Informing Science:
the International Journal of
an Emerging Transdiscipline

An Official Publication
of the Informing Science Institute
InformingScience.org

Inform.nu

Volume 23, 2020

EFFECTIVE SELECTION OF QUALITY LITERATURE DURING A SYSTEMATIC LITERATURE REVIEW

Holger Schumann*	German Aerospace Center (DLR), Braunschweig, Germany	holger.schumann@dlr.de
Axel Berres	German Aerospace Center (DLR), Braunschweig, Germany	axel.berres@dlr.de
Tilman Stehr	German Aerospace Center (DLR), Braunschweig, Germany	tilman.stehr@dlr.de
Dominik Engelhardt	German Aerospace Center (DLR), Braunschweig, Germany	dominik.engelhardt@dlr.de

* Corresponding author

ABSTRACT

Aim/Purpose	Although a literature review is the fundamental base for any research, it is often considered tedious and conducted with a lack of methodology and rigor. The paper presents a method for systematically searching and screening literature using modern search technologies. The method focuses on minimizing the amount of manual screening by employing the references among papers.
Background	A method to select quality literature effectively using modern search technologies is presented and evaluated.
Methodology	The method starts with a keywords search in which the most suitable keywords are identified. In the backward search, promising resources are collected based on the keywords and their reference sections are searched for duplicates to find often cited basic literature. Then, the forward search identifies current literature that cites the basic sources.
Contribution	Modern search technologies have the potential to improve the effectiveness of the use of information channels significantly and thus of traditional literature searches.
Findings	The selection method was applied to the field of literature review itself and to the field of functional modelling. In both cases, relevant literature was identified within a surprisingly short time.

Accepting Editor Kay Fielden | Received: March 3, 2020 | Revised: April 1, April 24, April 29, 2020 | Accepted: April 30, 2020.
Cite as: Schumann, H., Berres, A., Stehr, T., & Engelhardt, D. (2020). Effective selection of quality literature during a systematic literature review. *Informing Science: The International Journal of an Emerging Transdiscipline, 23,* 77-87. https://doi.org/10.28945/4551

Recommendations for Researchers	Literature reviews should be done systematically by using modern search technologies.
Future Research	The presented method may be adapted according to the evolution of search technologies. The tool support for the automated extraction of references should be improved and a quantitative evaluation of the method in comparison to traditional reviews may foster the findings.
Keywords	literature review, systematic literature review, review guide, research review, education research, information systems literature

INTRODUCTION

Researchers today are routinely faced with the problem of becoming acquainted with a research field that is unknown to them. Especially, this is common in a transdisciplinary context where scientists need to learn about results from related fields to apply them to their own research and foster collaboration between disciplines.

In order to obtain sound knowledge in an unknown research area, it is necessary for a researcher to know the established research results. Boote and Beile (2005) state, "A thorough, sophisticated literature review is the foundation and inspiration for substantial, useful research" (p. 1), and Webster and Watson (2002) extend "a crucial endeavor for any academic research" (p. 1). To know the current body of knowledge in a given research field is a necessary condition for any undertaking in research (Iivari et al., 2004). Regardless, many researchers underestimate the value of a sound literature review as shown by Boote and Beile (2005). They analyzed literature reviews of 12 dissertations and found reviews of surprisingly low quality.

Searching and screening literature can be considered as one stage of a whole systematic review. For novice researchers it is difficult to decide if a resource is significant, relevant, or of high quality. An example is given by Hjorland (1988) in which he also analyses a dissertation literature review. The challenge is not to collect everything that has ever been written. Rather, overuse of research resources can be as problematic as underuse because a resource published by a famous person may influence many people even though the resource is based on limited or inconclusive findings (Rousseau et al., 2008). Moreover, Levy and Ellis (2006) emphasize the quality of the output of the review is related to its inputs. According to Boote and Beile (2005), it "requires advanced bibliographic methods for searching and locating research" (p. 12). Otherwise, the searching and screening stage can be exhausting and tedious.

