

3

Literature Search and Review

3.1 Introduction to Literature Review

3.1.1 Overview of Literature Review

3.1.1.1 What Is Literature Review

Research is about advancing knowledge and developing new technologies. Picture a research effort like a relay race where one researcher takes the torch from the previous runner. Doing the groundwork of reviewing relevant literature is a foundation of new research and become a value additive in a technical field.

“Literature” here refers to any collection of materials in a subject. “Review” can be the discussion, critique, synthesis, and summary of selected literature materials. From a review, we are able to have an understanding of the status quo and seek out new opportunities. Thus, a literature review is a search and evaluation of available literature to present the state-of-the-art with respect to a particular subject.

Literature review may not be new, as it is introduced in a high school curriculum. For our purposes though, a literature review goes more in-depth and becomes critical as a tool and process to qualify the status of knowledge and needs for moving forward.

3.1.1.2 The Formats of Literature Review

Discussed in Chapter 2, a literature review often is a specific section in research proposals. For technical papers, a literature review may either be embedded into the introduction section of a paper or stand as a separated section. When in a separated section, a literature review may be organized into three or four subsections or paragraphs depending on the subtopics and detail. In addition, a literature review can be a standalone article, which is discussed in the Section 3.3.3 of this chapter.

As a practice, a literature review is integrated into the introduction section of a scholarly paper. Here is an example (Amershi et al. 2019):

“In recent years, teams have increased their abilities to analyze diagnostics-based customer application behavior, prioritize bugs, estimate failure rates, and understand performance regressions through the addition of data scientists [7], [8], ...

One commonly used machine learning workflow at Microsoft has been depicted in various forms across industry and research [1], [9], [10], [11]. It has commonalities with prior workflows defined in the context of data science and data mining, such as TDSP [12], KDD [13], and CRISP-DM [14].”

Some papers have a separated literature review section. In such a structure, the literature review is often arranged into a few subsections. Figure 3.1 shows an example (Diabat et al. 2019).

3.1.2 Purposes of Literature Review

The overall objective of a literature review is to know the status of relevant knowledge on the theoretical, methodological, and/or practical achievements to a particular topic. Figure 3.2 shows five objectives and benefits of conducting a literature review. Depending on the nature of research, the objectives of a specific literature review can have different emphases. For example, assessing research methods can be more important than learning from others in some situations.

3.1.2.1 To Understand Status Quo

We conduct a literature review to track down the latest knowledge, such as what has been studied and how the knowledge was obtained by other professionals.

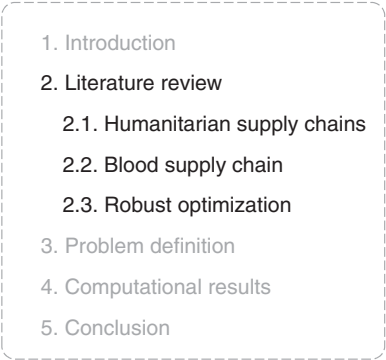
- 
1. Introduction
 2. Literature review
 - 2.1. Humanitarian supply chains
 - 2.2. Blood supply chain
 - 2.3. Robust optimization
 3. Problem definition
 4. Computational results
 5. Conclusion

Figure 3.1 A section of literature review in a paper.



Figure 3.2 Purposes and benefits of literature review.

Then, we can do a new, enhance study, rather than “reinvent the wheel.” Generally, the more we understand the existing status and perspectives in our research subject, the more effectively we can tackle our research.

Thus, reporting the latest status and labeling as such is important. Here are three examples of literature reviews:

“The latest preload technology of machine tool spindles: A review” (Lee et al. 2017)

“A literature review on latest developments of Harmony Search and its applications to intelligent manufacturing” (Yi et al. 2019)

“Bitumen and Bitumen Modification: A Review on Latest Advances” (Porto et al. 2019)

3.1.2.2 To Learn from Other Professionals

Doing a literature review is a learning process from the works of domain experts and professionals. We can learn from our peers who have conducted the same or similar research projects. For example, some papers state,

“Once such systems are in place, one can better design threat mitigation techniques that are tailored to those systems by leveraging on lessons learned from other fields, such as autonomous vehicles.” (Schmale 2019)

“Lessons learned from evidence-based practice in other domains, especially law and medicine, are described and incorporated into evidence-based systems engineering.” (Hybertson et al. 2018)

“This paper describes research aimed at optimising the performance of metallic processes, e.g. selective laser melting (SLM) and direct metal laser sintering (DMLS); but, will first review some of the lessons learnt from other processes and materials.” (Morgan et al. 2016)

Different from learning from textbooks and in classrooms, reviewing papers can effectively update and broaden our knowledge. Textbooks tell us background, basic principles, and methods. While the recent scholarly papers provide us with the latest research achievements, various viewpoints, analysis approaches, particular subject evolution, and so on. Occasionally, older (more than 10 years old) literature is valuable as well.

3.1.2.3 To Look for New Opportunities

Literature reviews play as important a role in leading our research to new directions to the current research. Through a literature review, we may gain insight into problems, recognize the imperfections within existing publications, and identify research gaps or deficiencies of a subject. For example, we can find some new research opportunities on the topics not well studied because:

- Not many people yet recognized them
- Prior advance challenges due to known reasons (technical, resources, etc.)
- Low interest (probably due to funding) etc.

Then, we may propose new research, to build our bridge to cover the knowledge need or gap on top of something that has already been worked upon. Hence, a new research proposal intends to advance by

- Applying a proven technology to a new subject or field
- Using a different method to prove an important theory
- Resolving a conflict or controversy in differing research results
- Creating a new concept or different perspective

Many papers briefly state the plan for a continuation of their research and additional studies at the end. Such statements shed a light on what the authors believe should be the next direction for the particular research. For example:

“Our future work involves extending our evaluation to other open source and commercial projects. We also plan to extend DeepJIT using attention neural network so that our model can explain its predictions to software practitioners.” (Hoang et al. 2019)

“First, we shall test the proposed method with datasets other than Titanic, especially, with a much larger dataset. Second, we shall improve our method to support numerical features. Third, we require to support transformations

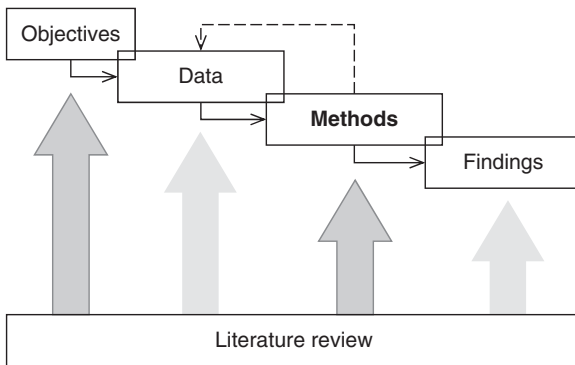


Figure 3.3 Literature review and other parts of research.

combining multiple features. We also plan to have the synthesized program in a way that users can modify it.” (Narita and Igarashi 2019)

Based on a review, we may adjust or revise our research direction, emphasis, or methodology to reposition our research for an increased potential of success.

3.1.2.4 To Assess Research Methods

Literature reviews can support all parts of research; many reviews focus on research method (refer to Figure 3.3). When reviewing methods, researchers should think about the methods from different angles, such as objectives, data used, and findings, to understand better why the methods were used in a particular research project.

There are numerous research methods and approaches in a subject’s domain. Different methods are used in the same subjects and for solving similar problems. By analyzing method, we can know the best one for a new research project, which is essential to the effectiveness of a research project.

In many cases, the purpose of review is to assess the methods used in published literature and to propose and justify a new method. In these cases, we need to identify the issue or gap of the existing methods. Here are examples of statements about new methods after a literature review section.

“Looking at the statistics of the translated model, the advantage of the proposed concept becomes apparent: There is no large non-linear equation system at all.” (Zimmer et al. 2018)

“In this paper, we proposed a new approach to developing p-charts that does not make control limits more precise than it really is.” (Ahmed et al. 2019)

“To overcome these shortcomings, a simple and systematic unifying approach is proposed in this study to extend our previous results in Refs. 3–5 to solve a complex operational amplifier.” (Chen et al. 2019)

3.1.2.5 To Justify Proposed Research

We can also use literature review to justify the motivation for doing new research. In other words, a literature review shows the significance of the research project and the incomplete, limited, or unsatisfactory nature of the existing research. Accordingly, the connection between the previous research and new research can be established and then new research can be justified and supported.

We can generate new research ideas and directions with the support of literature reviews. Reading the literature review section of research papers or standalone review articles, we can find such statements. Here are examples:

“Given these findings in the literature on open software, open data, and open innovation, combined with the fact that the importance of data is growing for several types of applications, lead us to think of OCD as a potential means for spending less on commodity features and more on differentiating and innovative features in data-driven applications.” (Runeson 2019)

“In our approach, we follow the methodology proposed in TSQL2 book [8]. We specify aspects (1), (2) and (3) in a formal way, so that the necessary properties of reducibility and consistent extension can be proved ([8, 17]).” (Anselma et al. 2013)

“Previous studies offer the core algorithm and an implementation as a tool for industrial parts traceability in factory use [8]. However, no practical tool has been proposed for implementing our framework yet. Now, we have developed a functional prototype of such a tool.” (Bergen et al. 2019)

As a sum, a literature review is an integral value of a research project and significantly benefits new research in various ways. It gives us a base to build on and can bolster our confidence to do new and challenging work. Therefore, it is well worth our time and efforts.

