Janet Daly
Indexing Manager
jdaly@nas.edu
September 2015

Goals

New or Occasional Searchers:

- Framework for conducting literature searches more effectively and efficiently

Expert Searchers

- New strategies

Information Professionals:

- Help for your patrons



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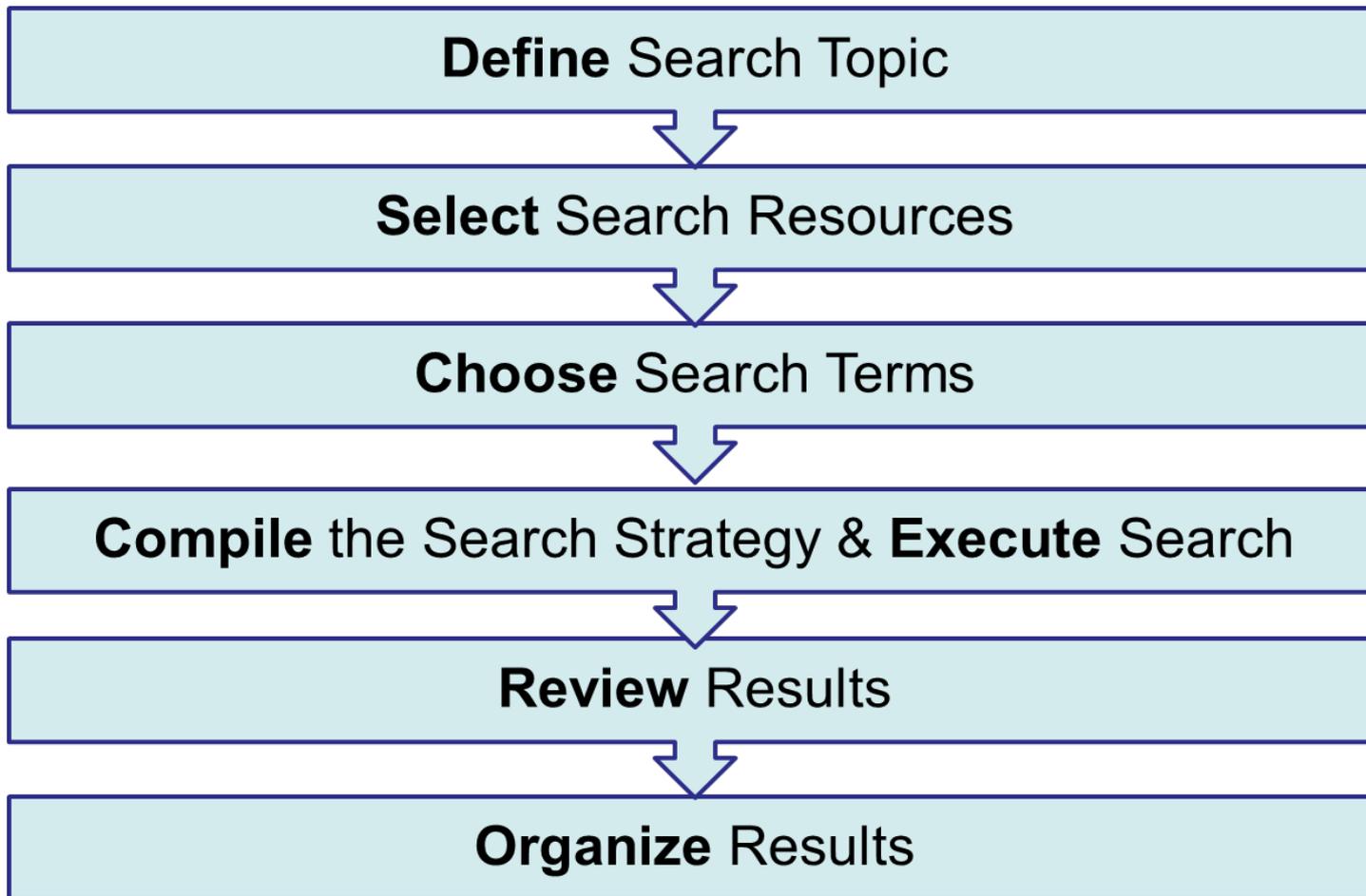
What is a literature search?