To enable a structured approach while researching for an effective way of finding quality literature, the informing system from the philosophy of Informing Science (Cohen, 2009) was taken as a base. On instance level of an informing system, an author can be seen as an informer, whose paper is one form of information channel and the reader is the client. Even if the direction of information flow is determined in this system, the side that triggers the information flow is not. In the case of literature review, for example, the client can be seen as the one who triggers the information flow by reading the paper. The next abstraction level of this informing system, the instance-creation level, may be a knowledge domain that uses diverse media to channel information to upcoming authors. Again, these upcoming authors may trigger the information flow by searching and screening databases of literature. The question of the work at hand is how to do this in an efficient way. To complete the sketched view on the informing system, the design level may be comprised of a professor whose state doctorate is used as a channel to found or compose a new knowledge domain (in analogy to abstraction level examples from Gill, 2016).

While Webster and Watson (2002) suggested that "the major contributions are likely to be in the leading journals" (p. XVI), this paper examines in which way common Internet search engines can be

used to find relevant literature. Shaw (1995) found that computer-based retrieval tools can improve the efficiency of searching relevant literature dramatically. According to Levy and Ellis (2006), "it is important for the novice researchers to spend time expanding their literature seeking skills beyond a given database vendor" (p. 189). Given that, usually, search engines return a great number of papers, researchers often have to spend a large amount of time screening and evaluating candidates. To help with this problem, an elaborated method for the effective selection of quality literature is proposed in this paper. The method focuses on minimizing the amount of manual screening by employing the references among papers. To demonstrate and evaluate the proposed method, several internal literature selection studies were conducted.

CURRENT STATE / SYSTEMATIC LITERATURE REVIEW

Using search engines, the effectivity of the selection stage can be enhanced further. For example, both Google Scholar and the ISI Citation Index now provide a forward search, while such a tool support could not have been considered by Levy and Ellis (2006). For this reason, there is the impression that the selection method should be elaborated taking into account modern Internet technologies. Note that most literature resources are available on the Internet (Fink, 2005). Nowadays this also includes books, as already noted by Okoli and Schabram (2010). Petticrew and Roberts (2006) concluded that, with today's possibilities, the check can be done without a professional librarian if it is done systematically. But, it is important to understand the correct use of Boolean operators when searching in databases (Fink, 2005).

Additionally, it is the impression that an elaborated and detailed method will help to apply search operators correctly and to make the selection phase reproducible, which is a complement to the guide proposed by Okoli and Schabram (2010).

The literature selection method described is built on some basic assumptions, which must be met to perform the literature selection. In the following sections, these assumptions will be elaborated and explain using the introduced informing system.

An assumption is made, that the client (upcoming author or reviewer) is able to assess the relevance and quality of the information channel (paper). However, this process is slow and exhausting. Therefore the goal is to minimize the amount of papers for which this quality assessment needs to be performed.

To find literature it is assumed that there exists a set of keywords that describe a sufficiently large slice of the information channels in question. Note that while these keywords exist, they may not yet be known to the person performing the literature search.

The final two assumptions relate to references between papers. Firstly, it is assumed that papers that are referenced by many papers in the field are more likely to be relevant to that field. This is based on the fact that authors will in general be more likely to cite relevant literature. The authors refer to these often-cited relevant literature as *basic papers* or *basic literature*.

Secondly, it is assumed that literature referencing many of the basic papers is likely of a higher quality. Knowing a large amount of the basic research indicates that a thorough literature review was performed, which is a good basis for high quality research.

ELABORATED METHOD FOR EFFECTIVE LITERATURE SELECTION

The method for an effective and systematic literature selection is broken down to a keywords search, a backward search, and a forward search phase according to Levy and Ellis (2006). In the keywords search phase, suitable search phrases are identified systematically. During the backward search phase, basic literature often referenced by the community is discovered. In the forward search phase, rele-

vant literature referencing the basic papers is identified. In the following, an overview of the method is given and in the next subsections, every phase is explained in detail.

A) Keywords search
   1. Defining initial keywords
   2. Searching, refining, and ranking keywords

B) Backward search and screening
   3. Searching and collecting references of promising papers
   4. Drawing a literature map and ranking the central resources and often-quoted authors
   5. Screening the basic literature

C) Forward search and screening
   6. Searching for literature, citing the *basic papers*
   7. Screening the citing literature

KEYWORDS SEARCH

The keyword search phase is used to identify keywords that turn up relevant paper for the subject of the literature review. Note that the phrase is not intended to turn up papers, during this phase the reviewer solely focuses on the keywords. The initial keywords should be defined in the protocol and have to be elaborated in this phase. Note that the term *keyword* may imply more than one single word and that a keyword may consist of several words strung together. For this reason, the name *search phrase* would be a better alternative, but for reasons of compatibility with popular linguistic use, *keyword* will be still used.

