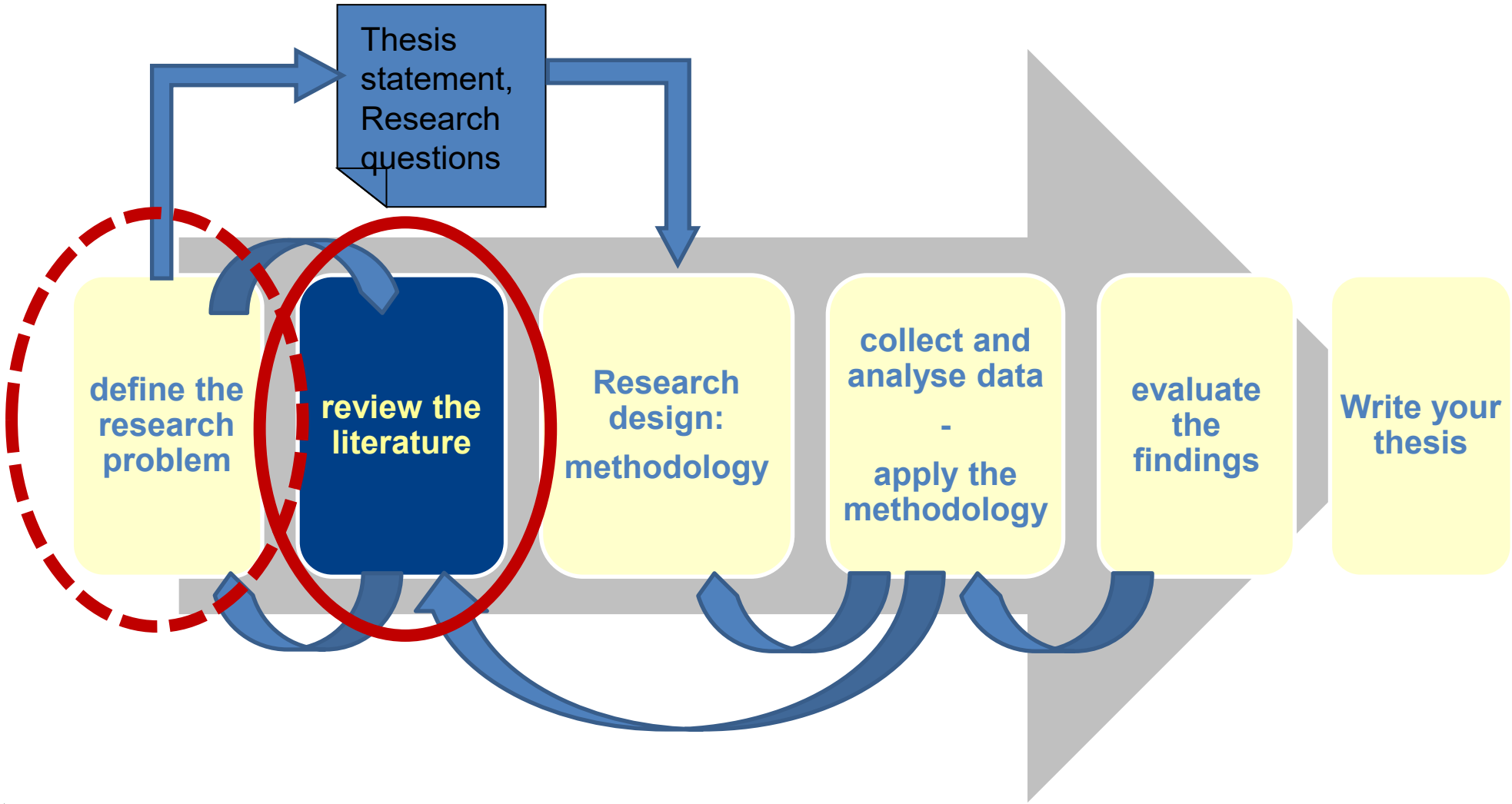
3 Literature Review

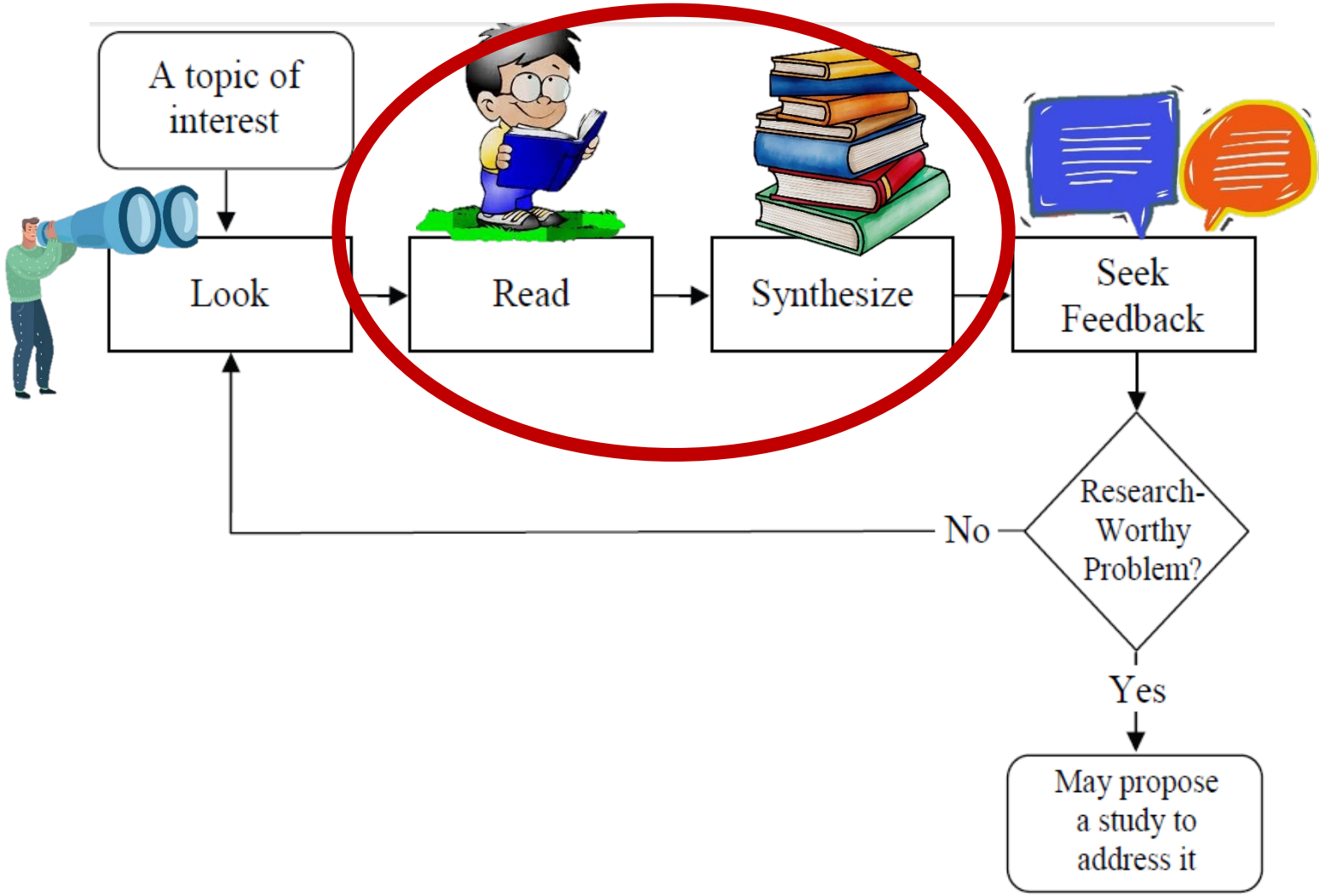
Knut Hinkelmann

Research Process

The research process is meant as a guidance for you



Process of Finding a Research-Worthy Problem



(Ellis & Levy 2008)

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The Body of Knowledge (BOK)

- Researchers in a field build up a community
  - **publications** build up their body of knowledge: journals, conference proceedings
  - **communication** also takes place in other ways, e.g. at conferences and workshops, in discussion groups etc.
- Knowing the current status of the Body of Knowledge (BoK) in the given research field is an essential first step for any research project.