- Identifies authoritative sources of information on a topic
- Comprehensive
- Final result=list of relevant resources
- Informs the work of literature review



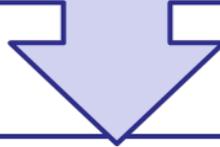
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Six Steps of a Literature Search



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Step 1: Define the Search Topic



Search topic = ultimate goal of research

- * Turn research need/idea into problem statement or question.
- * Keep topic narrow and focused
- * Establish parameters on date, geography, type of document.



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Sample Search Topics

Have bicycle sharing programs reduced automobile travel on college campuses?

Environmentally-safe solutions for the storage of de-icing salts

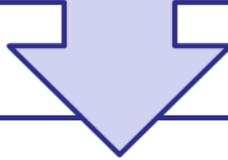
The possible safety risks of using unmanned aerial vehicles for package delivery

Is having a bike lane safer than having wide road shoulders?



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Step 2: Select Search Resources



Catalogs

WorldCat

www.worldcat.org

Databases

TRID

trid.trb.org

Internet Search Engines

Google Scholar

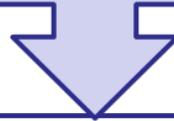
scholar.google.com

Consider using more than one!



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Step 3: Choose Search Terms



Choose terms for each major element in the search topic.

Add synonyms, acronyms, technical terminology

Consult glossaries and thesauri



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The potential safety risks of delivery services using unmanned aerial vehicles

Unmanned Aerial Vehicles

- Drone(s)
- UAV(s)
- Unmanned Aircraft System(s)
- UAS

Delivery Services

- Package(s)
- Package delivery
- Amazon
- Delivery system(s)
- Commercial

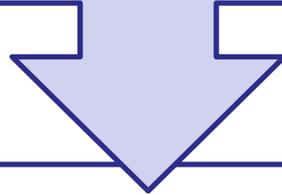
Safety Risks

- Risk(s)
- Safe or safety
- Crash(es)
- Accident(s)



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Step 4: Compile Search Strategy & Execute the Search



Seek out the Help Page of the resource

Look for resource-specific terminology



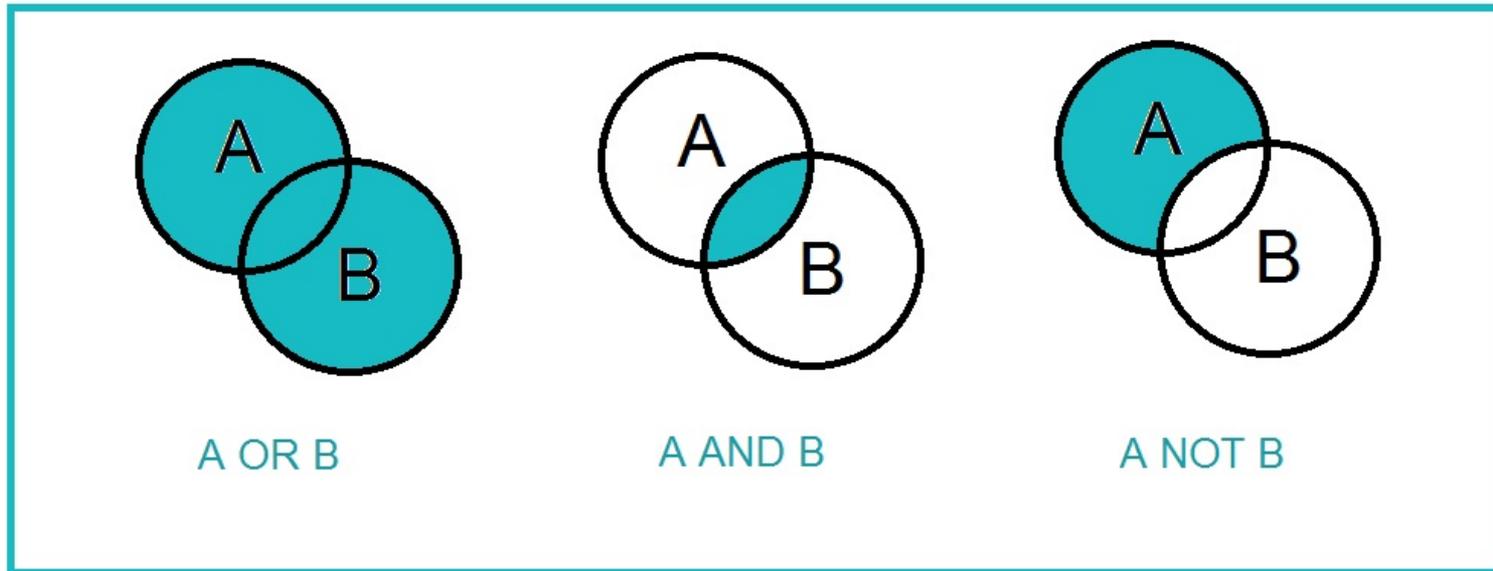
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Boolean Operators