In the first step, variations of the keywords are built in the way that plural forms or synonyms are added. Xiao and Watson (2019) provide a further detailed description of how to deal with keywords used for a search. In addition, it should be stated explicitly, that keywords should be refined by iterating the keywords search phase until no new keywords are found. A keyword should be comprised of at least 3 words and at least two of them should be linked by the Boolean operator *AND* to avoid a too unspecific search. Examples for useful keywords in the field of literature reviews may be:

- research "literature reviews"
- "conducting a literature review"
- "conducting literature reviews"
- "performing a literature review".

Note that the quotation marks are used in search engines typically to express a required exact match with the search results, which is more limiting than using an *AND* operator. The results can be filtered further by specifying the accepted file type. In many search engines, for example, the operator ***filetype:pdf*** or ***ext:pdf*** can be added to the keyword to find documents in PDF format only.

After having elaborated the initial keywords, the second step begins with a first search. As stated above, it is recommended that common Internet search engines are used to reduce the search effort and to increase the efficiency. For reasons of reproducibility, every used keyword and its success in terms of hit counts should be documented in a keyword table together with the date of search. Figure 1 shows an excerpt of a keyword table for a literature review on the topic of literature review itself. Counting hits is the easiest and most efficient measure for assessing the quantitative value of a keyword. To add a qualitative component to the assessment by adding a flag to the keyword to indicate if the keyword has turned up promising titles or not is recommended. For efficiency reasons, only the top search results should be considered. Because the only purpose of this phase is to refine the keywords, the resulting resources themselves are not relevant yet. In fact, only the resource titles and keyword sections of papers should be screened for new keywords. If new keywords are found, the keywords table is extended for a further search iteration immediately. In analogy to Leedy and

Ormrod (2005), who stated that the search is near completion when one discovers that new articles only introduce familiar arguments, the keywords search should be seen as finished when no new relevant keywords are found.

Finally, the keywords should be ranked and selected for use in the next step. To achieve this, building some groups of familiar keywords is recommended. Also, all keywords should be assigned to a corresponding group and the keywords in every group according should be ranked to their highest number of hits. After this, at least one keyword with the highest hit count should be selected from every group to be used in the backward search phase. In the study shown in Figure 1, three keywords that showed promising titles and achieved a high number of search results, were selected. The authors made good experiences with selecting 12 or fewer keywords, which limits the effort for the next phase. Performing the keyword search with two reviewers in parallel, as recommended by Xiao and Watson (2019), may increase the quality of this phase even more.

Keyword Group	Keyword / Search term	Hits (Google) / in Thousands	Promising Titles	Selected Keywords
state of the art	"conducting a state of the art" pdf	271	no	
	"conducting a state of art" pdf	0	no	
	"conducting state of the arts" pdf	0	no	
	"conducting state of arts" pdf	0	no	
	"performing a state of the art" pdf	427	no	
	"performing a state of art" pdf	0	no	
	"performing state of the arts" pdf	0	no	
	"performing state of arts" pdf	0	no	
literature review	"conducting a literature review" pdf	141	yes	1
	"conducting literature reviews" pdf	9	yes	0
	"conducting research literature reviews" pdf	18	yes	0
	"performing a literature review" pdf	88	yes	0
	"performing literature reviews" pdf	21	no	
	"preparing a literature review" pdf	55	yes	1
	"preparing literature reviews" pdf	4	yes	0
	"undertaking a literature review" pdf	47	yes	1

Figure 1: Excerpt of an exemplary keyword table

Backward Search

In this phase, basic literature that is often referenced by the community is identified by analyzing the reference sections of promising resources as described by Levy and Ellis (2006). In this work, this is done by using the selected keywords to search again for any resources using common Internet search engines. Consider the top of the results list and screen the resources by looking at the title and briefly into content to decide if the resource fits the topic. If the resource is a paper, screen the title as well as the abstract and download it. For every promising resource, copy its reference section into a spreadsheet tool like Excel. For every row, put the main author's name in one column to keep the reference's source and put the reference itself in a second column. An excerpt of a references table is shown in Figure 2, continuing the example from Figure 1. If no references are given or if they cannot be copied the resource should be skipped to save time - there will be other resources providing the relevant references.