Reasons for becoming familiar with the BoK

- learn how others handled a research project similar to yours
- discover new ideas and approaches
- find solutions to particular problems of your research project
- find significant researchers and establish valuable social contacts

Purpose of a Literature Review

1. Helping the researcher understand the existing body of knowledge
   - ♦ what is already known?
   - ♦ what is needed to be known?
2. Providing a solid theoretical foundation for the proposed study
   (related to “what is already known?”)
3. Substantiating the presence of the research problem
   (related to “what is needed to be known?”)
4. Justifying that the proposed study contributes something new to the Body of Knowledge
5. Framing the valid research methodologies, approach, goals, and research questions for the proposed study

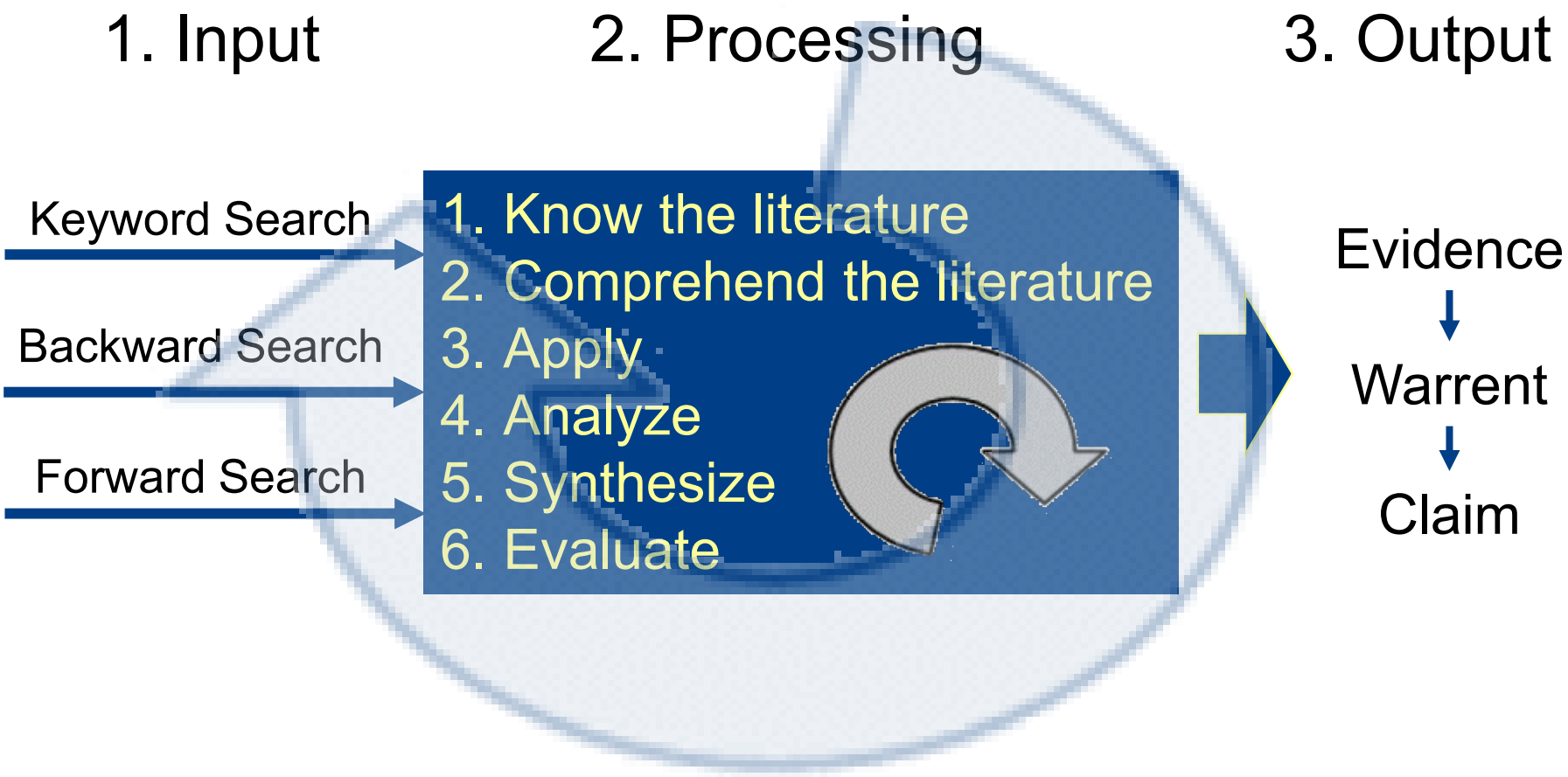
(Levy & Ellis 2006)

Literature Review

- The literature review contains secondary literature – work previously published by other scholars.
- A good literature review is *comprehensive*, *critical* and *contextualized*
- A good literature review shows:
  - That you are aware of what is going on in the field
  - That there is a theory base for the work you are proposing to do
  - How your work fits in with what has already been done
  - That your work has significance
  - That your work will lead to new knowledge.

Thanks to Prof. Alta van der Merwe

Three Stages of Effective Literature Review Process



(Levy & Ellis 2006)

1. Input: Finding Literature

Literature Sources (1) - Online Resources (a)

- Publisher-neutral citation indexes – quality checked
  - Scopus (https://scopus.com)
    - Largest citation database, free access provided by FHNW
  - Science Direct (https://www.sciencedirect.com/)
  - DBLP (https://dblp.uni-trier.de/)
    - Specialised to Computer Science
  - Web of Science (clarivate.com/webofsciencegroup/solutions/web-of-science/)
- Search Engines – not quality-checked, easy to
  - Google Scholar (https://scholar.google.com)
    - Easy to use, large, many download links
- Social Software - Sharing of publications
  - ResearchGate
  - Academia.edu

Literature Sources (2) – Publisher sites

- ACM and IEEE are associations, which organize conferences and publish journals
  - ACM Digital Library (https://dl.acm.org)
  - IEEE Xplore (https://ieeexplore.ieee.org/)
- Websites of commercial publishers, e.g.
  - Springerlink (https://link.springer.com/)
- These publishers provide online access only to their publications
- The contents of these sources are mostly included in citation databases like Scopus, DBLP, Web of Science or accessible via Google

Quality of Literature

- General criteria for the quality of a publication:
  - **peer-reviewed!**
  - international
  - quality of journal or conference (impact factor)
  - recent
- First consider ***journals, conference proceedings***, books
  - Journals are rated higher than conference proceedings
  - But: conferences proceeding contain more recent work
- Don't trust non-refereed sources like blogs or websites
  - you don't know the quality
  - they might be biased (companies, sponsorship, …)
  - (Problem: descriptions and discussions of new technology often appears in non-refereed work or in questionable sources)
- Use wikipedia only for introduction or background ideas - don't reference

Top Journals and Conferences

Top Conferences Information Systems

Hindex	Publisher	Conference Details
86	ACM	SIGKDD : ACM SIGKDD International Conference on Knowledge discovery and data mining Aug 22, 2020 - Jan 1, 1970 - San Diego , United States https://www.kdd.org/kdd2020/
74	ACM	VLDB : International Conference on Very Large Databases Aug 31, 2020 - Sep 4, 2020 - Tokyo , Japan https://vldb2020.org/
67	ACM	SIGMOD : ACM SIGMOD International Conference on Management of Data Jun 14, 2020 - Jun 19, 2020 - Portland , United States https://sigmod2020.org/
63	ACM	STOC : ACM Symposium on Theory of Computing Jun 22, 2020 - Jan 1, 1970 - Chicago , United States http://acm-stoc.org/stoc2020/
55	ACM	SIGIR : ACM SIGIR Conference on Research and development in information retrieval Jul 26, 2020 - Jul 30, 2020 - XI'AN , China https://sigir.org/sigir2020/
53	IEEE	ISIT : IEEE International Symposium on Information Theory Jun 21, 2020 - Jun 26, 2020 - Los Angeles , United States https://2020.ieee-isit.org/
52	PMLR	AISTATS : International Conference on Artificial Intelligence and Statistics Jun 3, 2020 - Jun 5, 2020 - Palermo , Italy https://www.aistats.org/
51	IEEE	FOCS : IEEE Symposium on Foundations of Computer Science Nov 16, 2020 - Nov 19, 2020 - Durham , United States https://focs2020.cs.duke.edu/
48	PMLR	COLT : Conference on Learning Theory (COLT) Jul 9, 2020 - Jul 12, 2020 - Graz , Austria http://learningtheory.org/colt2020/
48	ACM	CIKM : ACM International Conference on Information and Knowledge Management Oct 19, 2020 - Oct 23, 2020 - Galway , Ireland https://cikm2020.org/call-for-papers-full-and-short-research-papers/
43	Springer	FC : International Conference on Financial Cryptography and Data Security Feb 17, 2020 - Feb 21, 2020 - Kota Kinabalu , Malaysia https://fc20.ifca.ai/
43	IEEE	SC : International Conference for High Performance Computing, Networking, Storage and Analysis Nov 15, 2020 - Nov 20, 2020 - Atlanta , United States https://sc20.supercomputing.org/submit/paper-submissions/

http://www.guide2research.com/topconf/

Top Journals in Information Systems

	Rank	Journal Name
Premier Journals	1	MIS Quarterly
	2	Information Systems Research
	3	Management Science
	4	Journal of Management Info. Systems
Top Tier Journals	5	Decision Sciences
	6	Communications of the ACM
	7	Decision Support Systems
	8	European Journal of Info. Systems
	9	ACM Transactions
	10	Journal of AIS
	11	Information Systems
	12	ACM Computing Surveys
	13	Journal of Information Systems
	14	Journal of Strategic Info. Systems
	15	Information and Management
	16	Communications of the AIS
	17	Journal of Database Management
	18	Journal of Information Management
	19	DATA BASE
	20	Journal of Computer Info. Systems
	21	Info. Resources Management Journal
	22	Journal of Management Systems
	23	Journal of the ACM
	24	Omega
	25	Journal of Info. Systems Management
	26	Journal of Information Science
	27	Human-Computer Interaction
	28	Operations Research
	29	Interfaces (INFORMS)
	30	Int'l Journal of Human-Computer Studies
	31	Journal of Information Systems Educ.
	32	Knowledge Based Systems
	33	Journal of Operations Research
	34	Journal of Data Base Administration
	35	Journal of Systems and Software
	36	Expert Systems with Applications
	37	Organizational Behavior and Human Decision
	38	Journal of Systems Management
	39	INFOR
	40	Expert Systems Review
	41	Journal of End-User Computing
	42	Behavior and Information Technology
	43	Communication Research
	44	Simulation
	45	AI Expert
	46	Journal of Software Maintenance
	47	Computers and Automation
	48	Computers in Human Behavior