3.1.3 Keys of Literature Review

3.1.3.1 Review Process

We may treat a literature review as a small project, with a few steps of planning and execution. Before conducting a literature review, we should clearly define a few items, such as

- Subject, topic, and scope
- Number of papers to review
- Timeframe of read and review

The subject and topic are determined based on research need. The scope of search can be based on experience, resources, others advice, and/or own target. The number of papers to review should be preliminarily determined, which is

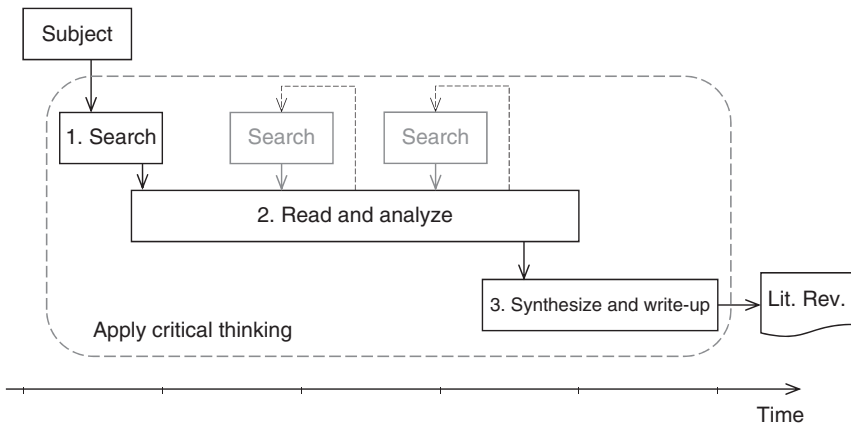


Figure 3.4 Common steps of literature review.

associated with time constraints. Depending on the width and depth of a search and review, we may arrange the time of a literature review. If you have three weeks for a literature review of 10 papers, you may plan three tasks with time overlap (see Figure 3.4):

1. Subject and search (three days)
2. Read and analysis (15 days)
3. Synthesis and write-up (five days)

During literature review, critical thinking and open mindedness are important to analyze the literatures. In addition, regular discussion meetings with an adviser and/or team members can be helpful. During the review, we may reiterate the steps of Search and Analyze a few times. We have more discussion on effective search in the next section.

3.1.3.2 Information Processing

Going through the steps of a literature review, we make the review to become more directly relevant and useful to our research subject. The narrowing down of information looks like a multiple-level filtering process (see Figure 3.5).

A literature review is not simply a collection of information and results from literature. The main effort is on “review” to

- Compare, critique, and assess the existing achievements
- Synthesize disparate or inconsistent ideas and results
- Summarize the state-of-the-arts
- Comment on possible issues and gaps
- Recommend new directions or topics for future study

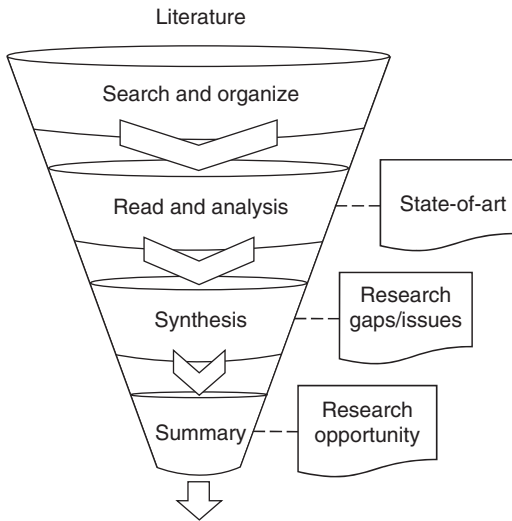


Figure 3.5 Funnel view of literature review.

The analysis process in a literature review first scans and then organizes the papers found into a few categories. We may consider this task as a prerequisite to our next step: critical analysis. With well-organized literature, the analysis, synthesis, and write-up can be streamlined.

The synthesis and write-up of a literature review is similar to writing an essay. We often organize a review section into several subsections, based on the topic and purpose of a literature review rather than around the source list. For example, a subsection may be on the research methods. We further discuss the writing of a literature review in the next section of this chapter.

3.1.3.3 Focuses and Structure of Review

In addition to knowing the overall process and purpose, understanding the characteristics of a literature review can be conducive to a quality review. The Association of College and Research Libraries published the Framework for Information Literacy for Higher Education. Readers may refer to it for the details (ACRL, Association of College and Research Libraries 2016).

A review can be on one of the following focuses. Clearly, the focus is associated with the goals of a literature review and the type of research (basic research, applied research, or R&D).

- Research finding and outcomes
- Research methods and approaches used
- Development of theories
- Applications of known principles and methods

We may organize a literature review one of three different ways, listed below. Sometimes we use a primary style, combining others with it.

- *Methodological.* To focus on the details of methods used in research papers, rather than with the content of the papers. This type of arrangement is often in research proposals and papers in engineering fields.
- *Thematic.* To organize review around a topic, issue, and opportunities. Within this type of review, progression of time may be an important factor. For example, reviews are on the issues and development of autonomous vehicles over time.
- *By Technical Trends.* To examine the sources through the lens of a developmental trend. This type of review follows the progression of time and is orientated around technical details as well. On this point, by trend and thematic reviews are similar. A review may have subsections according to the era within the period being referenced.

3.1.3.4 Items of Significance

It is important to understand the following parts of a literature search and review:

- *Scholarly Value.* Understanding the contributions of the original researcher's work to the field, which is the main purpose of a literature review. Please note that research results reflect researcher's expertise and credibility, but are not necessarily proportional to the author's status or reputation.
- *Objectivity.* On the conclusions of a particular works. Reviewers may check the persuasiveness of author's perspectives – how they are supported by data, analysis, reasoning, etc. A critical review may reveal imperfect or incomplete tasks for further work. For example, looking for certain pertinent information being ignored or inconsistent data.
- *Provenance or Authority.* About the original authors' research credentials and their affiliations. A novice researcher may rely on basic indicators of authority, such as the reputation of journals, author's institute, and/or research support sponsors.
- *Selectivity.* The information we choose to mention and comment should be related directly to our research focus. General information on a subject is not necessary.
- *Clarity.* A literature review should not only be clear to ourselves but also to our readers. Therefore, readers will see our research is backed up and justified by literature review.

For the reliability of literature sources, some librarians consider CRAAP, or five factors: currency, relevance, authority, accuracy, and purpose (Herrero-Diz et al. 2019).

Occasionally, we may experience the challenge of not having many scholarly articles available. There may be two possibilities when we cannot find enough literature on a specific topic:

- The topic is rarely studied (interesting to think about why, if not very new)
- The search range, defined by keywords and constraints, may be too specific.

3.2 Literature Sources and Search

3.2.1 Information and Process

3.2.1.1 Search Process

A literature search sounds straightforward but can be time-consuming. Two decades ago, researchers spent much time in “brick and mortar” libraries to find useful literature materials. Nowadays, the situation is different – more and more information, including scholarly papers and books, is available online. We can search remotely from anywhere to get literature, which is much more efficient and extensive than it used to be.

Even with well-designed search engines of the Internet and electronic databases, a literature search can still take significant time. A challenge is how to work effectively through the thousands (or even millions) of documents that turn up in seconds using Google Scholar or from scientific databases. The chore of finding the most useful sources to meet a research project need is still left to us.

Before beginning a literature search, we should have a basic plan and target. Do we want to do an exhaustive search or have a selected target group? A target group can be defined on its pivotal items, selective research projects by certain sponsors, conflicting objects, and so on. In general, we may consider two filters in a search process, refer to Figure 3.6.

The first task is to determine the *relevance* of the literature. Based on the search criteria selected, there may be thousands of articles available. It is necessary to review them quickly for their relevance to the research topic based solely on their titles. Then, we need to refine our search criteria, say additional keywords. We

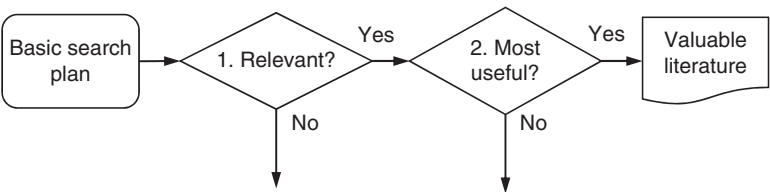


Figure 3.6 Two filters in literature search process.

may need to re-run the search again until the papers on the resultant list are directly relevant and the number of papers looks manageable, say several hundred items.

The second review filter is on the *usefulness* of the literature based on the methods and/or conclusions of the papers. Usefulness is research objective dependent. Here, we may not only add additional search constraints, such as time, but also scan the abstracts or the conclusions of papers. A systematic review reports 19 most relevant and useful papers from 1511 works with several screening steps (Veiga et al. 2019). This second step takes more time than the first one.

One practice is to check the potential research opportunities that may or may not be explicitly stated in the papers. Such a check may be on the defined research problem, imperfect executions, not fully agreeable conclusions, or study limitations mentioned in the literature. Any such items may imply opportunities for new research topics. If the proclaimed research in an article is well studied, it may be considered a good example and cited. However, such literature may or may not provide a direct clue for new research.

3.2.1.2 General Information Sources

The articles of newspapers, trade magazines, and general websites (.com) may have useful information but should not be used in research and scholarly papers. Trade magazines, for example, do not necessarily include sufficient scientific or technical details. A trade journal article may be written by a subject matter expert but may be used to promote their solution or technology over competitor's solutions.

Newspaper's articles lack detail and are written to meet reader's interest, as newspapers rely on advertising as a source of income. The undisclosed third-party influence in such sources is likely prevalent. Due to advertisement, an inherent bias could be associated with the source, whether it is intended or not. Similarly, not all websites can be trusted for a complete and accurate information without verification. For new technologies, we may find valuable information from company websites (such as organizations in ".com" domain), as they may promote their ideas, products, and/or technology. In such cases, we need to evaluate for possible commercial bias and technical validity. However, we may visit .com sites as a reference to lead us to the sources that are more academic.