Because of different referencing styles, extracting the references can take much effort. However, in contrary to screening of papers, the extraction of references can be automated. An example of a tool supporting this is the References Extractor provided by the INSPIRE (n.d.) information system which may support extracting the references. Note that the author's surname should be mentioned in the first place without any forename initials to support alphabetical sorting. After having copied the references, the spreadsheet tool can be used to sort the references column by the name of the referenced author. Finally, the referenced authors which are referenced by three or more different re-

search groups are highlighted. In Figure 2, the paper by Bem, 1995 is highlighted as it is referenced by three authors, while Boote and Beile, 2005 is used by four authors. These two papers are candidates for basic papers in the area of literature reviews. From experience, it has been found that for a resource that is referenced four times, about 500 references have to be considered. If this resource is referenced by independent authors, this is a remarkable indication of a basic resource. The number of references given above can easily be extracted from about 15 resources. According to our exemplary studies, the numbers seem to be scalable.

Cronin	Beecroft C, Rees A, Booth A (2006) Finding the evidence. In: Gerrish K, Lacey A, eds. The Research Process in Nursing. 5th edn. Blac
Bandara	Beel, J. and Gipp, B. (2009). Google Scholar's Ranking Algorithm: An Introductory Overview. In Proceedings of the 12th Internationa
Durlak	Bem, D. J. (1995) Writing a review article for Psychological Bulletin. Psychological Bulletin 118: pp. 172-177 » CrossRef
Okoli	Bem, D. J. (1995). Writing a review article for Psychological Bulletin. Psychological Bulletin, 118, 172-172.
Schryen	Bem, D.J. (1995) Writing a Review for Psychological Bulletin. Psychological Bulletin 118: pp. 172-177 CrossRef
Schryen	Berghout, E., Renkema, T. (1997) Evaluating information systems investment proposals: a comparative review of current methodol
Kitchenham	Berlin, J.A., Miles, C.G., Crigliano, M.D. Does blinding of readers affect the results of meta-analysis? Online J. Curr. Clin. Trials, 1997
Guest	Bernard, H. R., & Ryan, G. (2010). Qualitative data analysis: Systematic approaches. Thousand Oaks, CA: Sage.
Okoli	Berthon, P., Pitt, L., Ewing, M., & Carr, C. L. (2002). Potential research space in MIS: a framework for envisioning and evaluating rese
Cronin	Beyea S, Nicholl L (1998) Writing an integrative review. AORN Journal 67(4): 877–80
Schryen	Bharadwaj, A.S. (2000) A resource-based perspective on information technology capability and firm performance: An empirical inv
Guest	Bickman, L., & Rog, D. (2009). Applied research design: A practical approach. In L. Bickman & D. Rog (Eds.), Handbook of applied soci
Rutter	Boaz, A. and R. Pawson (2005). "The perilous road from evidence to policy: five journeys compared." Journal of Social Policy 34(2):
Okoli	Boote, D. N., & Beile, P. (2005). Scholars Before Researchers: On the Centrality of the Dissertation Literature Review in Research Pr
Onwuegbuzi	Boote, D. N., & Beile, P. (2005). Scholars before researchers: On the centrality of the dissertation literature review in research prep
Durlak	Boote, D. N., Beile, P. (2005) Scholars before researchers: On the centrality of the dissertation literature re-view in research prepar
Minnesota	Boote, David N., and Penny Beile. August/September 2005. "Scholars Before Researchers: On the Centrality of the Dissertation Lite
Okoli	Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). Introduction to Meta-Analysis (1st ed.). Wiley.