http://www1.chapman.edu/~bdehning/MIS%20Journal%20Rankings.htm

Top Conferences

Software Engineering

Hindex	Publisher	Conference Details
75	ACM	ICSE : International Conference on Software Engineering May 23, 2020 - May 29, 2020 - Seoul , South Korea https://conf.researchr.org/home/icse-2020
56	ACM	ASPLOS : International Conference on Architectural Support for Prog and Operating Systems Mar 16, 2020 - Mar 20, 2020 - Lausanne , Switzerland https://asplos-conference.org/calls/
51	ACM	PLDI : ACM SIGPLAN Conference on Programming Language Design (PLDI) Jun 15, 2020 - Jun 20, 2020 - London , United Kingdom https://pldi20.sigplan.org/home
51	IEEE	FOCS : IEEE Symposium on Foundations of Computer Science Nov 16, 2020 - Nov 19, 2020 - Durham , United States https://focs2020.cs.duke.edu/
51	ACM	FSE : ACM SIGSOFT International Symposium on Foundations of Soft Nov 8, 2020 - Nov 13, 2020 - Sacramento , United States https://www.cs.ucdavis.edu/fse2020/
51	ACM	POPL : ACM SIGPLAN-SIGACT Symposium on Principles of Program (POPL) Jan 17, 2021 - Jan 22, 2021 - Copenhagen , Denmark https://popl21.sigplan.org/
49	usenix	OSDI : Symposium on Operating Systems Design and Implementatio Nov 4, 2020 - Nov 6, 2020 - BANFF , Canada https://www.usenix.org/conference/osdi20
48	ACM	DAC : Design Automation Conference (DAC) Jul 19, 2020 - Jul 23, 2020 - San Francisco , United States https://www.dac.com/
47	Springer	RSS : Robotics: Science and Systems Jul 12, 2020 - Jul 17, 2020 - Oregon State University at Corvallis , United States https://roboticsconference.org
46	ACM	UIST : ACM Symposium on User Interface Software and Technology Oct 20, 2020 - Oct 23, 2020 - Minneapolis , United States https://uist.acm.org/uist2020/
46	ACM	SODA : ACM SIAM Symposium on Discrete Algorithms Jan 10, 2021 - Jan 13, 2021 - Alexandria , United States https://www.siam.org/conferences/cm/conference/soda21
44	ACM	Mobisys : Annual International Conference on Mobile Systems, Appli Jun 15, 2020 - Jun 19, 2020 - Toronto , Canada https://www.sigmobile.org/mobisys/2020/

Computer Science

Hindex	Publisher	Conference Details
240	IEEE	CVPR : IEEE/CVF Conference on Computer Visi Jun 16, 2020 - Jun 18, 2020 - Seattle , United State http://cvpr2020.thecvf.com/
169	NeurIPS	NeurIPS : Neural Information Processing Syster Dec 6, 2020 - Dec 12, 2020 - Vancouver , Canada https://nips.cc/Conferences/2020/CallForPapers
137	Springer	ECCV : European Conference on Computer Visio Aug 23, 2020 - Aug 28, 2020 - Glasgow , United Kin https://eccv2020.eu/
135	AAAI	ICML : International Conference on Machine Le Jul 13, 2020 - Jan 1, 1970 - Vienna , Austria https://icml.cc/Conferences/2020
129	IEEE	ICCV : IEEE/CVF International Conference on C Oct 11, 2021 - Oct 17, 2021 - Montreal , Canada http://iccv2021.thecvf.com/home
106	ACL	ACL : Meeting of the Association for Computatio Jul 5, 2020 - Jul 10, 2020 - Seattle , United States https://acl2020.org/
95	AAAI	AAAI : AAAI Conference on Artificial Intelligen Feb 2, 2021 - Feb 9, 2021 - Vancouver , Canada https://aaai.org/Conferences/AAAI-21/
88	ACL	EMNLP : Conference on Empirical Methods in Na Nov 16, 2020 - Nov 20, 2020 - Online , United State https://2020.emnlp.org/
87	ACM	CHI : Computer Human Interaction (CHI) May 8, 2021 - May 13, 2021 - Yokohama , Japan https://chi2021.acm.org/
86	ACM	SIGKDD : ACM SIGKDD International Conferen Aug 22, 2020 - Jan 1, 1970 - San Diego , United Sta https://www.kdd.org/kdd2020/
82	IEEE	ICRA : IEEE International Conference on Robot May 31, 2020 - Jun 4, 2020 - Paris , France https://www.icra2020.org/
82	ACM	CCS : ACM Symposium on Computer and Commu Nov 9, 2020 - Nov 13, 2020 - Orlando , United State https://www.sigsac.org/ccs/CCS2020/

Information Systems

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63	ACM	STOC : ACM Symposium on Theory of Computing Jun 22, 2020 - Jan 1, 1970 - Chicago , United States http://acm-stoc.org/stoc2020/
55	ACM	SIGIR : ACM SIGIR Conference on Research and development in information retrieval Jul 26, 2020 - Jul 30, 2020 - Xi'AN , China https://sigir.org/sigir2020/
53	IEEE	ISIT : IEEE International Symposium on Information Theory Jun 21, 2020 - Jun 26, 2020 - Los Angeles , United States https://2020.ieee-isit.org/
52	PMLR	AISTATS : International Conference on Artificial Intelligence and Statistics Jun 3, 2020 - Jun 5, 2020 - Palermo , Italy https://www.aistats.org/
51	IEEE	FOCS : IEEE Symposium on Foundations of Computer Science Nov 16, 2020 - Nov 19, 2020 - Durham , United States https://focs2020.cs.duke.edu/
48	PMLR	COLT : Conference on Learning Theory (COLT) Jul 9, 2020 - Jul 12, 2020 - Graz , Austria http://learningtheory.org/colt2020/
48	ACM	CIKM : ACM International Conference on Information and Knowledge Management Oct 19, 2020 - Oct 23, 2020 - Galway , Ireland https://cikm2020.org/call-for-papers-full-and-short-research-papers/
43	Springer	FC : International Conference on Financial Cryptography and Data Security Feb 17, 2020 - Feb 21, 2020 - Kota Kinabalu , Malaysia https://fc20.ifca.ai/
43	IEEE	SC : International Conference for High Performance Computing, Networking, Storage and Analysis Nov 15, 2020 - Nov 20, 2020 - Atlanta , United States https://sc20.supercomputing.org/submit/paper-submissions/

http://www.guide2research.com/topconf/

Techniques for Literature Search

- Keyword Searching
- Backward Searching
- Forward Searching

Mastering all three techniques is key

Keyword Searching

- Querying of quality scholarly databases by the use of a specific word or phrase
- Use of reliable online resource
- Key issue
  - Selection of keywords

Determining Keywords

- Determining appropriate keywords is essential
- Coldstart problem: How to find keywords for an unknown domain?
  - Look in the literature ☹
  - Make initial search with topic keywords
  - Ask your supervisor
    - Key theories and concepts
    - Key authors
    - Key papers
    - Key journals and conferences
- Revise your keywords based on intermediate search results

Problems with Keywords

- Problems with keywords
  - Keywords have limited time span
    - Application Service Providing → Cloud Computing
  - Buzzwords appear and disappear
    - Ontology → Knowledge Graphs
  - Over time, terms are used with different focus/meaning
    - Machine Learning – Artificial Intelligence
- Solution: Identify underlying constructs and theories

Findling Literature – Combining Search Strategies

A common mistake by novice researchers [...] is to assume that the keyword search yields all that is available from the literature.

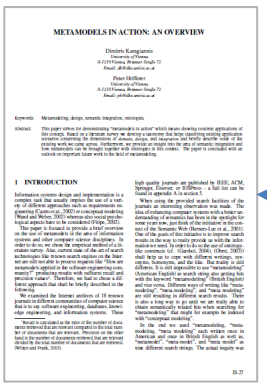
- The keyword search should be just the initial, not the main step for a literature search.

Except for Systematic Literature Review, which is a research method in its own rights

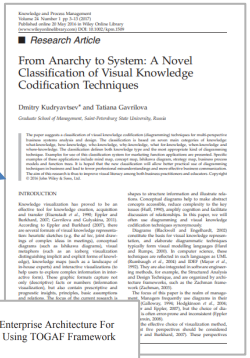
Backward and Forward Search (Snowball)

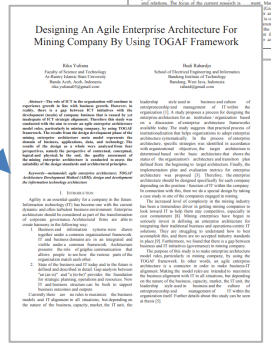
Backward and forward approaches can help to follow models, theories, theoretical constructs, and research streams.