Wikipedia is a good reference for general information. It is an online encyclopedia with exclusively free content and allows anyone to edit the text and publish things that may or may not be validated. The items of Wikipedia are not permanent and can be edited at any moment. Wikipedia itself states, "Wikipedia is not a reliable source for academic writing or research" (Wiki n.d.). We may check Wikipedia at the beginning to gather basic and preliminary information. However, we should not cite Wikipedia as a valid reference for scholarly works. It is

extremely rare that scholarly papers cite Wikipedia. Most professors do not allow their students to use Wikipedia even for learning purposes in the classroom.

However, we may check Wikipedia for basic information and look at the references listed in Wikipedia to see if any of the scholarly ones can be useful.

3.2.1.3 Scholarly Publications

The target sources of a literature review are the papers published in refereed scholarly journals and conferences.

We can identify scholarly journals based on their names. For example, a periodical with name “Journal of...” or “... Journal” sounds scholarly. However, there are many exceptions that scholarly journals have no “journal” in their titles, such as “Computers and Operations Research” published by ELSEVIER, “Advanced Materials” published by Wiley Online, and “Research in Engineering Design” published by Springer-Verlag. If the journal name seems to not clearly show its scholarly nature, we should check the details of the journal, such as its introduction and history.

The history of a journal, for example, in terms of the volume number, is an important indicator. It is positive if a journal has been circulated in the professional field for many years. However, new technology keeps developing with new journals born every year. For example, Manufacturing Letters was created in October 2013. It is a scholarly journal of the Society of Manufacturing Engineers (SME) and considered a high-quality journal.

A key factor is that a journal must be refereed. Scholarly journals have a rigorous peer review process in place. The acceptance rates for journals of good reputation are normally less than 40%, which denotes the quality of papers published in the journals.

Considering these factors, novice researchers can search, filter, and find valuable academic research information. Refer to Figure 3.7.

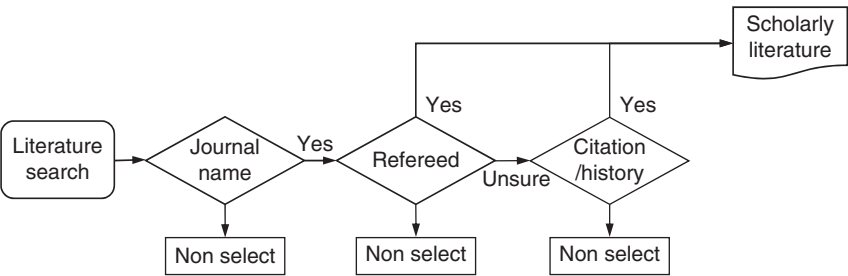


Figure 3.7 Selection considerations for scholarly journals.

3.2.2 Literature Sources

For the researchers and students of academia, the best channels are the online databases of university libraries. Access to most technical and scholarly literature databases is moderated via paid subscriptions. An institute library subscribes to many databases. The researchers and students can log in to the library databases, search the literature, and download them free of charge. If a paper is not available in full-text from a library, we may ask a librarian to obtain the paper via an inter-library loan. Consulting with a librarian can be very helpful for all researchers, particularly for student researchers.

3.2.2.1 Scholarly Databases

There are many database sources or platforms in engineering and technical fields; some are broad, others are more dedicated to specific areas, such as electrical engineering. Databases can be owned and operated by a professional society, for example IEEE, or a government agency; some are platform vendors, such as ProQuest. Table 3.1 lists the commonly used ones.

Every university has a depository for its students' theses and dissertations. In addition to ProQuest, you may visit other databases through library or via public Internet for theses and dissertation:

- Networked Digital Library of Theses and Dissertations <https://www.ndltd.org/>
- DART-Europe E-theses Portal <https://www.dart-europe.eu>
- WorldCat <https://www.worldcat.org/>
- Open Access Theses and Dissertations <https://oatd.org/>

3.2.2.2 Public Domain Internet

Using a web search engine, such as Google Scholar (<https://scholar.google.com>), we may find specific papers. Millions of peer-reviewed academic journals and books, conference papers, theses and dissertations, technical reports, and other scholarly literature are available, either in full-text or abstract-only to the public.

We should use the Advance Search function of Google Scholar with multiple search constraints. Figure 3.8 shows an example. We hope that one day Google Scholar will have more filtering functions, like additional constraints on title, abstract, journal name, publisher, etc., in advance search.

It is good practice for new researchers to use Google Scholar jointly with professional databases. We may use Google Scholar for a wide-ranging search to find relevant papers. Many papers found by Google Scholar are not available in full-text. Therefore, we must use professional databases for the full-length texts of the selected papers.

Table 3.1 Engineering databases and sources.

Database	Information
EI	EI Compendex is an interdisciplinary engineering bibliographic database published by Elsevier. The database has over 11 million of journal articles and around 7 million conference papers and proceedings of 190 engineering disciplines. For example, EI Compendex materials include about 29% in electrical engineering, 14% in civil engineering, 13% in chemical engineering, and 9% mechanical engineering. https://www.elsevier.com/solutions/engineering-village/content/compendex .
IEEE Xplore	It provides full-text journals and conference proceedings in electrical engineering, computer science, and electronics from the Institute of Electrical and Electronics Engineers (IEEE). IEEE Xplore provides over 4.5 million documents, comprising over 195 scholarly journals, over 1800 conference proceedings, more than 6200 technical standards, etc. https://ieeexplore.ieee.org/Xplore/home.jsp .
INSPEC	INSPEC, owned by The Institution of Engineering and Technology (IET), is extensive in the fields of physics and engineering, over 17 million of records. https://www.theiet.org/resources/inspec/index.cfm
Knovel	It includes engineering and science reference handbooks, databases, and conference proceedings and data. This library content includes more than 7000 reference works and databases from over 120 leading technical publishers and professional societies. Knovel has a sound content selection methodology to provide the more relevant information from the authoritative sources. https://app.knovel.com/web/index.v
NTIS	National Technical Information Service is US government-sponsored research and worldwide scientific, technical, engineering, and business-related information. Having over three million bibliographic records, including research reports, computer products, software, video cassettes, audio cassettes, etc. Its National Technical Reports Library (NTRL). (https://classic.ntis.gov/products/ntrl/) is freely available worldwide.
Scopus	It covers scholarly journal articles and conference papers on topics in science, technology, medicine, social sciences, and arts & humanities of about 35 000 peer-reviewed journals in top-level subject fields. The journals are listed on the SCImago Journal Rank website. https://www.scopus.com/
ASCE Library	It provides literature across the disciplines of civil engineering. The ASCE Research Library includes the full-text papers published in 36 journals from 1983, conference proceedings from 2000, and full-text ASCE standards and e-books. The Library offers free access to abstracts. https://ascelibrary.org/

Table 3.1 (Continued)

Database	Information
NTRS	NASA Technical Reports Server displays citation (not full-text) information from NASA's Scientific and Technical Information (STI) Program. It include research reports, journal articles, conference and meeting papers, technical videos, mission-related operational documents, and preliminary data. https://www.sti.nasa.gov/
ProQuest	ProQuest Dissertations & Theses Global is a comprehensive index to dissertations and theses from all fields of study, deposits from universities in 88 countries. The full-text version includes 2.4 million dissertation and theses with over 1 million full-text dissertations that are available to download. https://www.proquest.com/products-services/pqdtglobal.html
SAE Mobilus	SAE database covers thousands of SAE standards in three categories: Ground Vehicle Standards (J-Reports), Aerospace Standards, and Aerospace Material Specifications (AMS). The thousands of SAE technical papers covering the latest advances and research in all areas of mobility engineering including ground vehicle, aerospace, off-highway, and manufacturing technology. https://saemobilus.sae.org
SAFARI	As subscription-based, the digital library that includes technical reference books, videos, short-form content, and evolving manuscripts, etc. The topics include networking, Java, Linux/Unix, Perl, NET, desktop productivity, web development and more from O'Reilly and other publishers of IT books. https://learning.oreilly.com
SCI	Science Citation Index includes worldwide research literature in the sciences. It covers 8500 notable and significant journals across 150 scientific disciplines. The journals selected by SCI are often viewed as the world's leading journals of science and technology because of the rigorous selection process of SCI. http://mjl.clarivate.com/cgi-bin/jrnlst/jloptions.cgi?PC=K
EBSCO	EBSCO Applied Science & Technology Source database offers a diverse array of full-text and indexed contents, which cover the applied sciences and computing disciplines of over 4000 journals and magazines. https://www.ebsco.com/products/research-databases/applied-science-technology-source

3.2.2.3 Open Access

Open access (OA) is a relatively new business model for academic publication and is getting more popular. With OA, research papers are distributed online, free of charge to readers. Interestingly, studies showed that two thirds of the journals and three quarters of all OA publications are in scientific, technical, and medical

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Advanced search

🔍

Find articles

with **all** of the words

with the **exact phrase**

with **at least one** of the words

without the words

where my words occur

☒ anywhere in the article

☐ in the title of the article

Return articles **authored by**

Return articles **published in**

Return articles **dated between**

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Figure 3.8 Advance search window of Google Scholar. Source: Google Scholar.

subject fields (Dallmeier-Tiessen et al. 2010). Figure 3.9 shows an example of OA in manufacturing engineering.

Table 3.2 lists some publishers for their OA publications. There is a website called Directory of Open Access Journals (DOAJ) across all disciplines (<https://www.doaj.org/>).

OA publication is under Creative Commons (CC) license, which has several types with different conditions for copyright material distributions. Two common versions are CC BY 4.0 and CC BY-NC-ND 4.0. The latter version does not allow using the materials for commercial purposes.