OR—broadens search (“drone” OR “UAV”)

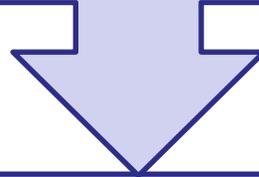
AND—narrows search (“drone” AND “delivery”)

NOT—excludes unwanted terms (“drone” NOT “military”)



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Step 5: Review Search Results



Categorize the Results:

- Definitely Related
- Possibly Related
- Not Related

Modify and run the search again. Repeat as needed.



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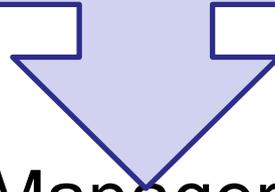
When to Stop:

- Finding the same resources repeatedly
- Have enough to start literature review
- Have set up alerts to notify you of new material
- Time constraints



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Step 6: Organize Results



Use Bibliographic Management Software (EndNote, RefWorks, Zotero etc.) or Excel to keep track of citations.

Find full-text of the Definitely Related documents



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Need help?

Ask a

librarian.



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Key Points

- A literature search is a step-by-step process.
- The first—and most important—step is to develop a search topic.
- Your initial results are only a starting point.

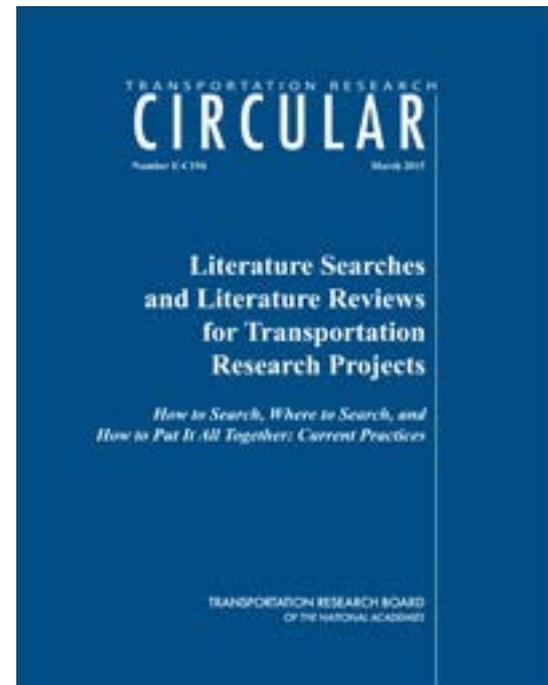


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For more details, consult TRB E-Circular
E-C194, *Literature Searches and Literature
Reviews for Transportation Research
Projects*

Thank you!

Janet Daly
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Where to Search

Bob Sweet
Information Resources Manager
UMTRI
bsweet@umich.edu

TRB Electronic Circular E-C194: Literature Searches and Literature Reviews for Transportation Research Projects

E-C194 addresses the necessary steps for producing a high-quality literature review for a transportation research project. The circular explores how to conduct literature searches; where to search for transportation information; how to put it all together as a quality literature review; and what the definitions are for related terms.

Electronic information sources:
No one-stop shop.

More is not necessarily merrier.

The categories of info and data sources in E-C194

- Bibliographic databases
- Data and statistics
- Directories
- Websites
- Research databases

Number one tip: Ask your librarian.

No librarian available?

- Midwest Transportation Knowledge Network

<http://mtkn.org>

- Eastern Transportation Knowledge Network

<http://etkn.org>

- Western Knowledge Network

<http://wtkn.org>

- National Transportation Library

<http://ntl.bts.gov>

- TRB's Transportation Information Services

<http://www.trb.org/InformationServices/TRBLibrary1.aspx>

Bibliographic databases

- TRID <http://trid.trb.org/>
- Scopus <http://www.scopus.com/>
- ProQuest <http://www.proquest.com/>
- PubMed (Medline) <http://www.ncbi.nlm.nih.gov/pubmed>
- PsycINFO <http://www.apa.org/pubs/databases/psycinfo/>
- LexisNexis <http://www.lexisnexis.com/en-us/gateway.page>
- Library catalogs
- WorldCat <http://www.worldcat.org/>

Google Scholar

“Certainly Google Scholar suffers from a similar problem as Google's conventional search interface: an enormous number of potentially relevant hits and very little means to organize or comb through them.”