Backward Search:
Which papers are cited?



Relevant Article





Forward Search:
Who cited that paper?

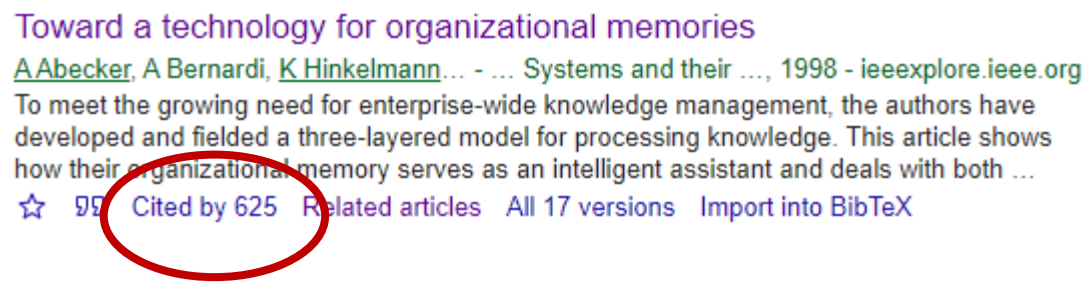
Backward Searching

- Objective: learn more about the origins of construct, theory, or models under study.
  - *Backward references search:* review the references of the articles you already found
  - *Backward authors search:* review what the authors have published prior to the article.
- Only for relevant work
- Some online resources directly link to referenced work

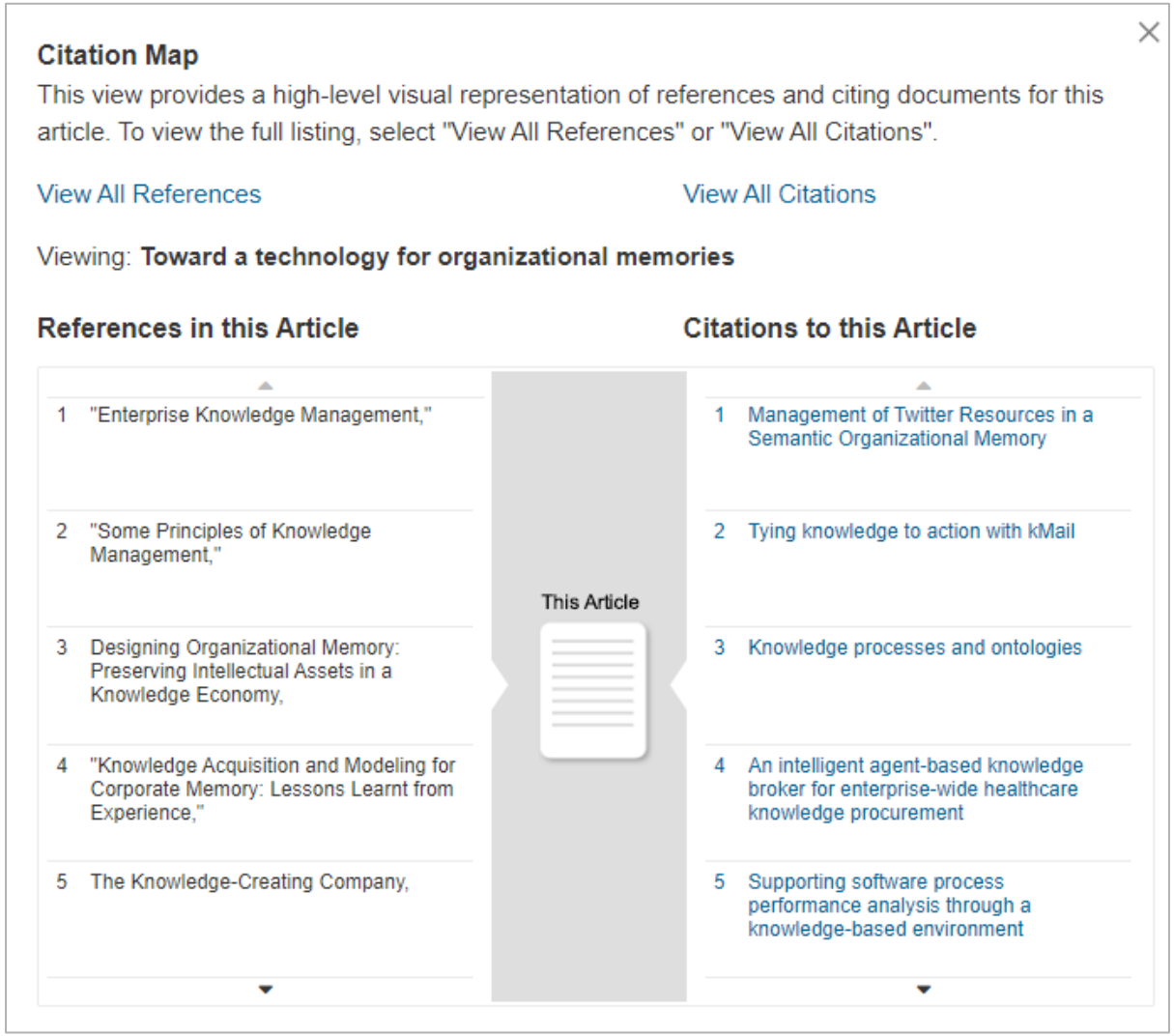
Forward Searching

- Objective: Identify evolutions of construct, theory, or models as will as applications.
  - *Forward references search:* review additional articles that have cited the article.
  - *Forward authors search:* review what the authors have published following the article.
- You can use online resources to do forward search

Example: Google Scholar

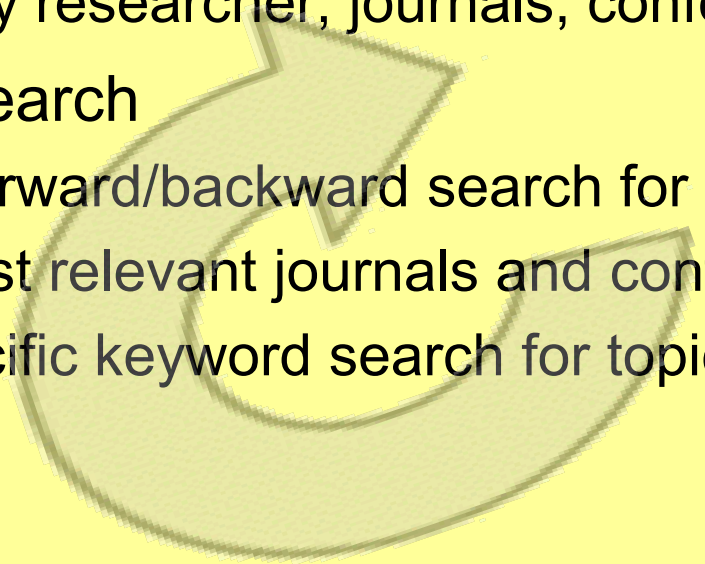


Citation Map with Forward and Backward Reference from IEEE Xplore



Finding Literature – Combining Search Strategies

- Possible strategy: Combine keyword, forward and backward search
  - Keyword search for a first list of articles
    - Identify key researcher, journals, conferences, theories
  - Refine the search
    - Perform forward/backward search for relevant articles
    - Check most relevant journals and conferences
    - Make specific keyword search for topics, authors, theories



How the get the Articles (1)

- Many articles are available online
- Example: Google Scholar often provides links for download
  - to original sources, e.g. publisher sites
  - to pre-print versions, e.g. on university or author websites
  - to sharing platforms, e.g. research gates

How the get the Articles (2)

- Check via the Library of Unicam
- If you struggle to get an article, consider to contact the author directly, e.g.
  - Researchgate
- Ask your supervisor

When Are Done With the Literature Search?

- By default, the literature search process should continuously be done during the course of the study.
- Rule of thumb: the search is near completion when
  - you discover that new articles only introduce familiar arguments, methodologies, findings, authors, and studies.
  - no new citations are discovered and
  - articles cited in newly discovered literature have already been reviewed.