On top of its free access and download, OA publishes papers faster than conventional print journals. Many quality journals offer publication options, including regular publication, OA, and a “hybrid” format combining print and online.

3.2.2.4 Patents

A patent is a detailed report of research results for real or potential industrial applications and of commercial value. A granted patent entitles a monopoly for a fixed period, say 20 years, to the inventors, meaning other researchers cannot directly use the ideas or concepts in patents. Therefore, a patent can provide a protection for an invention. We have more discussion on patents in Chapter 7.

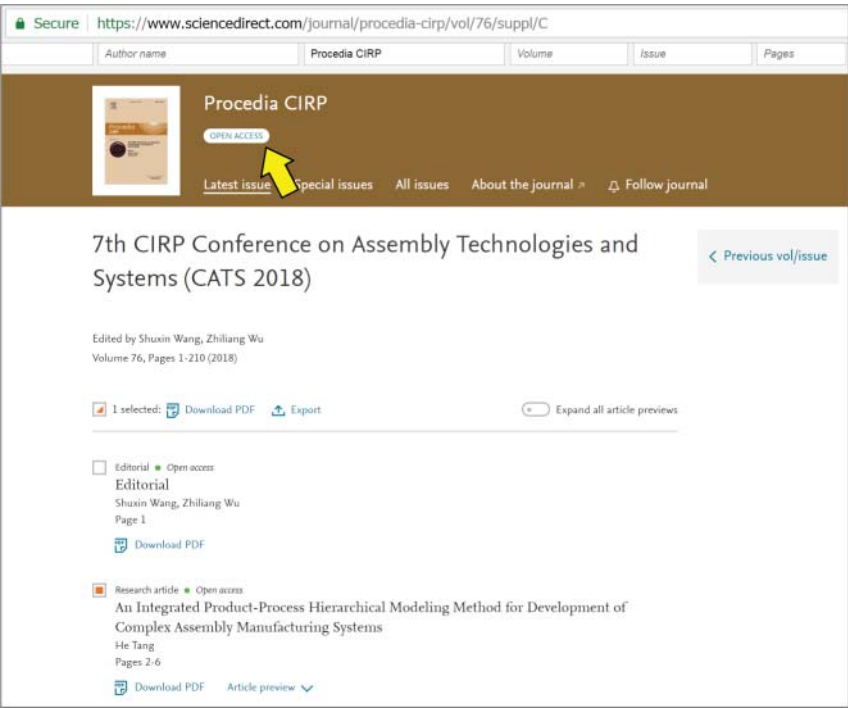


Figure 3.9 An example of open access publication. Source: Science direct.

Table 3.2 Open-access publications by some large publishers.

Name	Website
Elsevier's OA Journals	https://www.elsevier.com/about/open-science/open-access/open-access-journals
Springer Open	https://www.springeropen.com/journals
Taylor & Francis OA Journals	https://www.tandfonline.com/openaccess/openjournals
Wiley Open Access	https://authorservices.wiley.com/open-research/open-access/index.html
Royal Society Open Science	https://royalsociety.org/journals/authors/open-access/

It is occasional that scholarly papers cite patents. The reference value of patents to research depends on the types, areas, and characteristics of research. A recent study showed that the degree of popularity of a topic for scholarly papers and patents are very different from 1995 to 2015 (Qi et al. 2018). For basic research that aims for new knowledge, the reference value of patents may be low or less relevant. However, for applied research and R&D projects, searching and reading patents may be conducive to generate new ideas and avoid potential infringement of existing patents.

Searching patents is similar to other types of literature search. The first and most important way is keyword searching when keeping synonyms in mind. Some patent databases have multiple categories, such as by organization, which are helpful for searching by competitors, for example. Table 3.3 lists commonly used patent databases.

One characteristic of patents is that no verification is needed, as a patent can be a claim of a new concept only. A study estimated, “a surprising 27% of all patents would be at least partially invalidated” (Miller 2013). The implementation of peer reviews on patents is an on-going research. Several institutes and agencies have been studying it for patent applications to improve the validity of patents.

Table 3.3 Main patent databases.

Access	Database	Website
Free search (some services with fees)	Google Patents	https://patents.google.com/
	Espacenet (European Patent Organisation)	https://worldwide.espacenet.com/
	The Lens (Cambia and Queensland University of Technology)	https://www.lens.org/
	FPO (A SumoBrain Solutions Company)	http://www.freepatentsonline.com/search.html
	USPTO (US Department of Commerce)	http://patft.uspto.gov/
	WIPO (United Nations)	https://patentscope.wipo.int/search/en/search.jsf
Subscription required	Derwent Innovations Index	https://clarivate.libguides.com/webofscienceplatform/dii
	IEEE/IET Electronic Library	https://innovate.ieee.org/ieee-iet-electronic-library-iel/
	ScienceDirect	https://www.sciencedirect.com/

3.2.3 Considerations in Search

Due to the uniqueness and complexity of databases, search effectiveness is related to searching skills and experience. It is advisable to consult with experienced professionals, and/or librarians before searching. Here are practice tactics and tips for searching reference.

Bear in mind both literature search and literature review, as two phases of the process, are strongly connected and overlap (Figure 3.4). Inspection is often necessary on search results during search.

3.2.3.1 Using Keywords

A common way to search is using keywords, which are derived from our review subject and scheme. Figure 3.10 shows an overall process flow of using keywords to search interesting literature. The first step is to identify the keywords to use. Reading a couple of papers can help you identify the keywords and phrases to search. Seeking counsel from advisors and colleagues is also a good idea.

The reference section of papers is an excellent starting point. It is a good idea to examine the citations and reference lists of the papers. From these lists, you may identify additional literature of interest, possibly a bit old, and find new hints and keywords for a further search.

It can be tricky to select keywords. A search may start with two or three keywords. Commonly, thousands of items may show up in a search based on three keywords. For example, when using three keywords: hybrid, additive, manufacturing, Google Scholar yielded 132 000 results on 3 June 2019, which is unrealistic to review all of them.

One way to reduce the number of search results is to add more keywords and use two-word phrases that are more specific. There are two other tips: one is using acronyms, for instance, product lifecycle management (PLM) as it infrequently

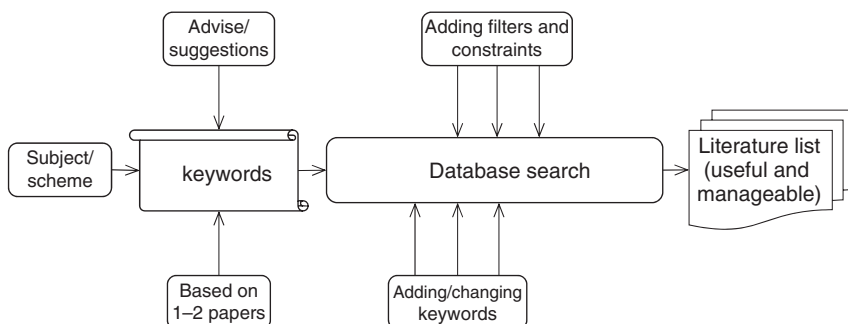


Figure 3.10 A process flow of literature search using keywords.

“spells out.” The other is to use alternate spellings in American English and British English as different authors use different spellings.

For searching a very new or rare topic, we may have a hard time trying to locate literature relative to the topic. Such relevant literature may be sporadic. In such cases, try less-direct keywords. Once we find one or two papers, we have some hints from the contents and references of the papers.

3.2.3.2 Search with Constraints

In addition to using more and unique keywords in a search to narrow down search results, we may add some constraints. For example, the publication years can be limited to an appropriate range, say, the last five years, of literature. For example, the three keywords of hybrid, additive, and manufacturing within the period of 2018, Google Scholar yielded 18 800 results, about 14% of that without the time constraint.

Another way to add constraints is to group a few keywords using quotation marks, which restricts a search to the exact string inside the quotes. If using “hybrid additive manufacturing” as a whole phrase for searching, Google Scholar got 149 results, which is further down from the 18 800. A total of 149 papers are not difficult to scan, so we may start reviewing their titles and details.

We may also apply direct constraints on keywords themselves and using Boolean operators, such as AND, OR, and NOT, refer to Table 3.4. For example, if excluding a word, put a minus sign “-” before a keyword, can significantly narrow from the records selected to improve the relevancy of search results.

As an exercise, we used Boolean operators for three keywords: “artificial intelligence” AND “quality control” AND “production” in recent five years (see Figure 3.11). As a results, three doctoral dissertations were found.

Another example is where we used “Systematic Literature Review” as search keywords, with the constraints of “Full Text Online,” “Journal Article,” “Engineering”

Table 3.4 Boolean operator applications in literature search.

Operator	Function	Examples
AND	Containing both phrases	“Artificial intelligence” AND “quality control”
OR	Containing one phrase of two	“Artificial intelligence” OR “machine learning”
NOT (-)	Excluding the phrase	-“Expert system”



Figure 3.11 A search example with constraints in a database. Source: ProQuest dissertations and theses global.

discipline, from “6/29/2018 to 6/29/2019”, and “Add results beyond your library’s collection.” This search came with 888 results (see Figure 3.12).

More constraints or functions are available in Google and databases. For example, we can select a particular language, such as Chinese or Japanese. Even though the papers not published in English, they normally have abstracts in English. We may also search a specific website domain, such as .edu or .gov, or to add the specific domain later to narrow down the quantity of search results. Another way to narrow down the search results is to limit the file type. For instance, if only literature in a PDF format is desired, we can have the phase “filetype:pdf” after keywords in Google search window.

We may use a sorting function, when available, to rearrange the results based on either date or number of citations. This may help bring up the most current or most prominent research first.