Jeremy Cusker. “Elsevier Compendex and Google Scholar: A Quantitative Comparison of Two Resources for Engineering Research and an Update to Prior Comparisons.” *The Journal of Academic Librarianship*, Volume 39, Issue 3, May 2013, Pages 241–243.

Data and statistics

- Bureau of Transportation Statistics
<https://www.rita.dot.gov/bts/>
- Data.gov
<http://www.data.gov/>
- Statistical Abstract of the United States
<http://www.census.gov/compendia/statab/>
- United States Census Bureau
<http://www.census.gov/>

Directories

- **Transportation Research Board Directory**
<http://www.trb.org/CommitteeandPanels/OnlineDirectory.aspx#>
- **Federal Highway Administration Research Expertise Directory**
<https://www.fhwa.dot.gov/research/tfhrc/expertise/>
- **AASHTO Committees**
<http://www.transportation.org/Pages/Committees.aspx>

Websites

- Council of State Governments Knowledge Center

<http://knowledgecenter.csg.org/kc/>

- Deer-Vehicle Crash Information Clearinghouse

<http://www.deercrash.org/index.htm>

- Science.gov

<http://www.science.gov/>

- Transportation and Climate Change Clearinghouse

<http://climate.dot.gov/>

Research databases

- **USDOT Research Hub**
<http://ntlsearch.bts.gov/researchhub/index.do>
- **Research in Progress**
<http://rip.trb.org>
- **Transport Research Portal**
<http://www.intransport.eu/search/about>

Subject index

Bicycles

- ERIC
- Fatality Analysis Reporting System
- National Transportation Library Digital Repository

Biophysics

- PubMed/MEDLINE

Bridges

- ASCE Library
- Civil Engineering Database
- Compendex
- National Bridge Inventory Database
- National Transportation Library Digital Repository

Buses

- Federal Motor Carrier Safety Administration - Data, Analysis and Statistics
- National Transit Database

Businesses

- ABI/Inform
- LexisNexis
- ProQuest Newsstand

Fatalities

- FARS Fatality Analysis Reporting System
- Highway Statistics
- Motor Vehicle Accidents and Fatalities

Finance

- Highway Statistics
- Measurement of Government Transportation Financial Statistics
- Transportation Statistics Annual Report

Freight transportation

- ABI/Inform
- Association of American Railways (AAR)
- Bureau of Transportation Statistics
- Commodity Flow Survey
- Congestion Data for Your City
- Data Sources Related to Freight

Fuel consumption

- Annual Energy Review
- CAFE Fuel Economy
- Congestion Data for Your City
- Transportation Energy Data Book



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Mode index

All modes

Academic Search Complete
Bureau of Transportation Statistics
Data.gov

Aviation

AASHTO Committees
Aerospace Research Center
ASCE Library

Freight transportation

AASHTO Committees
Annual Energy Review
CAFE -Fuel Economy

Highways

AASHTO Committees
Annual Energy Review
ASCE Library

Marine transportation

AASHTO Committees
ASCE Library
Boating Safety Resource Center

Motor carriers

Commodity Flow Survey

Federal Motor Carrier Safety Administration-Data, Analysis and Statistics

National Emissions Inventory (NEI)

Passenger transportation

AASHTO Committees
Annual Energy Review
CAFE -Fuel Economy

Pedestrians and bicycles

AASHTO Committees
ITE Technical Information
National Emissions Inventory (NEI) Air Pollutant Emission Trends Data

Pipelines

Environmental Science and Pollution Management
National Transportation Atlas Database
National Transportation Safety Board

Public transportation

AASHTO Committees
Annual Energy Review
Boating Safety Statistics

Railroads

AASHTO Committees
Association of American Railways
Federal Railroad Administration



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Thank you for your attention.