Managing Literature

Use a literature management system

- Literature management – some common tools:
  - Mendeley (www.mendeley.com)
  - EndNote (www.endnote.com)
  - Zotero (www.zotero.org)
  - citavi (www.citavi.com)
  - Paperpile (paperpile.com/app)

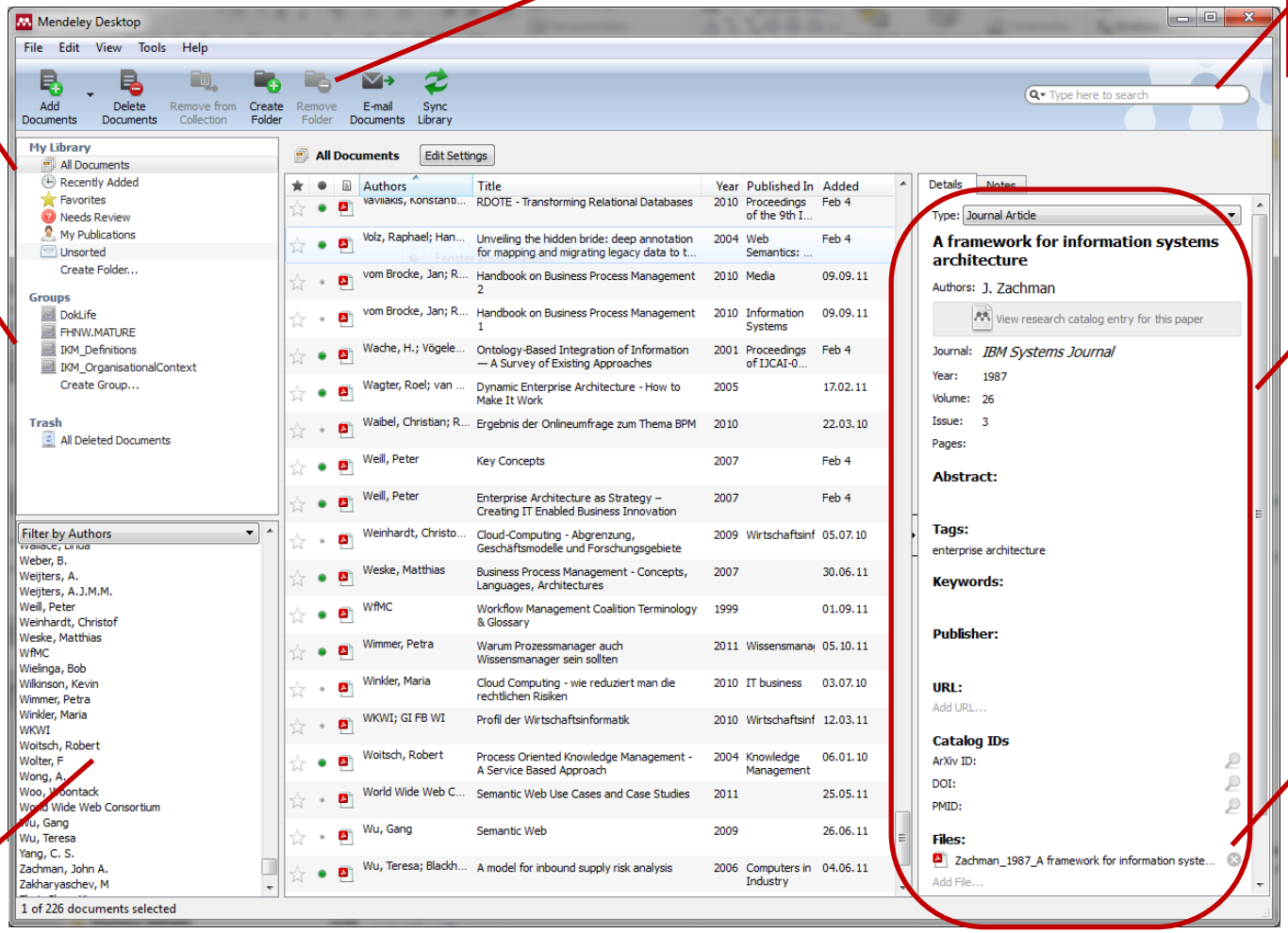
Example: Mendeley Desktop

Connectors to Word, LaTeX

Full-text search

Libraries

Sharing references



Metadata

Sharing references

Libraries

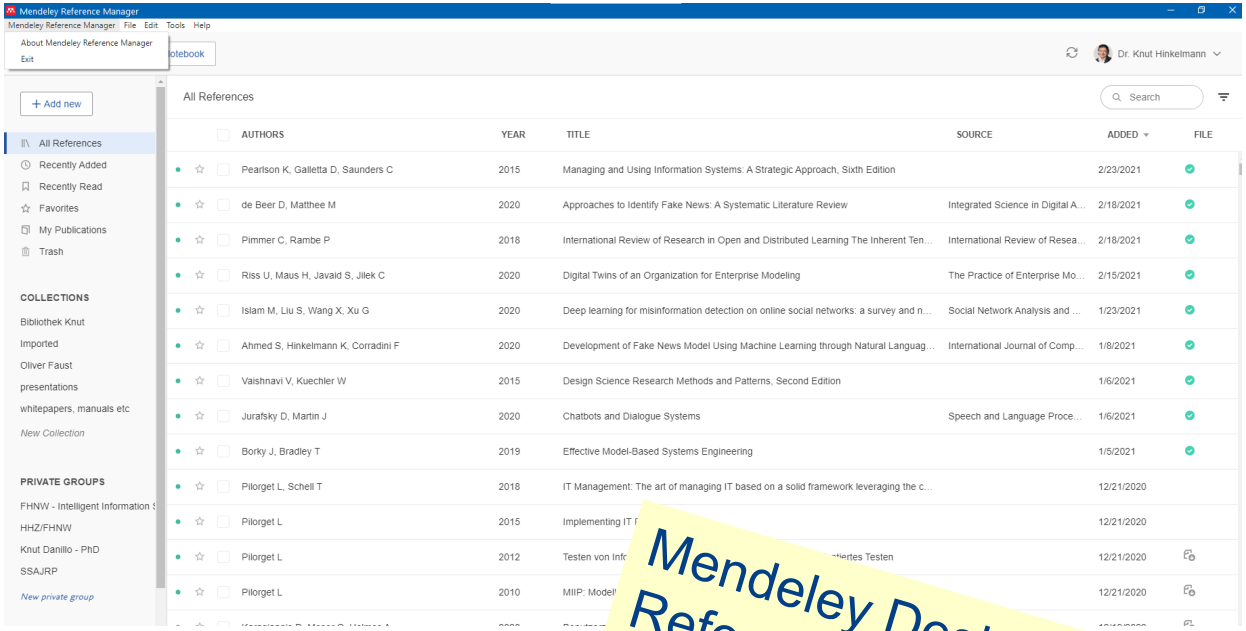
List of authors

Link to file

Mendeley can automatically extract metadata from PDF and organize your files

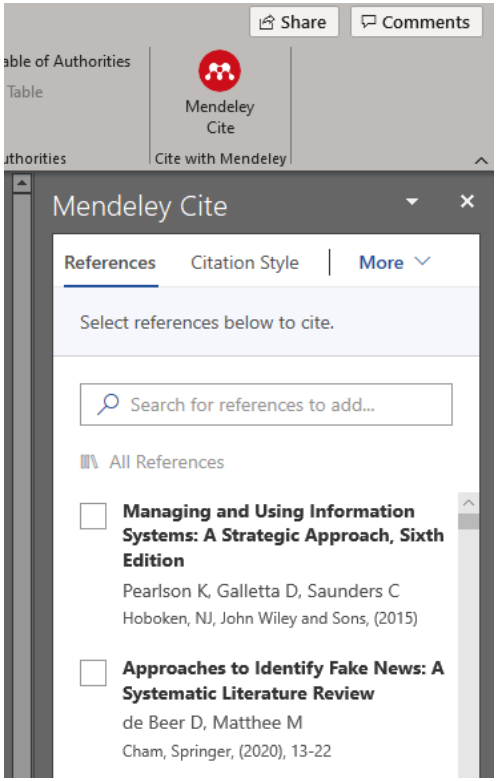
Mendeley Reference Manager

Manage your library online



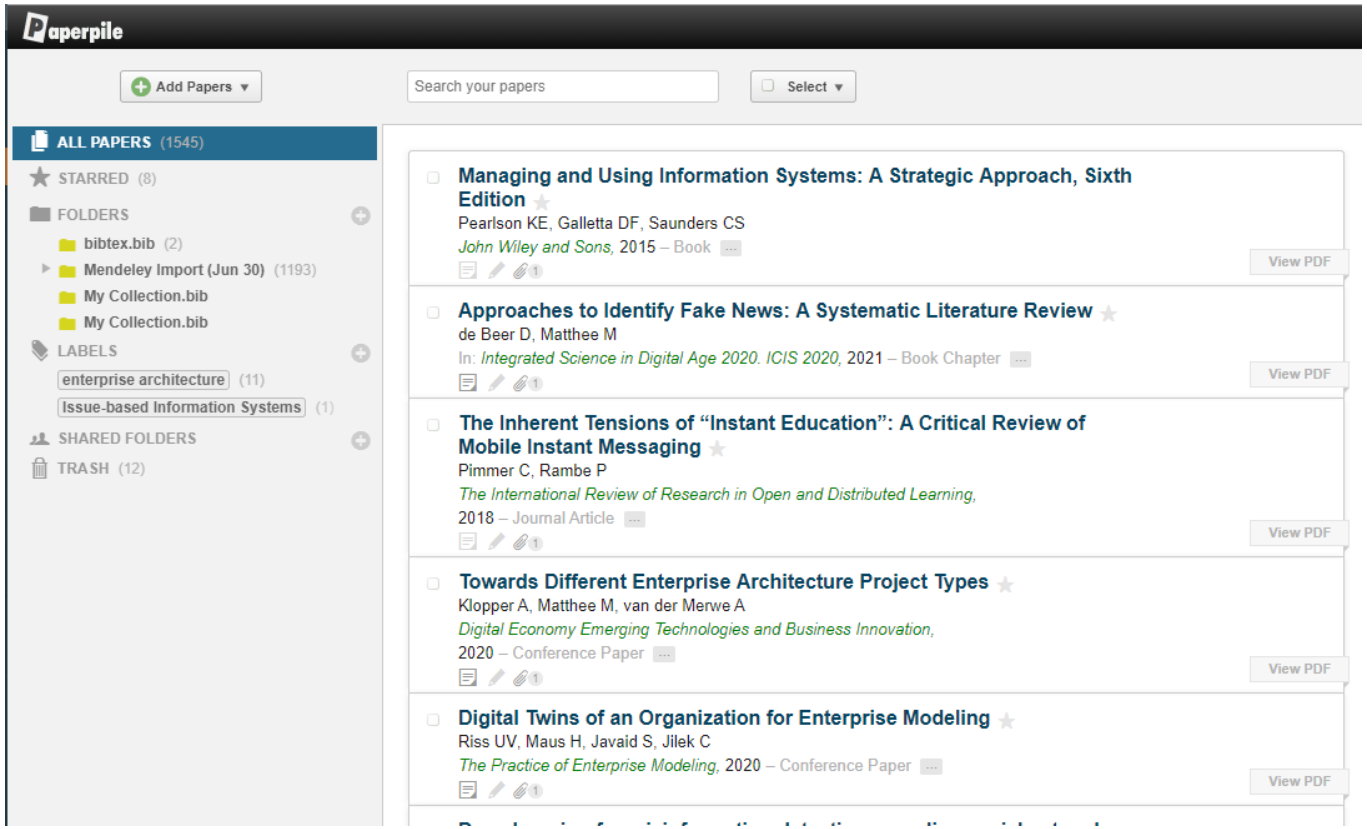
Mendeley Desktop and Reference Manager are synchronized