3.2.3.3 Currency of Literature

Many research areas evolve quickly. It is imperative that research uses the latest information, particularly for fast advancing technologies. Therefore, the publishing date of literature is important. In general, most literature to be used should be published within several years, even within 12 months for some subjects.

A publication process takes several months between the initial submission and publication date for journal papers. Thanks to the OA scenario of many journals, the OA publication time can be significantly shortened. Note: journal papers are timelier than textbooks.

There is about six months between the submission of an abstract and the presentation for the papers presented in professional conferences. Not all conferences publish the full length of papers in their proceedings. The access to these papers can be either OA, limited to the conference participants, or with

a required subscription. Some papers presented in a conference are revised and later published by scholarly journals, which will be discussed more in Chapter 9.

After a research achievement is published, the authors and other researchers may have moved forward with their research. In other words, the information may not be contemporary. Thus, reviewers should be cautious if following the author's original suggestions.

3.2.3.4 When to Stop

We need to know when to be satisfied with our search and move forward. In theory, we should have a saturation point where we are seeing similar viewpoints repeated over and over again. Unfortunately, there is no clear, objective criteria to decide where and when to stop. For example, some master's theses have 20 references and some have over 50. You may also refer to similar published papers regarding the number of papers to be used. Students should consult with their advisors for a common practice in their field.

What if we keep finding significantly new information? That may mean the subject is very broad or we need to adjust our focus. Preferably, such focus adjustment is in an early phase of the search.

At some point, we have to stop and feel righteous in doing so. For a specific topic, we feel confident with the sought information to conduct a new research project. It is a good idea that we do a bit more search than needed. As suggested (refer to Figure 3.4), we may resume searching when you need more information during review.

When being close to the end of literature search, we may draw a tree-like map, using Figure 3.13 (to continue to Figure 3.14) as a plan, to summarize what you have and keep updating when finding new papers. With the literature map, we can know the search status and identify which topic you need to do more search.

Sometimes we would have to stop due to a time constraint, which it is not the best reason to stop, as we may not be fully ready to move on. Good planning and time management are important to literature search and review, which again can be a small project in of itself.

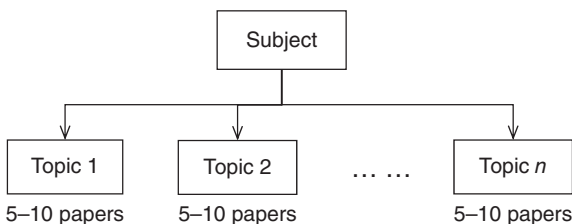


Figure 3.13 A literature tree for literature search.

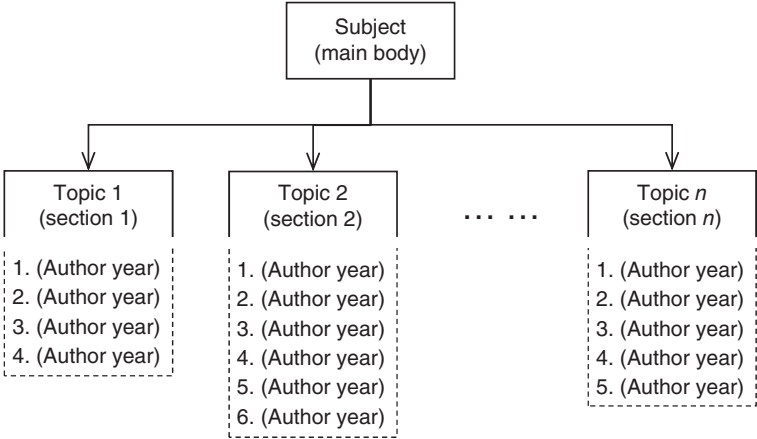


Figure 3.14 A structure of literature review.

3.3 Conducting Literature Review

3.3.1 Basic Tasks

3.3.1.1 Overall Attention

As discussed, we have two main tasks in a literature review. One is to search for current, relevant information. The other, more importantly, is to analyze and evaluate critically the ideas, methods, and conclusions contained therein.

Review itself requires careful reading and in-depth thinking that can be time-consuming and seemingly tedious work at times, especially during proposal development. Here are a few suggestions and hints for effectively preparing a literature review report.

Literature reviews should not only be a summary of the literature sought but also an exposition of the existing knowledge and reasoning to lead to and support a new research project. In other words, a literature review should involve synthesis after searching and analysis of the new research topic. In preparing a literature review, we should

- Emphasize relative context
- Use logical transitions
- Compare one work with others in the same topic
- Use appropriate paraphrases and citations
- Summarize at the end of the review

Therefore, our voice should remain front and center. For example, we may start a paragraph with our own ideas, followed by the sources supporting the point we want to make.

Another lesson learned from practice is to stay on the defined topic or problem. With so much information and details in literature, it is possible to let a review run “off-track” from the original scope of work and problem. A good practice is to pause and take stock after given literature is reviewed. The pause and in-process summary is helpful to guide further literature search and review.

As discussed in Chapter 1, critical thinking is a foundation of finding new research opportunities. Learning from literature and other professional’s viewpoints can be inspiring but they should not be considered prescriptive. Understanding other research results, assumptions, and limitations can lead to the identification of the lack of perfection and deficiency of the research. Along with identifying and presenting the research status, we analyze and evaluate the literature contents for the new research. Base such evaluation on

- Reflection on the status quo
- Logical strength of research process
- Convincing strength of results
- Different viewpoints on the particular contents
- Questions on any review impression

3.3.1.2 Organizing Analysis

When reviewing 20 or more papers, we need to organize well our review activities, such as reading, analysis, synopsis, and composing a review section. We can group literature into topic groups based on the review scheme, which is a continuous effort to update the literature map (Figure 3.13). One effective way to organize literature review work is to use a table (Colon-Rivera 2019), like Table 3.5.

When reading a paper, we put a concise statement or key points of the paper into the cells of the table. Some focal points, such as methods, vary with research theme. This tabularized summary of literature information, once completed, provides a solid foundation to compose an integrated literature review section of a paper or a standalone review article.

Generally, the keywords and title of an article state what it is about. The abstract of a paper offers a short description of the study and a brief overview of the contents of the paper. Therefore, we should read the abstract once a paper is preliminarily

Table 3.5 A template of literature review summary.

Paper	Main point	Method	Research gap	Others
(1)				
(2)				
(3)				

identified relevant. In most cases, we can determine whether a paper has a good reference value from reading its abstract. If yes, we can spend more time on the content of the paper and cite it in our literature review.

Clearly, not every paper is equally useful on a specific topic. In addition, we may find a paper difficult to understand. In this case, unless article is super relevant, we may skip it for a bit while and read it again later. After analysis, a literature review frame evolves to Figure 3.14 from Figure 3.13. Now, it is about time to compose a good review.

3.3.1.3 Making Good Argument

Please keep in mind, when making a summary, comment, or recommendation in a literature review, we in fact make an argument. To have a good argument, it is suggested that we use the Toulmin method (Toulmin 1958), which involves the data, claim, and warrant.

The data in the Toulmin method are the evidence to prove or support a claim. A claim is a statement of our position on the issue. Furthermore, any claim or perspective in a review should be based on data and facts, which can be from another literature or source. Without support, an argument sounds like an assertion.

A warrant is the principle and assumptions to bridge the data and the claim (see Figure 3.15). In other words, the warrant interprets the data and supports the claim. The three elements of data, claim, and warrant form a sturdy logical structure, even when the warrant or interpretation is debatable. We may have additional statements (backing) to support or prove the warrant.

Here is an example for readers to identify the data, claim, and warrant in the concluding remarks below.

“It is worth noting that the academic production country ranking is far from KPMG’s Readiness Index ranking (Table 2), due to the analyzed key

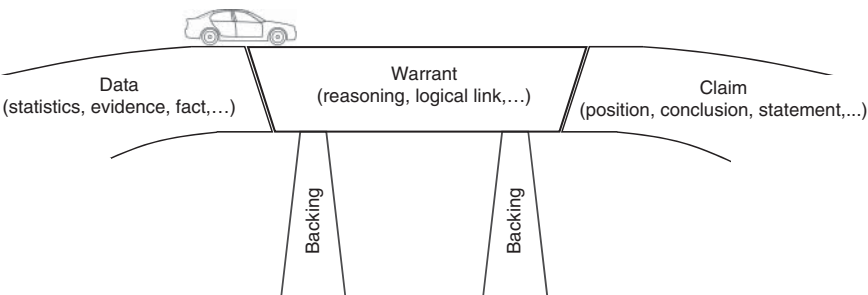


Figure 3.15 A diagram for the Toulmin method.

performance factors. This also implies that the introduction of AVs on the market is highly locally oriented, indicating that many adaptations in technology as well as in business models must be addressed.” (Gandia et al. 2019)

Sometimes, we may write a nonargumentative analysis report. In such cases, we mainly synthesize what we have found out about a research topic. Our review may look like a summary of previous research with or without the comments on a future direction. Such reviews may be less interesting to readers than an argumentative literature review, but still has a value to research community.

3.3.2 Focal Points

Based on our assessment of the strengths and weaknesses of literature, we may propose new research. In some cases, we can even challenge the existing conclusions. To perform a literature review, we may keep in mind the following key points.

3.3.2.1 On Methods

Our review may focus on research methods. In addition to the methods commonly used in our field, we may search and review the methods implemented in different areas to generate new ideas for our research. Three examples of using the method of discrete event simulation (DES) in different areas are listed below. If we will use DES in our project, we want to know how the method is used in other areas.