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Technical communications for transportation professionals

Effective Literature Searches and Literature Reviews: Tools and Tricks for the Trade

Transportation Research Circular E-C194 Part II: Literature Reviews

Patrick Casey
CTC & Associates LLC
September 2015



TRANSPORTATION RESEARCH
CIRCULAR

Number E-C194

March 2015

**Literature Searches
and Literature Reviews
for Transportation
Research Projects**

*How to Search, Where to Search, and
How to Put It All Together: Current Practices*

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OF THE NATIONAL ACADEMIES

TRANSPORTATION RESEARCH CIRCULAR E-C194

Literature Searches and Literature Reviews for Transportation Research Projects

*How to Search, Where to Search,
and How to Put It All Together:
Current Practices*

Prepared by

Andrea Avni, Paul Burley, Patrick Casey,
John Cherney, Leighton Christiansen, Janet Saunders Daly, Rita Evans,
David Jared, Greg Landgraf, Andrew Meier, Jane Minotti, Barbara Post,
Birgitta Sandstedt, Roberto Sarmiento, Susan Sillick, Bob Sweet,
Michael Wendt, Ken Winter, and Hong Yu

For the

Conduct of Research Committee
Library and Information Science for Transportation Committee
Transportation Research Board

March 2015

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PART II

Literature Reviews *How to Put It All Together*

PATRICK CASEY
GREG LANDGRAF
CTC & Associates LLC

Despite its importance, the literature review is a relatively poorly understood component of research, and many authors in a number of fields have lamented the poor quality of literature reviews submitted for publication (1–3). Research agencies, professors, and others with research administration responsibilities often expect that researchers understand the importance and expectations for a literature review when, in fact, there is often little focus on it or dialogue about its intended contribution in a given research project.

This document, drawing from the literature surrounding the topic, aims to summarize the characteristics of effective literature reviews and approaches for writing them. The intended audience is principal investigators and their teams who conduct research for transportation agencies and who are expected to deliver a literature review as part of each research project.

The *literature search* and *literature resources* are treated in Part I and Appendix E, respectively, of this e-circular.

DEFINITION AND PURPOSE OF A LITERATURE REVIEW

The literature review is a critical portion of the research process in any field of inquiry and an important component of the final research report. For the researcher, a literature review helps to clarify the scope of the research project by creating a narrative of what is and is not known in the field and where there are areas of dispute. For the customer of the research and other readers, the review also provides valuable context, establishes the researcher's expertise and relates the findings of the project to what is already known.

In the case of transportation research, identifying the hallmarks of a good literature review is complicated by the wide range of business functions and research subject areas falling under the jurisdiction of federal and state transportation agencies. What might be a good approach for a literature review in pavement research and related materials sciences may be inappropriate for a literature review related to psychology and human factors in safety research. In addition, the applied nature of most state-sponsored research often means the project scope is already well-defined by the customer and not as open-ended as some academic research.

It is important to remember what a literature review is *not* (4). A bibliography, for example, is merely a list of published works with author, publisher, date, etc. An annotated bibliography includes a summary or evaluation with each work, but it is still not a literature review, though it may be a useful step and a separate product of value for both the author and reader.

A literature review is not a list but rather a narrative, organized by topic, with connections between papers made as appropriate. Within each topic of the literature review, cited

Presentation Outline

- ❑ Background, importance of the review, types of review
- ❑ Key steps in writing the review
- ❑ Example reviews from transportation research
- ❑ Tutorials for further study
- ❑ Importance of researcher/sponsor dialogue

Literature Reviews: How to Put It All Together

- ❑ Part II of the TRB E-Circular is a limited snapshot of published work on literature reviews for any field of research
- ❑ Emphasis on transportation research projects where possible
- ❑ Also based on discussions with the sponsor (MnDOT) and co-authors of the E-Circular
- ❑ See Annotated Bibliography for main sources consulted - Appendix C

Why a Literature Review is Important

- ❑ Often overlooked, an afterthought rather than an initial focus
- ❑ A narrative, not a bibliography
- ❑ Informs the research: What is known, not known; what is controversial, settled
- ❑ Provides context: How does previous research relate to the problem at hand?
- ❑ Establishes authority: The investigator is familiar with the topic

Many Possible Types of Review Depending on Overall Purpose. Factors Include:

- ❑ **Focus:** On research outcomes, methods, theories, practices, applications
- ❑ **Goals:** Synthesis, criticism, focus on central issues
- ❑ **Perspective:** Neutral presentation, advocacy for specific position
- ❑ **Coverage:** Comprehensive, representative, central or pivotal works only
- ❑ **Organization:** Chronological, conceptual
- ❑ **Audience:** Specialists, generalists, practitioners, policymakers, public

Key Steps in Writing the Review

Preliminary: A literature *search* (Part 1) from credible *sources* (Appendix E)