Manage cite

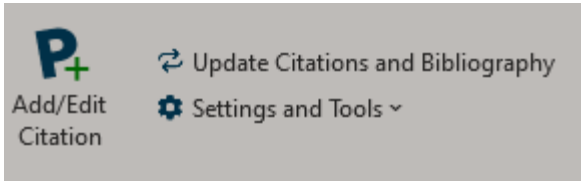


Paperpile

https://paperpile.com/



Add-in to Word and Google Desktop for referencing

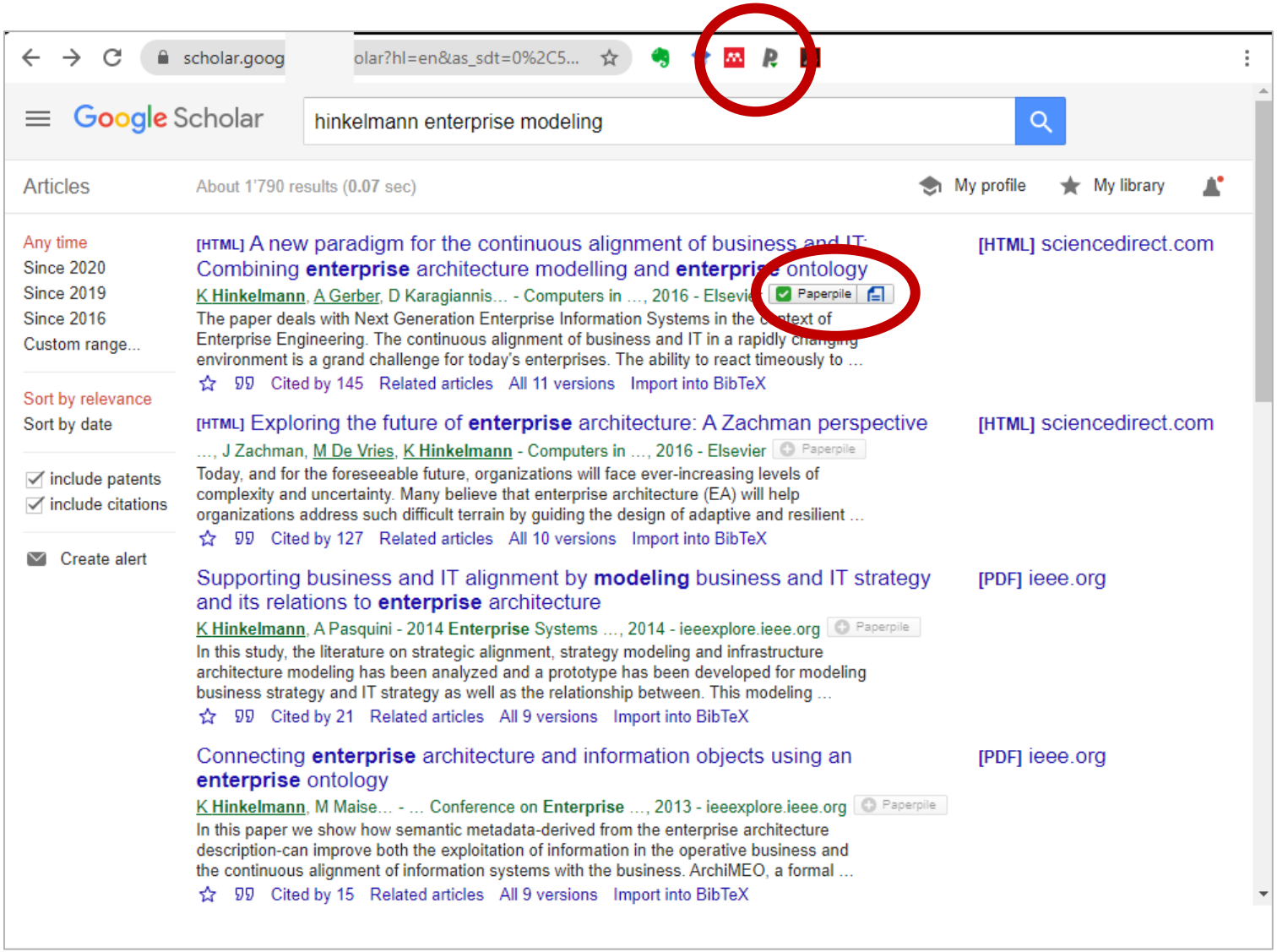


Adding Entries

- Adding Entries
  - Manually
  - Drag & Drop
  - Web-Importer
  - Export from Databases (via RIS file)
  - Watchfolder
  - DOI (= Digital Object Identifier)
- Automatic detection of bibliographic data from PDF and DOI

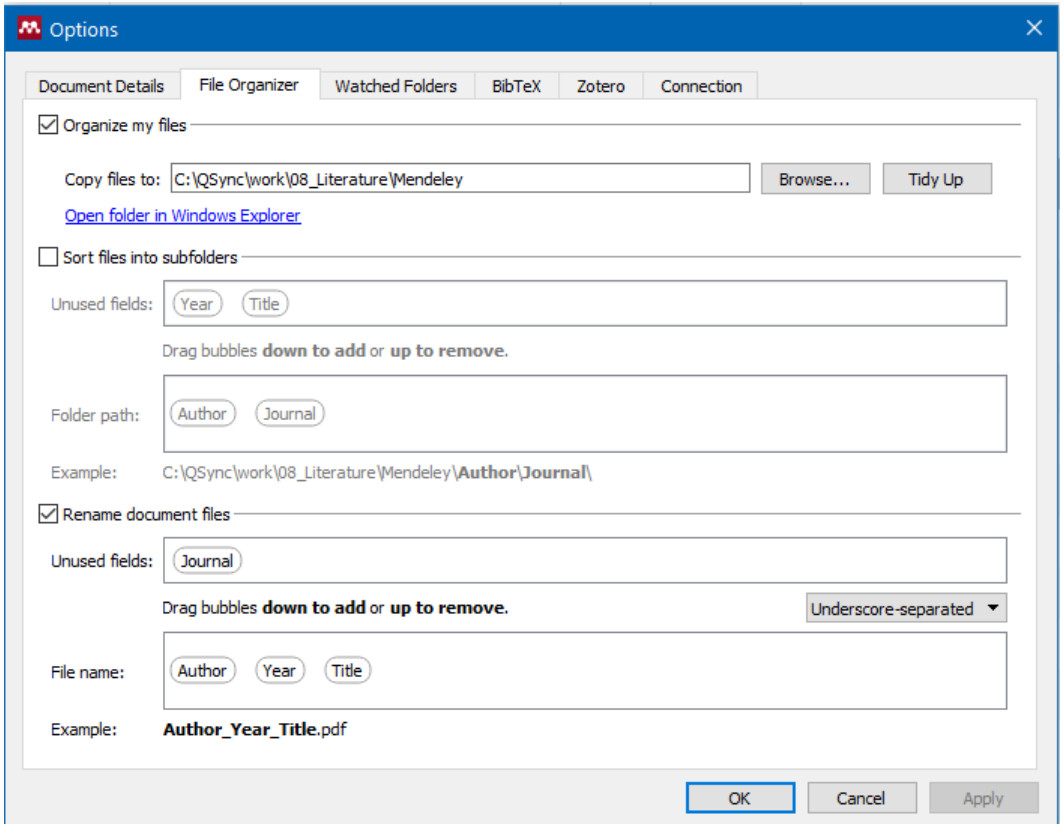
Caution: Always check whether the entries are correct and consistent