“Simulation of auto design performance in the market to meet fuel efficiency standards.” (Duff et al. 2015)

“Analysis of Oil and Gas Supply Chain Using Continuous-Time Discrete-Event Simulation.” (Kbah et al. 2016)

“Modelling and Simulation of a River-Crossing Operation via Discrete Event Simulation with Engineering Details.” (Jung et al. 2015)

In addition to the same methods used in different areas, we may consider different methods applied to the same subjects, individually and combined. There are trends that more untraditional methods consistently introduced to new applications and different combinations of methods are increasingly used in research. Such methodological changes may have unique advantageous potential for breakthrough in research. Here are three examples of combining different methods in research projects:

“Optimization under uncertainty in chemical engineering: Comparative evaluation of unscented transformation methods and cubature rules.” (Maußner and Freund 2018)

“Throughput Analysis of Manufacturing Systems with Buffers Considering Reliability and Cycle Time Using DES and DOE.” (Imseitif et al. 2019)

“Deep learning-based feature engineering methods for improved building energy prediction.” (Fan et al. 2019)

In addition, there are standalone literature reviews focusing on research methods; three review of machine learning methods are listed below. This type of review can save our time when we focus on a particular method.

“A systematic literature review of machine learning methods applied to predictive maintenance.” (Carvalho et al. 2019)

“Big Data Creates New Opportunities for Materials Research: A Review on Methods and Applications of Machine Learning for Materials Design.” (Zhou et al. 2019)

“Machine Learning Methods for Pipeline Surveillance Systems Based on Distributed Acoustic Sensing: A Review.” (Tejedor et al. 2017)

3.3.2.2 Exploring Trends

We may need to study the development and the latest advances of a give subject. Such reviews provide an evolutionary perspective for a particular research subject, which has a special value to support new research efforts. Here is an example,

“One example is the latest study carried out by Kai et al. in which tubes with pre-folded origami patterns were tested numerically.” (Alkhatib et al. 2017)

In addition, a new trend may be stated in a review. For instance,

“The continuous effort in academia and industry will contribute to emerge integrated MBR in treatment and valorization of wastewater.” (Neoh et al. 2016)

We should cite multiple papers on the same subject to show comprehensively their development and different aspects or perspectives.

3.3.3 Standalone Review Articles

3.3.3.1 Review Articles

As discussed, a literature review is often a section of a research proposal or paper. Sometimes, researchers write a systematic literature review as a standalone article.

Such a review article is a comprehensive synthesis or analysis of the published research and has good reference value. Interestingly, review articles are more often downloaded and cited than original research papers, which implies contribution by providing insight and comprehensive information.

In a review article, authors often provide their comments and predict further development. Sometimes, authors do not focus on a specific topic. Instead, they provide an assessment of a state of knowledge in a domain, and identify the issues for further research. Some authors engage in comparison between the two types of literature reviews (Boell and Cecez-Kecmanovic 2015).

Review articles can save time for the researchers who are new to the topic. Reading a review article, readers can learn:

- Recent advances and discoveries
- Current research focuses and gaps
- Different viewpoints and research aspects
- Researchers (reviewers) and their institutes

Because of academic value of review articles, highly reputable scholarly journals publish review articles. Often, authors often use a term “systematic” in the titles of such review articles.

3.3.3.2 To Prepare Review Article

We do not have to be a domain expert to write a review article. Most Ph.D. students need to do an intensive literature review before proposing their research. When preparing a new research grant application, we also need to do a rigorous literature review. After a review, we may spend additional time, e.g. a few weeks, to write up for publication to tell the professionals in the world what we have learned.

When considering publication of a review article, we need to think a bit broadly. For example,

- Who is the audience of our review?
- What is the central thesis of the review?
- Is the review distinct from similar reviews?
- What is the additional insight beyond the collection of literature?
- What are journals that accept review articles?

During preparing a review article, we may discover something that we did not realize or pay attention before. Keeping readers in mind, we also make an effort to coordinate the information from literature to deal with a large variety of type, style, focus, etc. For example, we may compare the definitions and create a glossary list.

Here are several examples in different technical areas, and specific focuses, such as a technique, method, modeling, applications.

- Muhammad Ilyas Azeem, et al. (2019). Machine learning techniques for code smell detection: A systematic literature review and meta-analysis, *Information and Software Technology*, Vol. 108, p. 115–138.
- Mickaël Begon et al. (2018). Multibody Kinematics Optimization for the Estimation of Upper and Lower Limb Human Joint Kinematics: A Systematized Methodological Review, *Journal of Biomechanical Engineering*, Vol. 140, Iss. 3, 11 pages.
- Hajihassani, M. et al. (2018). Applications of Particle Swarm Optimization in Geotechnical Engineering: A Comprehensive Review. *Geotechnical and Geological Engineering*, Vol. 36, Iss. 2, p. 705–722.
- Eva-Maria Schön, et al. (2017). Agile Requirements Engineering: A Systematic Literature Review, *Computer Standards & Interfaces*, Vol. 49, p. 79–91.
- Marttunen, M. et al. (2017), Structuring problems for Multi-Criteria Decision Analysis in practice: A literature review of method combinations, *European Journal of Operational Research* Vol. 263, Iss. 1, p. 1–17.
- Costabile, G. et al. (2017). Cost models of additive manufacturing: A literature review, *International Journal of Industrial Engineering Computations*, Vol. 8, Iss. 2, p. 263–282.

3.3.3.3 Structure of Literature Review

Writing a review article, we normally organize an article into three sections (refer to Figure 3.16). Each section may have two or four subsections. For the

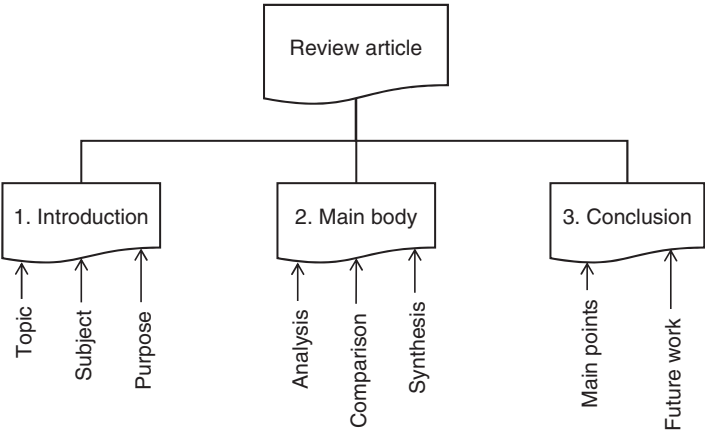


Figure 3.16 A typical structure of literature review article.

literature review section of a research paper, we may organize the review based on subtopics.

1. *Introduction.* In this section, we identify the topic and concerns, explain the purpose of the review, and provide our intention. This section may be only about 15% of the total length.
2. *Main Body.* We analyze literatures and comment on their main points. We prescribe the state-of-the-art knowledge and point out the gaps in current research. This section is about 80% of the article. We may consider:
 - Grouping topics into subsections
 - Arranging one idea or aspect per paragraph
 - Citing five or more references for each topic
 - Organizing in a priority or chronological order
3. *Conclusion.* We summarize the main viewpoints from the analysis of the literature and indicate future directions and opportunities.

As an example, Figure 3.17 shows the structure of the main body of a review article (Begon et al. 2018).

In a literature review article, we should select a large number of primary research articles. Many review articles cite over 100 papers. The length of a review article often varies from 5 to 10 printed journal pages.

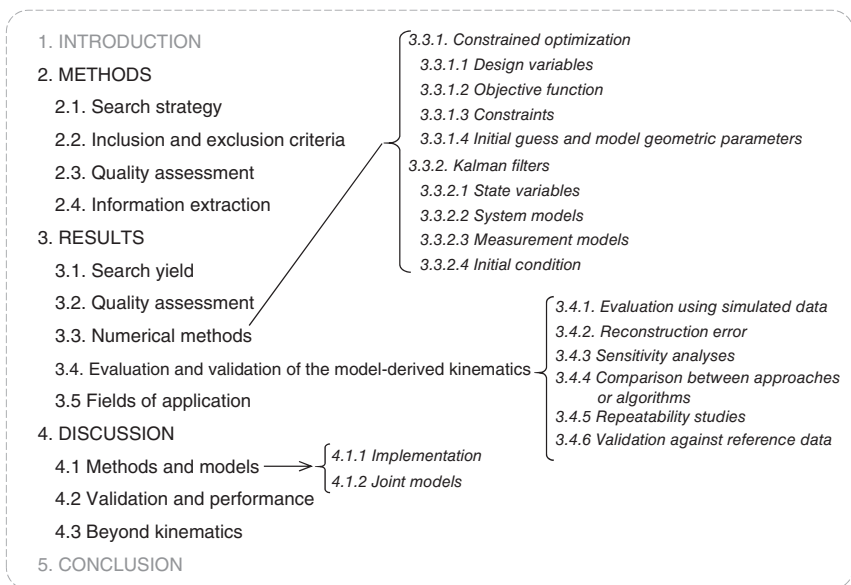


Figure 3.17 An example of main body of literature review article.

Sometimes, a review article is invited by journal editors based on the academic work of a reviewer. Without invitation, we may send an enquiry letter to journal editors about our review idea and plan before we finalize a review manuscript.

3.3.4 Writing Considerations

3.3.4.1 Professional Tone

When presenting a critical or different viewpoint, we should be professional and polite to represent the original information accurately first. Then, we analyze the research information of the original authors and point out possible areas for improvement.

We should take care when commenting on other works to avoid “putting down” a professional colleague who has worked on a similar project. We should make a criticism constructive and objective for a healthy atmosphere among cooperative professionals. Following are a few examples of critical comments.