1. Determine the **purpose** of the review:
Goal, audience, focus, perspective
2. Determine the **scope** of the review:
Topics, comprehensiveness, time period covered
3. **Review** the research: Read, document, assimilate, summarize

Key Steps in Writing the Review

4. **Evaluate the research:** Understand, analyze, apply, synthesize, explain
5. **Organize the material, write the review (a narrative), organized by a logical topic:**
 - Chronological - shows growth of knowledge
 - Thematic - groups major issues and authors
 - Methodological - groups studies by approach (lab, field, modeling, interviews, etc.)
 - Major “camps” - differing interpretations or conclusions

Examples of Effective Transportation Literature Reviews

Crack and Concrete Deck Sealant Performance

Karl Johnson, Arturo Schultz, Catherine French, Jacob Reneson

Minnesota Department of Transportation

Report No. MN/RC 2009-13, March 2009. <http://www.lrrb.org/media/reports/200913.pdf>

The appendix of this report includes a thorough summary of each study cited in the literature review. The review itself, however, effectively synthesizes this raw information into a more useful form that supports the overall paper's purpose of defining the current state of the art regarding bridge deck sealants and crack sealers.

The literature review addresses bridge deck sealants and crack sealers in turn. Regarding deck sealants, it defines the two categories of sealants, the four performance measures used to evaluate sealants, and variables that affect performance such as concrete parameters and environmental conditions. The section on crack sealers discusses different types of sealers, their properties and application methods, performance measures, general trends in their effectiveness and variables affecting performance.

While there isn't a specific "Gaps in Findings" section, this literature review effectively notes these gaps throughout the review, identifying areas for nearly every topic that existing research has not investigated as well as noteworthy limits to specific research projects cited. Of particular note is how the review identifies a shortcoming with a widely used deck sealant evaluation procedure and a suitable method to compensate for it:

It should be noted that the NCHRP Series II procedure, which is commonly used by vendors and state highway agencies to evaluate sealer performance, does not implement abrasion or freeze-thaw exposure to which sealers on bridge decks are frequently subjected. However, in determining the absorption properties of concrete sealers, a test was developed by Alberta Department of Transportation and Utilities which is essentially a modification of the NCHRP 244 procedure that incorporates abrasion (Kottke, 1987). Absorption is measured before and after abrading 0.04 in. off the faces of treated, cubic specimens to measure quantitatively the effect of abrasion on the absorption characteristics of sealers (p. 5).

The report clearly identifies the deck sealants and crack sealers that performed best for each of the performance measures, while noting how differences in test procedures can affect results. This provides useful information to support the report's overall conclusions and recommendations.

Snow Removal at Extreme Temperatures

Michelle Akin, Jiang Huang, Xianming Shi, David Veneziano, Dan Williams

Clear Roads Program, Minnesota Department of Transportation, March 2013. <http://www.clearroads.org/downloads/Snow-Removal-Extreme-Temps-Final-Report.pdf>

Literature Reviews from Transportation Research Projects – Appendix A

- ❑ *Crack and Concrete Deck Sealant Performance*, University of Minnesota, March 2009
 - Lit review is key part (Chapters 1 & 2) = 42% of report
 - Plus survey, assessment, recommendations, gaps
- ❑ *Snow Removal at Extreme Temperatures*, Montana State University, March 2013
 - Lit review is key part (Appendix) = 40% of report
 - Includes international research, airports
 - Topical organization: Chemicals, strategies

Literature Review Examples from Transportation Research Projects

- ❑ Development of a Concrete Maturity Test Protocol, Minnesota State Univ., April 2013
 - Primarily a field and lab study of test methods
 - Lit review is minor part (Chapter 2) = 10% of report
- ❑ Quality of Life: Assessment for Transportation Performance Measures, University of Minnesota, January 2013
 - Primarily results of focus groups and surveys
 - Lit review is minor part (Chapter 2) = 2% of report

Literature Review Examples from Transportation Research Projects

- Common elements in the four literature reviews
 - Focused on sponsor's (MnDOT) needs
 - Written for specific audiences: maintenance engineers, winter maintenance managers, construction engineers, department executives
 - Organized narrative of what is known and not known
 - Informed by expertise of investigators
- Different organizational strategies, styles, lengths, etc., determined by overall purpose, goals and scope of research project

Tutorials on Writing Literature Reviews

There is no shortage of online tutorials for writing literature reviews. Most are produced by university libraries and aimed at student researchers working on theses; however, the principles are applicable to all researchers. The majority of these tutorials put more focus on searching for sources than on synthesizing the information into a useful literature review. Five of the more thorough and useful tutorials for the organizational and writing process are:

Literature Reviews: An Overview for Graduate Students

North Carolina State University Libraries, undated. <http://www.lib.ncsu.edu/tutorials/lit-review/>

This video includes a unique visualization of the process of organizing existing literature, with major works forming the core of a web and studies that respond or build on them. This web identifies and depicts relationships among sources and provides a framework for developing and connecting original ideas to the body of published literature.