Directly import your Sources from the Web



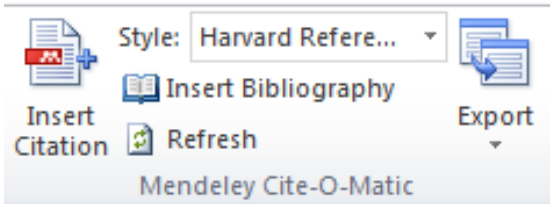
Organization your local files

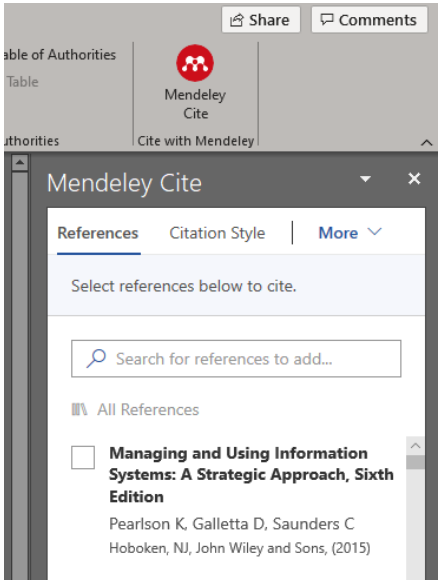
- Mendeley Reference Manager and Paperpile manage your files
- Mendeley desktop can organize your local copy of the files

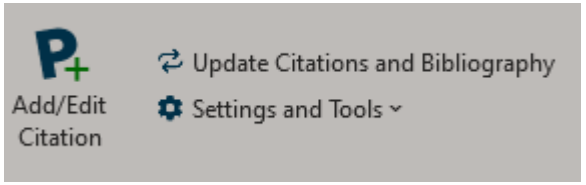


Referencing in Word

- Automatic Referencing in Word
  - Mendeley Plugin for Microsoft Word
  - Mendeley Cite for Reference Manager
  - Paperpile extension







Assignment– Mendeley

- find a paper that has something to do with your topic
- import it into Mendeley (or a tool of your preference)
- create a reference to it in a Word document
- create a bibliography section at the bottom of the same Word document that includes the reference that you inserted

1. Know the literature
2. Comprehend the literature
3. Apply
4. Analyze
5. Synthesize
6. Evaluate

2. Processing Literature

Academic Reading

- Be careful that you do not drown in the heap of available works.
- Know the top researchers in a field – start by investigating the top conferences – the newest work should be published there.
- Academic reading is done for a purpose:
  - You need to name your purpose BEFORE you start.
  - Skim each work to find out whether it is worth reading, or contains bits that are worth reading
- Once you find what you need,
  - Make sure you understand the information, and then
  - Extract what you need (make notes, “plagiarist file” ..)

Thanks to Prof. Alta van der Merwe

How to read a research article

- read title and author name(s)
- if still interesting: read abstract
  - ♦ usually these first 2 steps can be taken online before actually obtaining the article
- if still interesting: scan introductory section, browse the headings and subheadings, look through the bibliography
- if still interesting: check results and conclusions

- in the above, “interesting” means that the article is relevant to your own work
  - ♦ the closer your own research project is related to a paper the more detailed you need to read it

adapted from Thomas Hanne

Important Questions

- Questions to ask when considering the quality of work:
  - Who is the author? Do that tell you anything about the work?
  - Who is the publisher?
  - When was the work published?
  - Is there a thesis or a theme running through the work?
  - Does the author adequately cover his/her topic?
  - What basic assumptions or 'givens' can you spot?
  - Are the method used and evidence provided appropriate?
  - Does the piece work as a whole or are some parts stronger than others?
  - Is the author being controversial?
  - Is the work logically structured? Is there enough background information?

Thanks to Prof. Alta van der Merwe

Record your ideas ..Your ideas will become key concepts in your dissertation!

Keep notes on read articles

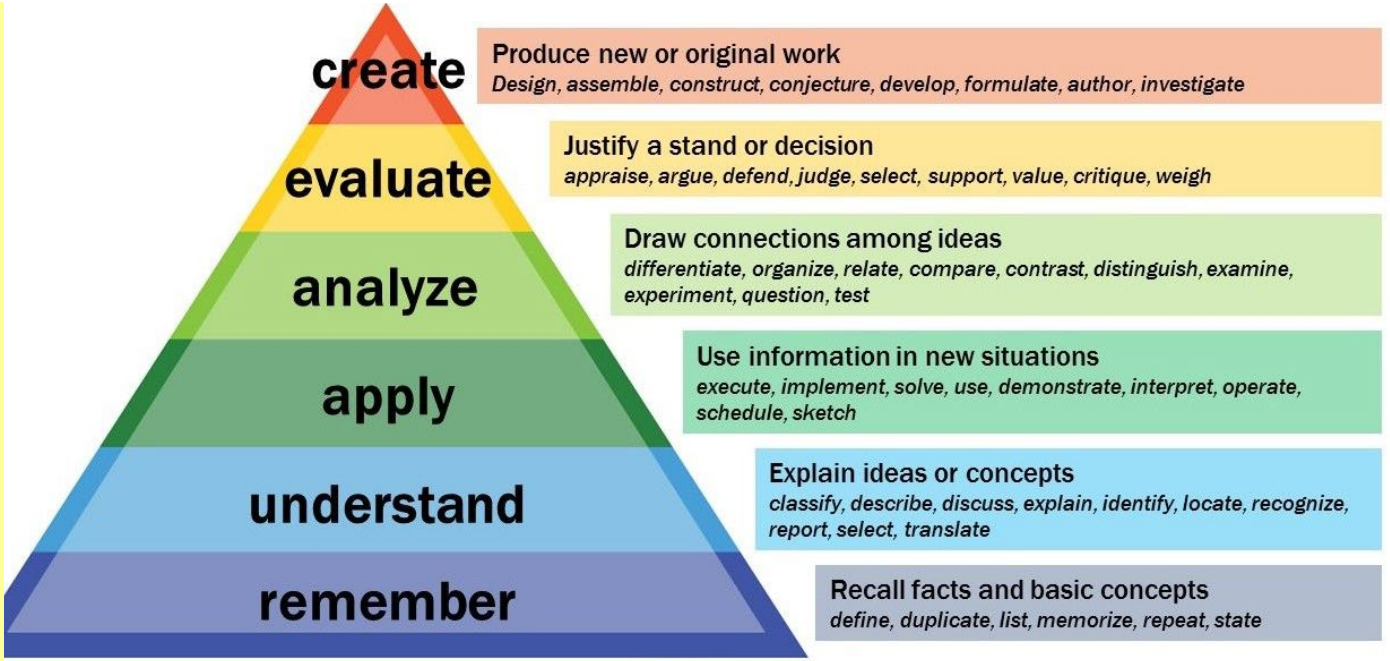
- Why?
  - Because you quickly forget the content of the article and the relationship of the article to your work
- What?
  - bibliographic details (title, author etc.)
  - what's interesting for you
- How?
  - Use Literature Management tools like Mendeley
  - Copy relevant parts "plagiarist file" (A. van der Merwe)
  - keep an overview of ideas/topics, e.g.
    - as a mind map
    - in Excel
    - …

Processing the Literature

- Reading and summarzing sources is not sufficient.
- Data contained in the sources must be processed into information that can serve as a foundation upon which new research can be built
- Can be compared to levels of learning about a topic – getting more and more familiar with a domain (e.g. Boom's Taxonomy)

- Processing the literature is comparable to move upwards in Blooms Taxonomy)

6. Evaluate
5. Synthesise
4. Analyze
3. Apply
2. Comprehend
1. Know



Knowledge the Literature

The researcher must demonstrate that he or she has read the article and extracted meaningful information from it

No knowledge-level Mastery:

Reader doesn't come to know anything about what the references say

Other research also indicates that individual and group marks should be combined in-group activities (Buchy & Quinlan, 2000; Lim et al., 2003; Romano & Nunamaker, 1998).

Knowledge-level Mastery:

This mentions research method and a conclusion

Buchy and Quinlan (2000) interviewed 36 students participating in tutorial groups. These interviews indicated that the students felt they were becoming more conscious of learning processes of both themselves and their peers.

Comprehend the Literature

The researcher demonstrates that he or she not only can repeat what was included in the article but also knows the meaning and significance of the information.

Pre-comprehension level mastery:

Does not go beyond a set of "buzz-words"

> Han and Kamber (2001) suggest an evolution that moves from data collection and database creation, towards data management, and ultimately, data analysis and understanding.

Comprehension-level mastery:

demonstrates an understanding of the concepts presented by the source

> Han and Kamber (2001) suggest an evolution that moves from data collection and database creation, towards data management, and ultimately, data analysis and understanding. For example, *data processing* is a base function enabling manipulation and aggregation of data, thus facilitating searching and retrieval.

Apply the Literature

Application of literature can be revealed by the two-step process:

a) identifying the major concepts germane to the study and

b) placing the citation in the correct category.

Application-level mastery:

	Concept 1	Concept 2	…	Concept n
Article 1	X			X
Article 2		X		
…			X	X
Article n		X	X	

Analyze the Literature

Analysis entails identifying why the information being presented is of importance.

Knowledge without analysis:

Just present the facts

> Data mining is a process of discovering new knowledge by using statistical analysis to identify previously unsuspected patterns and clustering in large data sets (Chen & Liu, 2005).