“Haoli et al. (2009) showed that the previous method of Choudhury et al. (2007) may give incorrect or inconclusive confirmations in the case of interacting multi-input multi-output systems.” (Capaci and Scali 2018)

“Except when it is explicitly stated, it is unclear whether all the researchers have considered the open world assumption.” (Batres 2017)

“Such approach is very useful in design of spintronics as it eliminates large energy losses caused by Ohmic heating. However, epitaxial growth of BiFeO₃ films over Si substrate poses a formidable challenge for integration within conventional semiconductor devices.” (Petrovic et al. 2015)

“A review of the literature on this subject has shown that there have been occasionally incorrect or ambiguous statements [7], [8], [18], [38] – including by this author – regarding the physical origins of the flux of hydrogen to the crack tip resulting in hydride precipitation and growth.” (Puls 2009)

If the criticism of earlier work is necessary, try to be direct and mild, instead of negative manner. Instead of using judgmental words such as “no,” “not,” or “never,” we may use “few” or “very limited.” Our literature search may not be thorough. Thus, such absolute statements may be true to our knowledge but not necessarily to reality. It is possible that we do not discover some sources for various reasons, such as published in a small conference, in a different language, or in a publication process. Here are another three examples for readers review.

“To this end, comparisons between the Rytov and Born approximations with QMH and SPM at these thicknesses have not been done.” (Tajik et al. 2018).

“Author found that comparative study on twisting strength of different notches i.e. square, V and U shapes have not been done yet.” (Dhakar et al. 2018).

“This is generally expected for the range measurements (although often disregarded) but never considered for the angular measurements.” (Medic 2019)

3.3.4.2 Citation and Format

In the context of literature review, the commonly used citation formats include

- “X’s study [reference year] showed that...”
- “An approach in this subject was studied by X is that...” [reference year]
- “X concluded [reference year] that...”

The citation from one particular paper in a review should be considerably small, for example less than 10%, of the original paper. An excessive citation can be an issue of copyright breach.

We may use direct quotation if we want to emphasize a point or to have a comment after the original statement. However, many direct quotes can be distracting from the reviewer’s standpoint, becoming front and center. In many cases, it may be better not using direct quotes, particularly if the original statement or discussion is long or detailed. We would need to rephrase other’s ideas in our own words with the reference mentioned. For such situations, we also use caution when paraphrasing to represent the original author’s statements accurately.

3.3.4.3 Common Concerns

The tenses can vary in the context of a review. In the introduction and conclusion sections of a review, we can use the present tense as general statements. Depending on the situations, in the main body of a review we

- Use the present tense to state other’s thoughts or knowledge
- Use the past tense to refer to a specific work or result
- Use present tense for the implications of results
- May use the present perfect tense when referring to multiple researcher’s work

There are common issues in a literature review. Some of them are already discussed above. Some issues are listed below for reader’s awareness and avoidance if applicable.

- Descriptive review, but lacking in criticism to identify a research gap
- Organized around individual papers, instead of on a research topic
- No smooth transition flow between topics or subsections
- Focused on results, but not going over the methodology sections of reviewed articles
- Narrow literature sources, say only a few journals, insufficient diversity
- Using nonscholarly, nonrefereed sources
- Citing many relatively old literatures, for example over 10 years old

Summary

Introduction to Literature Review

1. Literature reviews may serve multiple purposes, such as situational awareness, learning from others, looking for new opportunities, assessing methods, and justifying a new proposal.
2. A literature review can be either a section of a scholarly document or a standalone systematic review article.
3. Literature review itself is a study process, consisting of searching, reading, analysis, and writing up.
4. Review may be primarily on comparison, critique, assessment, synthesis, summary, recommendation, and so on.
5. A literature review may be organized in three ways: methodological, thematic, or by technical trend.

Literature Sources and Search

6. Use keywords when searching literature normally.
7. Additional filter constraints, e.g. time limit and Boolean operators, can help search efficiency.
8. Literature sources should be scholarly journals and professional databases. Information from media and “.com” websites, including Wikipedia, are normally not allowed as a research reference.
9. Open access scholarly papers are normally of good value, but it depends on the journals.
10. In addition to relevance, the currency of literature is important as well.
11. For a systematic review, there may be a saturation point to stop a literature search.

Conducting Literature Review

12. The literature sought should be well organized for an effective review.
13. A literature review may have different focal points: methods, a latest trend, etc.
14. A literature review article normally consists of three parts: introduction, main review body, and conclusion.
15. The Toulmin method can be used to make an argument.
16. When judging others work, wording should be professional and carefully selected.
17. There are some common practices when writing up a literature review, such as tone, tense, and citation formats.

Exercises

Review Questions

- 1 Use an example to discuss one of the objectives of literature reviews.
- 2 Please explain the significance and one of the benefits of conducting a thorough review of existing literature before writing a research proposal, using an example.
- 3 Think and talk about your plan of literature search and review.
- 4 Discuss the importance of searching and referring to recent literature.
- 5 Explain how to select a focal point for a literature review based on your practice.
- 6 How do you evaluate literature value in your research project?
- 7 Identify 5–10 keywords for your research problem and consider using some of them for a literature search.
- 8 How do you decide whether your literature review is finished? Is that based on available time or the number of papers found?
- 9 Conducting a search, a researcher has a lengthy list of research articles. She must shorten the list to make a review manageable. She wanted to eliminate the articles that are not published in prestigious research journals. What are your suggestions to help her select articles?
- 10 A student asked, when conducting a literature review, how important is it to not only search the specific topic at hand, but also adjacent or opposing researches? Does this add value onto the topic?
- 11 What you would suggest if one cannot find many scholarly papers on a subject?
- 12 A literature review may be organized in three ways (methodological, thematic, and by technical trend). Which one you likely use based on your research objective?
- 13 The articles from newspapers, trade magazines, and .com websites are normally not allowed for a research project. Can you explain why?
- 14 Review the reference value of patents to research with an example.
- 15 Use an example to show how to remove less *relevant* literature during a search process.
- 16 Use an example to show how to remove less *useful* literature during a search process.
- 17 Based on your study major or professional field, which scholarly databases should be used for your literature search?
- 18 Execute a search with Boolean operators and discuss the difference of search results.
- 19 Discuss the characteristics of OA from a viewpoint of readers.

- 20 How should you perform critical thinking when reviewing papers and writing a review?
- 21 From a literature review, you likely find research gaps or opportunities for conjecture. Can you use the Toulmin method to make a convincing argument?
- 22 In the text, a few common issues of literature review are listed (Section 3.1.3). Provide your comments on one of these issues.
- 23 Comment on the differences between direct and indirect citations in literature review.
- 24 Please discuss the challenges of doing literature search and review. You may talk through it as a general concern or specifically in a particular field or subject. Include a supporting example.

Mini-Project Topics

- 1 Search your institute library databases or Google Scholar to find five journal articles (full text, interesting and related to your future research) and report how to find the papers, such as using which database, what keywords, and constraint filters. Comment on your search practice and how to improve search efficiency.
- 2 Search a research topic using your institute library databases and Google Scholar in parallel. Compare the search outcomes and discuss the usefulness of the two searches.
- 3 Critical thinking and open mindedness are important for a literature review. Find an example to show the importance of critical thinking and open mindedness.
- 4 Evaluate the literature review section of two papers in your field. Compare and comment the similarities and differences of their literature review in terms of supporting the research work of the papers.
- 5 Search three to five papers in your field and review them. Identify a possible new research topic just based on the results of the papers. Please justify your insight.
- 6 Search three to five papers using the same method but on different topics. Analyze how the method is used on the different topics.
- 7 Review three to five papers in the same topic, using different methods. Analyze how the different methods are used on the same topic.
- 8 Review three to five journal papers and discuss their research thinking and writing style.
- 9 After completing a simple literature review, talk, about your approach of literature search and analysis (refer to Figure 3.4) and potential improvement of effectiveness.

- 10 Find a standalone review article and analyze its structure and key points.
- 11 Analyze a paper to address three of the four topics below.
 - a. Research contribution
 - b. Suggestion for future work
 - c. Research work timeline
 - d. Roles of researchers/authors

References

- ACRL, Association of College and Research Libraries (2016). Framework for information literacy for higher education. Adopted by the ACRL Board, 11 January 2016. www.ala.org/acrl/standards/ilframework (accessed January 2019).
- Ahmed, S., Kibria, G. and Zaman, K. (2019). A new approach to constructing control chart for inspecting attribute type quality parameters under limited sample information. Proceedings of the International Conference on Industrial Engineering and Operations Management, Bangkok, Thailand (5–7 March 2019).
- Alkhatib, S.E., Tarlochan, F., Eyvazian, A. et al. (2017). Collapse behavior of thin-walled corrugated tapered tubes. *Engineering Structures* 150: 674–692. <https://doi.org/10.1016/j.engstruct.2017.07.081>.
- Amershi, S., Begel, A., Bird, C. et al. (2019). Software engineering for machine learning: a case study. ICSE-SEIP '19 Proceedings of the 41st International Conference on Software Engineering: Software Engineering in Practice, Montreal, Quebec, Canada (27 May 2019), 291–300.
- Anselma, L., Bottrighi, A., Montani, S. et al. (2013). Extending BCDM to cope with proposals and evaluations of updates. *IEEE Transactions on Knowledge and Data Engineering* 25 (3): 556–570. <https://doi.org/10.1109/TKDE.2011.170>.
- Batres, R. (2017). Ontologies in process systems engineering. *Chemie Ingenieur Technik* 89 (11): 1421–1431. <https://doi.org/10.1002/cite.201700037>.
- Begon, M., Andersen, M.S., and Dumas, R. (2018). Multibody kinematics optimization for the estimation of upper and lower limb human joint kinematics: a systematized methodological review. *Journal of Biomechanical Engineering* 140 (3): 11. <https://doi.org/10.1115/1.4038741>.
- Bergen T.v., Ishiyama, R., Makino, K. et al. (2019). Indexing and retrieving voice recordings by instantly tagging mentioned objects with dots. IEEE 5th World Forum on Internet of Things, Limerick, Ireland (15–18 April 2019).
- Boell, S. and Cecez-Kecmanovic, D. (2015). On being 'systematic' in literature reviews in IS. *Journal of Information Technology* Vo. 30: 161–173. <https://doi.org/10.1057/jit.2014.26>.