Figure 2: Excerpt of the references table, the columns represent the referencing author and the reference

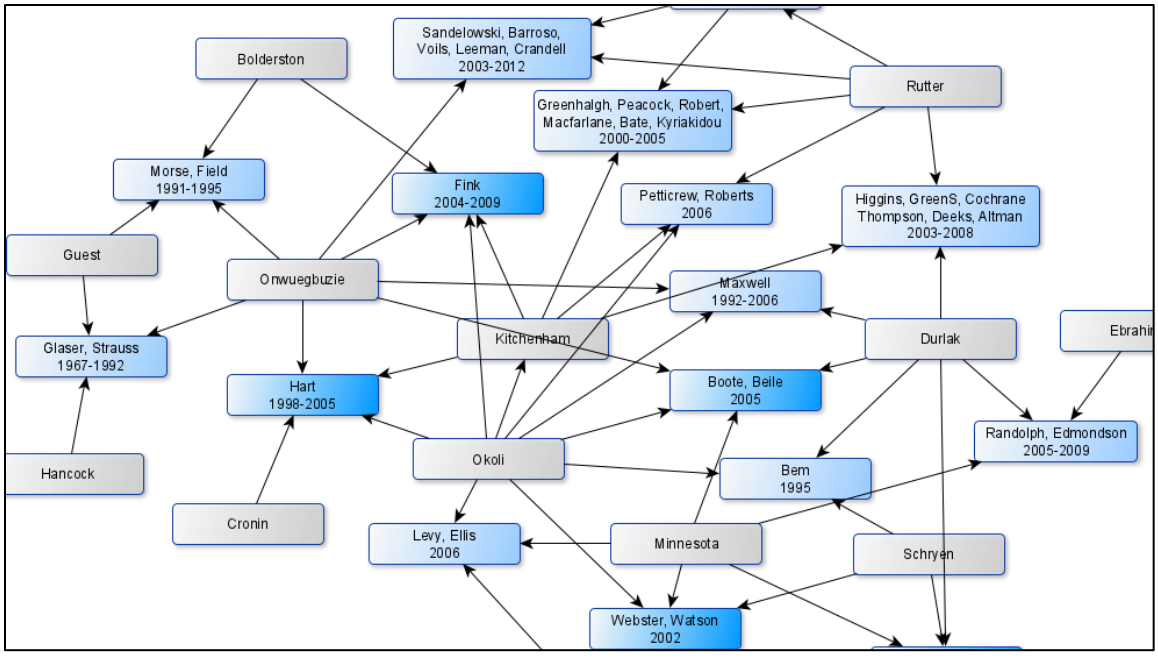

Figure 3: Excerpt of an exemplary literature map

After building the reference table, the next step's aim is to get a visual overview of the basic references and the authors who may have broad knowledge in the field. To achieve that, a literature map in form of a graph diagram is drawn as shown in Figure 3. For every referencing author and every

multiple cited publication, a node should be created whereas the edges are used to represent the references. Graph drawing tools like yEd (yWorks, n.d.) may be used to create the graph from the references table in automated fashion and optimizing its layout. Finally, the central basic resources can be highlighted as it can be seen in the exemplary literature map in Figure 3. Dark blue boxes represent literature that was referenced four times by independent authors. Light blue literature was referenced three times and the grey boxes represent the citing authors. To find a suitable base to start detailed screening, the year of publication is added to the literature nodes.

Note that to provide a clear overview, some authors can be merged into one author group. A good argument for merging authors is when one is co-authoring the other in the same research field. Also, a paper just refining an older one can be seen as one combined resource.

Based on the shown literature map and according to the desired knowledge penetration depth, the researcher can now decide with which author and year may be the best to start. If title, abstract, and figures of the chosen literature look promising, start reading it to get a basic common understanding in the field. This concludes step 5, but keep in mind that there is still another phase through which to go.

Note that reading of papers is limited to papers already identified as *basic papers*. This minimizes the time spent screening papers that need to be discarded because they are not relevant.

Forward Search

The goal of this last phase of literature selection is to find current or up-to-date literature that references the basic literature chosen in the backward search. The method is also based on the work of Levy and Ellis (2006). In the 6th step, a common Internet search engine is used to find who is citing the basic literature. Both Google Scholar and the ISI Citation Index, for example, provide this functionality by offering a "cited by" link below every search result entry. Both technologies are also mentioned and used by Xiao and Watson (2019).