Literature Review

Texas A&M University Libraries, July 23, 2013.
<http://guides.library.tamu.edu/content.php?pid=225811>

This website includes a lengthy video lecture on planning a literature review, searching for literature, assessing it and writing the review. It advises authors to consider their timeline and any standards they must follow in their planning process. It also recommends that authors determine criteria for papers that would be useful to cite in their research before beginning their literature search—defining details of the subject that are of interest and limiting by factors such as geography or time period. Existing literature reviews can be a useful resource by demonstrating what work has been done recently and by suggesting search methods and articles for inclusion. New literature reviews should not replicate previous ones, and if there is too much overlap, the focus of the review may need to be adjusted to focus on areas not already covered.

The Literature Review: A Few Tips on Conducting It

Dena Taylor
Health Sciences Writing Centre, University of Toronto, undated.
<http://www.writing.utoronto.ca/advice/specific-types-of-writing/literature-review>

This website offers a series of questions for researchers to help shape the literature review as they research and write it. Additional questions help to assess the validity of the books and articles they consider including in the review.

Writing a Literature Review and Using a Synthesis Matrix

Florida International University Center for Excellence in Writing, 2006.
<http://writingcenter.fiu.edu/resources/synthesis-matrix-2.pdf>

Tutorials for Future Study – Appendix B

These are samples only. Many more are available.

- ❑ North Carolina State University, 10 min video
- ❑ Texas A&M University Libraries, 40 min video
- ❑ University of Toronto, tips and questions
- ❑ Florida International University Center for Excellence in Writing (Synthesis matrix based on North Carolina work)
- ❑ University of Colorado, Four short slide presentations on elements of writing a lit review

Draft Specification Language

The suggested language below is meant to provide a framework for dialogue between the transportation agency and the principal investigator regarding what is expected in the literature review for a particular research project. The final language may be inserted into the research contract or used as a memorandum of understanding or other less formal agreement. A shared understanding of the features of the literature review outlined below is an important starting point. Defining specific deliverables will increase the likelihood that the investigator will understand the agency's objectives for the literature review and make a good faith effort to meet them.

- **Scope.** The literature review for this project shall include [*all literature/a representative sample of literature/all major works*] related to [*project topic*], published within the last [xx] years as well as older research pivotal to the subject. The literature review shall identify where there are gaps in knowledge in the published literature.
- **Purpose.** The literature review shall support the research project by analyzing and synthesizing previous literature. The following specific aspects of the research topic shall be addressed as well as others the investigator deems appropriate. [*List specific topics and desired methods of analysis.*]
- **Perspective.** Where there is controversy or disagreement in the published literature, diverse views shall be presented. The literature review shall evaluate arguments with the intent of illuminating the strengths and weaknesses of each rather than advocating for a specific position and shaping the evaluation of literature to support that position.
- **Organization.** The literature review shall be organized in such a way that conclusions the researcher has drawn, and the evidence to support those conclusions, are clearly presented. Works that are topically related shall be presented together.
- **Pertinence.** Literature cited in the review shall primarily be of research quality: peer-reviewed journals, conference proceedings and scholarly books. Other sources may be included as the investigator deems appropriate, with an explanation of the rationale for inclusion.
- **Audience.** The audience for this literature review and the research report is primarily agency practitioners and policymakers. The language and writing style should be appropriate for this audience.

Importance of Dialogue Between Sponsor and Investigator – Appendix D

- ❑ Draft language for research contract or memorandum of understanding
- ❑ Meant to provide a framework for dialogue *before* the research project starts
- ❑ Defines the lit review deliverables in writing
 - Scope
 - Purpose
 - Perspective
 - Organization
 - Pertinence
 - Audience

Literature Reviews for Transportation Research Projects

Thank You!

Pat Casey

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