- Capaci, R.B. and Scali, C. (2018). Review and comparison of techniques of analysis of valve stiction: from modeling to smart diagnosis. *Chemical Engineering Research and Design* 130: 230–265. <https://doi.org/10.1016/j.cherd.2017.12.038>.
- Carvalho, T.P., Soares, F., Vita, R. et al. (2019). A systematic literature review of machine learning methods applied to predictive maintenance. *Computers and Industrial Engineering* 137: 106024. <https://doi.org/10.1016/j.cie.2019.106024>.
- Chen, C., Chen, Y., and Li, J. (2019). New method of solving complicated operational amplifier systems and application to online electrocardiograph. *Sensors and Materials* 31 (6): 1973–2012. <https://doi.org/10.18494/SAM.2019.2336>.
- Colon-Rivera, W. (2019). An effective way to search literature. Internal Discussion in Course QUAL 655 Technical Six Sigma, CRN 25894, Eastern Michigan University (24 January 2019).
- Dallmeier-Tiessen, S., Suenje, B., Darby, R. et al. (2010). Open access publishing – models and attributes. Max Planck Digital Library/SOAP, 62. <http://edoc.mpg.de/478647> (accessed 22 June 2019).
- Dhakar, P.S., Chauhan, P.S., and Sengar, V.S. (2018). Analysis of effect of shape and depth of notch on twisting strength of medium carbon steel 40C8 Bar. *Asian Journal of Innovative Research* 3 (2): 1–13.
- Diabat, A., Jabbarzadeh, A., and Khosrojerdi, A. (2019). A perishable product supply chain network design problem with reliability and disruption considerations. *International Journal of Production Economics* 212: 125–138. <https://doi.org/10.1016/j.ijpe.2018.09.018>.
- Duff, W.S., Dowling, R., Hung, B. et al. (2015). Simulation of auto design performance in the market to meet fuel efficiency standards. 2015 Winter Simulation Conference (WSC), Huntington Beach, CA, 3160–3161. doi: 10.1109/WSC.2015.7408449.
- Fan, C., Sun, Y., Zhao, Y. et al. (2019). Deep learning-based feature engineering methods for improved building energy prediction. *Applied Energy* 240: 35–45. <https://doi.org/10.1016/j.apenergy.2019.02.052>.
- Gandia, R.M., Antonialli, F., Cavazza, B.H. et al. (2019). Autonomous vehicles: scientometric and bibliometric review. *Transport Reviews*: 1–20. <https://doi.org/10.1080/01441647.2018.1518937>.
- Herrero-Diz, P., Conde-Jiménez, J., Tapia-Frade, A. et al. (2019). The credibility of online news: an evaluation of the information by university students. *Cultura y Educación* 31 (2): 407–435. <https://doi.org/10.1080/11356405.2019.1601937>.
- Hoang, T., Khanh Dam, H., Kamei, Y. et al. (2019). DeepJIT: an end-to-end deep learning framework for just-in-time defect prediction. MSR '19 Proceedings of the 16th International Conference on Mining Software Repositories, 34–45. doi: 10.1109/MSR.2019.00016.

- Hybertson, D., Hailegiorgis, M., Griesi, K. et al. (2018). Evidence-based systems engineering. *Systems Engineering* 21 (3): 243–258. <https://doi.org/10.1002/sys.21427>.
- Imseitif, J., Tang, H. and Smith, M. (2019). Throughput analysis of manufacturing systems with buffers considering reliability and cycle time using DES and DOE. 25th International Conference on Production Research Manufacturing Innovation: Cyber Physical Manufacturing, Chicago, Illinois (12–15 August 2019). <https://doi.org/10.1016/j.promfg.2020.01.423>.
- Jung, C., Yun, W., Moon, I.C. et al. (2015). Modelling and simulation of a river-crossing operation via discrete event simulation with engineering details. *Defence Science Journal* 65 (2): 135–143. <https://doi.org/10.14429/dsj.65.8141>.
- Kbah, Z., Erdil, N.O., and Aqlan, F. (2016). Analysis of oil and gas supply chain using continuous-time discrete-event simulation. Industrial and Systems Engineering Research Conference (ISERC), Anaheim, CA (21–24 May 2016).
- Lee, C., Woo, W., and Kim, D. (2017). The latest preload technology of machine tool spindles: A review. *International Journal of Precision Engineering and Manufacturing* 18: 1669–1679. <https://doi.org/10.1007/s12541-017-0195-0>.
- Maußner, J. and Freund, H. (2018). Optimization under uncertainty in chemical engineering: comparative evaluation of unscented transformation methods and cubature rules. *Chemical Engineering Science* 183: 329–345. <https://doi.org/10.1016/j.ces.2018.02.002>.
- Medic, T. (2019). Improving the results of terrestrial laser scanner calibration by an optimized calibration process. Photogrammetrie, Laserscanning, Optische 3D-Messtechnik, Beiträge der Oldenburger 3D-Tage 2019, Wichmann Verlag, Berlin, Oldenburg, Germany, 36–50.
- Miller, S. (2013). Where's the innovation: an analysis of the quantity and qualities of anticipated and obvious patents. *Virginia Journal of Law and Technology* 18 (1): 1–58.
- Morgan, H.D., Cherry, J.A., Jonnalagadda, S. et al. (2016). Part orientation optimisation for the additive layer manufacture of metal components. *The International Journal of Advanced Manufacturing Technology* 86 (5–8): 1679–1687. <https://doi.org/10.1007/s00170-015-8151-6>.
- Narita, N. and Igarashi, T. (2019). Programming-by-example for data transformation to improve machine learning performance. IUI '19 Proceedings of the 24th International Conference on Intelligent User Interfaces: Companion, 113–114. doi: 10.1145/3308557.3308683.
- Neoh, C.H., Noor, Z.Z., Ahmad, N.S. et al. (2016). Green technology in wastewater treatment technologies: integration of membrane bioreactor with various

- wastewater treatment systems. *Chemical Engineering Journal* 283: 582–594. <https://doi.org/10.1016/j.cej.2015.07.060>.
- Petrovic, M., Chellappan, V., and Ramakrishna, S. (2015). Perovskites: solar cells & engineering applications—materials and device developments. *Solar Energy* 122: 678–699. <https://doi.org/10.1016/j.solener.2015.09.041>.
- Porto, M., Caputo, P., Loise, V. et al. (2019). Bitumen and bitumen modification: a review on latest advances. *Applied Sciences* 9 (4): 742. <https://doi.org/10.3390/app9040742>.
- Puls, M.P. (2009). Review of the thermodynamic basis for models of delayed hydride cracking rate in zirconium alloys. *Journal of Nuclear Materials* 393 (2): 350–367. <https://doi.org/10.1016/j.jnucmat.2009.06.022>.
- Qi, Y., Zhu, N., Zhai, Y. et al. (2018). The mutually beneficial relationship of patents and scientific literature: topic evolution in nanoscience. *Scientometrics* 115 (2): 893–911. <https://doi.org/10.1007/s11192-018-2693-y>.
- Runeson, P. (2019). Open collaborative data – using OSS principles to share data in SW engineering. Proceedings of the International Conference on Software Engineering, 41st International Conference on Software Engineering (ICSE), Montreal, Canada (25–31 May 2019).
- Schmale, D.G. (2019). Perspectives on harmful algal blooms (HABs) and the cyberbiosecurity of freshwater systems. *Frontiers in Bioengineering and Biotechnology* 7: 128. <https://doi.org/10.3389/fbioe.2019.00128>.
- Tajik, D., Foroutan, F., Shumakov, D.S. et al. (2018). Real-time microwave imaging of a compressed breast phantom with planar scanning. *IEEE Journal of Electromagnetics, RF and Microwaves in Medicine and Biology* 2 (3): 154–162. <https://doi.org/10.1109/JERM.2018.2841380>.
- Tejedor, J., Macias-Guarasa, J., Martins, H.F. et al. (2017). Machine learning methods for pipeline surveillance systems based on distributed acoustic sensing: a review. *Applied Science* 7 (8): 841. <https://doi.org/10.3390/app7080841>.
- Toulmin, S.E. (1958). *The Uses of Argument*. Cambridge: Cambridge University Press <https://doi.org/10.1017/S0031819100037220>.
- Veiga, G., Lima, E., Aken, E. et al. (2019) Efficiency frontier identification on the context of operations strategy – a study on representative constructs and variables. 25th International Conference on Production Research Manufacturing Innovation, Chicago, Illinois (9–14 August 2019).
- Wiki (n.d.) Wikipedia: academic use. https://en.wikipedia.org/wiki/Wikipedia:Academic_use (accessed 12 April 2019).
- Yi, J., Lu, C., and Li, G. (2019). A literature review on latest developments of harmony search and its applications to intelligent manufacturing. *Mathematical Biosciences and Engineering* 16 (4): 2086–2117. <https://doi.org/10.3934/mbe.2019102>.

- Zhou, T., Song, Z., and Sundmacher, K. (2019). Big data creates new opportunities for materials research: a review on methods and applications of machine learning for materials design. *Engineering* 5 (6): 1017–1026. <https://doi.org/10.1016/j.eng.2019.02.011>.
- Zimmer, D., Bender, D. and Pollok, A. (2018). Robust modeling of directed thermofluid flows in complex networks. Proceedings of the 2nd Japanese Modelica Conference, Tokyo, Japan (17–18 May 2018). doi: 10.3384/ecp1814839.