If Boote and Beile (2005) was chosen as basic literature (see Figure 3), the use of the "cited by" function discloses Levy and Ellis (2006) and Randolph (2009) as citing resources that can also be found in our literature map. The cited-by list of Levy and Ellis, in turn, points to Okoli and Schabram (2010), introduced above and known again from our exemplary literature map. As it can also be seen in Figure 3, Okoli references many of the papers marked as "basic." This may indicate that he has a broad overview in the field, which is confirmed by his stand-alone literature-review paper, as mentioned above. If the cited-by list is filtered for publication dates younger than the last 4 years, the paper of Xiao and Watson (2019) is disclosed, that also is mentioned above. In this way, the combination of backward and forward search can provide the researcher with chains of quality literature building up on each other from the past until today.

In the 7th and last step, the selected literature citing the basic resources is screened in analogy to step 5 of the backward search phase.

Application Studies

Review of "Literature Review"

The example given in this paper can be seen as a first study in the field of systematic literature reviews. For the main author, who is new in that field, it took only one working day to identify the mentioned literature (following keywords, backward and forward search). 12 keywords have been identified which led to 14 promising resources providing approximately 500 references. The references disclosed the following 4 basic resources that were referenced four times by independent authors:

- Boote and Beile (2005)
- Hart (2005)
- Fink (2005)
- Webster and Watson (2002).

Of those, Hart (2005) and Fink (2005) are books with many unspecific citations. Hence, they have not been considered in the forward search.

Using Boote and Beile (2005) and Webster and Watson (2002), the forward search finally disclosed the paper from Levy and Ellis (2006) and based on that, the review paper by Okoli and Schabram (2010) and the work of Xiao and Watson (2019). The authors are under the impression that the found literature is of high quality and that the presented method worked well for this example. However, a reader being familiar with literature reviews might evaluate the effectiveness and quality of the presented method for this example by oneself.

Review of "Functional Modelling"

Another study was conducted in the field of functional modelling. 11 keywords were identified, which led to 28 promising resources providing approximately 1000 references. Selecting the resources without reviewing them in detail took less than 2 working days. The references disclosed the three following basic resources in different editions which were referenced by independent authors 7-times at least:

- Ullman (1997, 2002)
- Pahl et al. (1984, 1996, 2007)
- Stone and Wood (2000), Hirtz et al. (2002).

An excerpt of the resulting literature map is depicted in Figure 4. Here resources that have been cited seven or more times are highlighted in dark blue, resources referenced at least three times are colored light blue. The dashed lines indicate that authors from these papers have coauthored with authors from other connected papers. This indicates that those authors might be affiliated with each other so any citations between them have to be considered with caution.

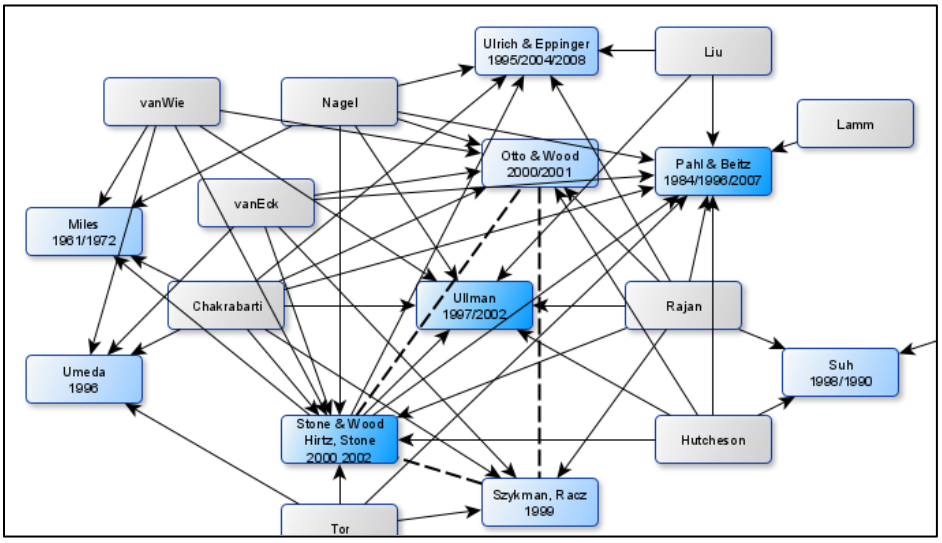

Figure 4: Excerpt of literature map for "Functional Modelling"

The forward search was conducted based on the paper of Hirtz et al. (2002). The paper was searched using Google Scholar and the list of its citations was filtered for being four years maximum old and sorted by date as well as by relevance. This disclosed papers that have many citations themselves and

promising titles. After reading and reviewing the three top ranked papers, all of them were considered as very relevant in the field of functional modelling. Additionally, two of those papers provide a valuable literature review in this field. In summary, the basic literature found during backward search and the current literature found during forward search are fundamental resources for developing the literature review in this field.

A handful of studies have been conducted using the presented method. Though detailed results will not be listed here, each study delivered promising results in surprisingly short times. The authors found that the most important step is to obtain precise keywords, so the inputs to the backwards search are neither too broad, yielding many unspecific papers without many common references, nor too narrow, excluding relevant branches in the field of research. Another observation is that the method works best in substantial research areas. Niche fields with a limited number of independent authors and citations are more difficult with which to work. Here the keywords should be of high quality and the few papers should be evaluated more carefully for their relevance.

CONCLUSION

Although a literature review is the fundamental base for any research, it is often conducted with a lack of methodology and rigor. Searching and screening literature can be a tedious part if it is neither done systematically nor with modern search technologies. As there is no method available to show how literature is searched as well as selected effectively using up-to-date search technologies and screened with minimal manual effort, it was presented in this paper. To have a structured framework for elaborating the method, the informing system was taken as a base. This method aims at efficient use of information channels and considers common Internet search engines like Google. The method was applied to the field of literature research itself to create the state-of-the-art section in this thesis, and it was further applied to the field of functional modeling, a subject more familiar to the authors of this paper.

In both studies, about 12 suitable keywords were identified in a few iterations. The keywords led to some promising resources whose reference sections led to three or four relevant basic papers, respectively. This basic literature led to further relevant up-to-date resources. The whole selection stage was conducted in both studies within a surprisingly low time of two days. The high quality of the found resources was confirmed by professionals from the corresponding field. In this way, a systematic method for an effective selection of quality literature was presented.

A comparison of the efficiency of literature reviews that use or don't use the presented method is considered as an avenue for future research. Also, the tool support for the automated extraction of references should be improved.

REFERENCES

Boote, D. N., & Beile, P. (2005). Scholars before researchers: On the centrality of the dissertation literature review in research preparation. *Educational Researcher*, *34*(6), 3-15. https://doi.org/10.3102/0013189X034006003

Cohen, E. (2009). A philosophy of Informing Science. *Informing Science: The International Journal of an Emerging Transdiscipline*, *12*, 1-15. https://doi.org/10.28945/425

Fink, A. (2005). *Conducting research literature reviews: From the Internet to paper* (2nd ed.). Sage Publications.

Gill, T. G. (2016). *Informing Science volume one: Concepts and systems.* Informing Science Press.

Hart, C. (2005). *Doing a literature review: Releasing the social science research imagination.* Sage Publications.

Hirtz, J., Stone, R., Mcadams, D., Szykman, S., & Wood, K. (2002). A functional basis for engineering design: Reconciling and evolving previous efforts. *Research in Engineering Design, 13*, 65-82. https://doi.org/10.1007/s00163-001-0008-3

Hjorland, B. (1988). Information retrieval in psychology: Implications of a case study. *Behavioral and Social Sciences Librarian*, *6*(3–4), 39–64. https://doi.org/10.1300/J103v06n03_03

Iivari, J., Hirschheim, R., & Klein, H. (2004). Towards a distinctive body of knowledge for information systems experts: Coding ISD process knowledge in two journals. *Information Systems Journal*, *14*(4), 313-342. https://doi.org/10.1111/j.1365-2575.2004.00177.x

INSPIRE. (n.d.) *References extractor*. http://old.inspirehep.net/textmining/

Leedy, P. D., & Ormrod, J. E. (2005). *Practical research: Planning and design* (8th ed.). Prentice Hall.

Levy, Y., & Ellis, T. J. (2006). A systems approach to conduct an effective literature review in support of information systems research. *Informing Science: The International Journal of an Emerging Transdiscipline, 9*, 181-212. https://doi.org/10.28945/479

Okoli, C., & Schabram, K. (2010). A guide to conducting a systematic literature review of information systems research. *Sprouts: Working Papers on Information Systems*, *10*(26). https://doi.org/10.2139/ssrn.1954824

Pahl, G., Beitz, W., Feldhusen, J., & Grote, K.-H. (1984). *Engineering design: A systematic approach*. The Design Council.

Pahl, G., Beitz, W., Feldhusen, J., & Grote, K.-H. (1996). *Engineering design: A systematic approach* (2nd ed.). Springer.

Pahl, G., Beitz, W., Feldhusen, J., & Grote, K.-H. (2007). *Engineering design: A systematic approach* (3rd ed.). Springer. https://doi.org/10.1007/978-1-84628-319-2

Petticrew, M., & Roberts, H. (2006). *Systematic reviews in the social sciences: A practical guide*. Blackwell Pub. https://doi.org/10.1002/9780470754887

Randolph, J. (2009). A guide to writing the dissertation literature review. *Practical Assessment, Research & Evaluation*, *14*(13).

Rousseau, D. M., Manning, J., & Denyer, D. (2008). Evidence in management and organizational science: Assembling the field's full weight of scientific knowledge through syntheses. *SSRN eLibrary*. https://doi.org/10.2139/ssrn.1309606

Shaw, D. (1995). Bibliographic database searching by graduate students in language and literature: Search strategies, system interfaces, and relevance judgments. *Library & Information Science Research*, *17*(4), 327-345. https://doi.org/10.1016/0740-8188(95)90030-6

Stone, R., & Wood, K. (2000). Development of a functional basis for design. *Journal of Mechanical Design*, *122*(4), 359-370. https://doi.org/10.1115/1.1289637

Ullman, D. G. (1997). *The mechanical design process* (2nd ed.). McGraw-Hill Higher Education.

Ullman, D. G. (2002). *The mechanical design process* (3rd ed.). McGraw-Hill Higher Education.

Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, *26*(2), 13-23

Xiao, Y., & Watson, M. (2019). Guidance on conducting a systematic literature review. *Planning Education and Research, 39*(1), 93-112. https://doi.org/10.1177/0739456X17723971

yWorks. (n.d.) *yEd graph editor: High-quality diagrams made easy*. https://www.yworks.com/products/yed

BIOGRAPHIES

Holger Schumann achieved his degree in computer science in 2002. Since then, he has been working at the German Aerospace Center (DLR) in Braunschweig, Germany. His research group focuses on all fields of engineering management like software and systems engineering as well as project management. Accordingly, he obtained a Project Management Professional (PMP) certificate and led several research projects. Currently he leads DLR's High Altitude Platform (HAP) project, in which an unmanned solar airplane is built to perform long-endurance observation missions in the stratosphere.

In 2000 **Axel Berres** earned a Diplom as Ingenieur für Technische Informatik at TU-Berlin. Between 2001 and 2010 he worked as a Scientist in German Aerospace Center (DLR) in the traffic research and software and simulation department. After three year as a product manager and systems engineer he returned into research. Since 2013, he is working in the Systems Engineering and Safety-Critical Systems Department of DLR. He participates and leads various national and international projects in the development of innovative aircraft systems. In addition, he evaluates system safety and is doing research in this field. Due to the different projects, there is always the need to become acquainted with different research topics.

Tilman Stehr achieved his BA in computer science in 2015 in a cooperative study program between the German Aerospace Center (DLR) and the Baden-Württemberg Cooperative State University. He has continued working at DLR in the Department for Safety Critical Systems & Systems Engineering. There he is focusing on researching and implementing methods for functional and system modelling for feasibility studies in the aerospace field. These modelling methods have been applied in multiple DLR projects, where he has also provided an integrated simulation framework for use in feasibility studies. Additionally he has carried on his studies at the Technical University of Braunschweig, specializing in software security.

Dominik Engelhardt is a programmer and researcher at the German Aerospace Center in Braunschweig, Germany. He received his degree in computer science at the Cooperative State University Mannheim in 2017. As computer science is an interdisciplinary field he has naturally been involved in a range of different topics, including advancing tactics of a robot-soccer AI on the path to defeating human players in the RoboCup, developing tools and methods to make the early phases of systems engineering more efficient or contributing to the simulation system of an unmanned solar powered stratosphere airplane. His latest effort is to improve inter-tool communication in the product-line engineering landscape by developing a universal variability language.