Analysis-level mastery:

insight into why it would be of any interest or value to find patterns and relationships in order to make correlations

> Data mining is the analyzing and interpretation of large amounts of information. Through analyzing vast amounts of data it is possible to find patterns, relationships and from these discoveries it is possible to make correlations (Chen & Liu, 2005).

Synthesize the Literature

Assemble the literature being reviewed for a given concept into a whole that exceeds the sum of its parts

Lack of Synthesis:

Listing of findings

One current DRM initiative, the *Digital Object Identifier (DOI)*, is an Internet-based system for global identification and reuse of digital content, and provides a tracking mechanism to identify digital assets (Paskin, 2003; Dalziel, 2004). However, despite being integrated in learning object technologies, this DOI is not widely employed across LOR and databases, nor is it universally adapted by content owners (Nair & Jeevan, 2004). Similarly, while most metadata schema enables assets to be tagged with copyright information, this method lacks technological enforcement (Genoni, 2004).

Synthesis-level mastery:

research from a number of sources is very effectively woven together

The *Digital Object Identifier (DOI)* is an Internet-based system for global identification and reuse of digital content (Paskin, 2003). It provides a tracking mechanism to identify digital assets (Dalziel, 2004). The DOI is not widely employed across LOR and databases and is not universally adapted by content owners (Nair & Jeevan, 2004). The DOI does not provide provision for assets to be tagged with copyright information (Genoni, 2004).

Evaluate the Literature

Clearly distinguish among opinions, theories, and empirically established facts.

Non-evaluated citations:

> Data mining has applicability to education as well as business (Sanjeev, 2002; Ma et al., 2000; Glance et al., 2005; Abe et al., 2004; Liu et al, 2005).

no indication if the material from the literature has been evaluated in any way

Citations demonstrating evaluation:

> … the applications of data mining fall under the general umbrella of business intelli-gence. Case studies have reported implementation of data mining applications for: (1) Enrollment management (to help capture promising students) (Sanjeev, 2002); (2) Alumni management (to foster donations and pledges) (Ma et al., 2000); (3) Marketing analysis (to better allocate the marketing funds) (Glance et al., 2005); and (4) Mail campaign analysis (to judge its effective-ness and design new, better targeted mailings) (Abe et al., 2004). Based upon the similarity to applications within the business community, Liu et al (2005) speculated that data mining could also be used within the educational community for fraud analysis and detection.

clearly identifies the type of information being presented – case study reports in the first four, opinion in the fifth citation

Evidence

↓

Warrent

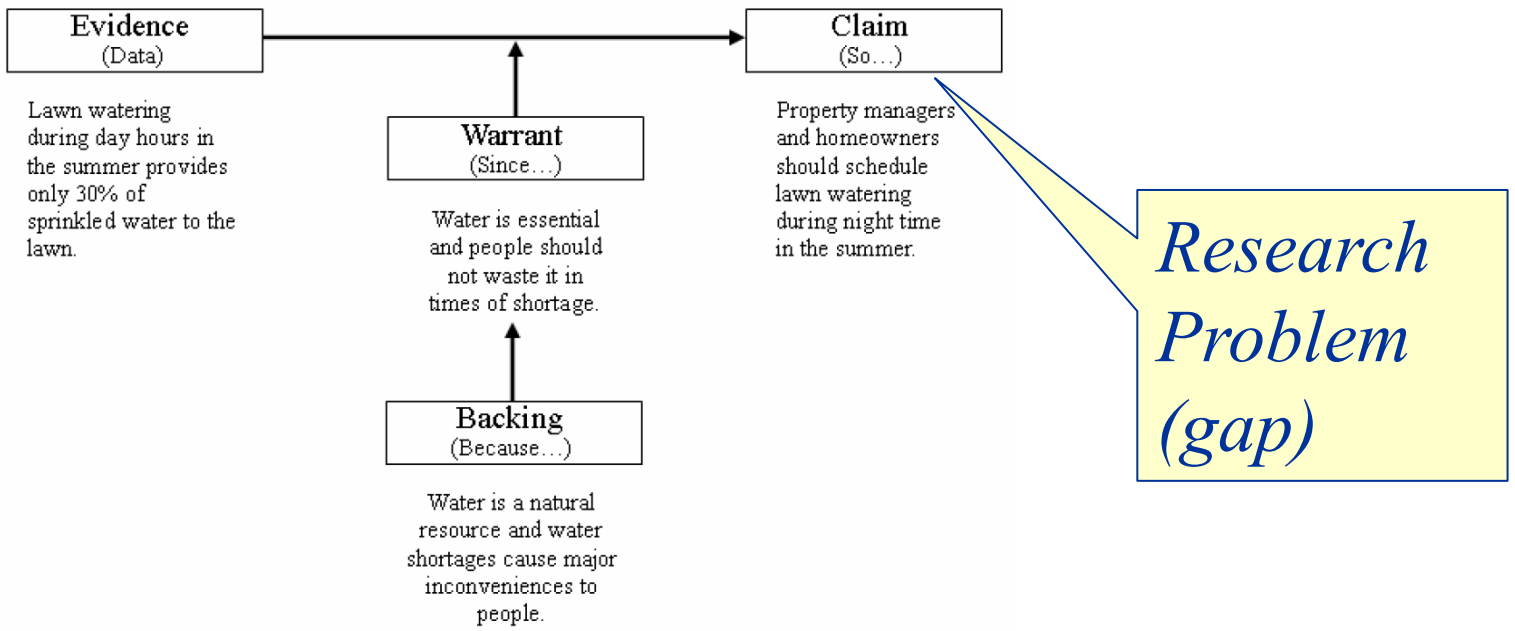
↓

Claim

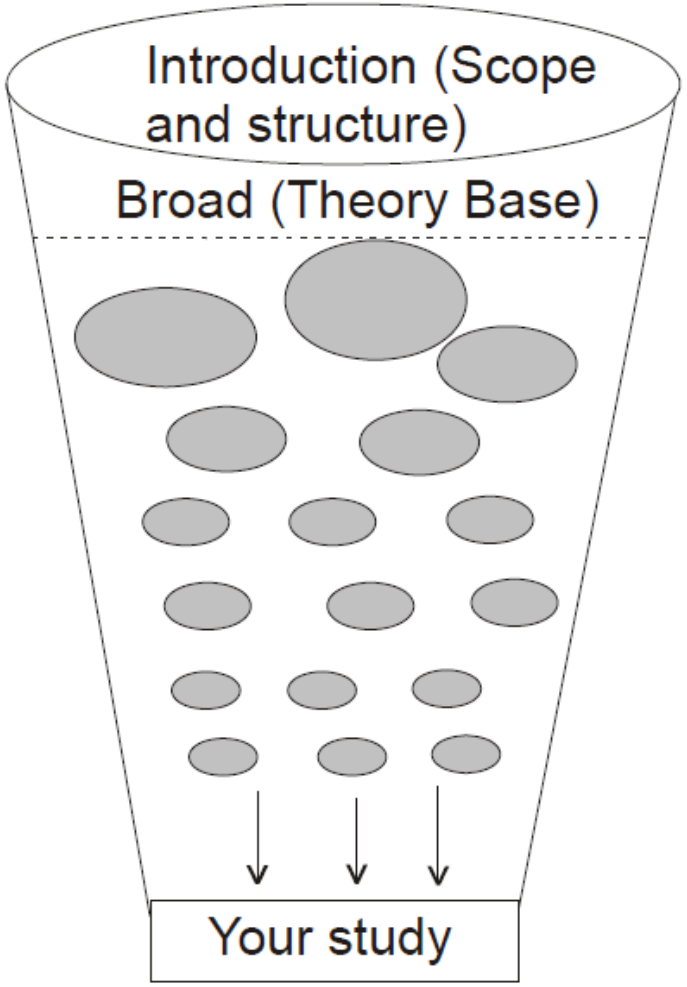
3. Output: Writing the Literature Review

Literature Review

- The “literature review […] must be *clear*, have a *logical structure* and show that you have *acquired a sufficient range of skills* and capabilities” (p. 172).
- A literature reviews is an argumentation for the research problem.



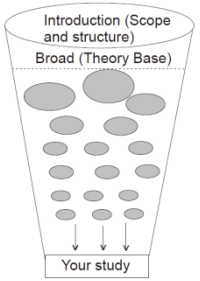
Structuring Literature Review: Funnel Method



- Start with the theory base – the basic works in your field. Just an overview - don't go too much in details.
- Next level will be nearer to your work.
- The lower you go in your funnel, the nearer to the work that you are doing you will move

Thanks to Prof. Alta van der Merwe

Categorizing works



- Group works according to commonality.
- No rules on the number of groups or number of commonalities.
- Make notes on index cards, Endnote, categorizing in a file cabinet.
- Start with the theory base – the basic works in your field. These may be related to your field, but not necessary your focus. Relate to your topic rather than your thesis statement.
- Next level will be nearer to your work, but not a 100% match.
- The lower you go in your funnel, the nearer to the work that you are doing you will move.

Thanks to Prof. Alta van der Merwe

Literature Review – Show Significance and Originality

- The “literature review […] must be *clear*, have a *logical structure* and show that you have *acquired a sufficient range of skills* and capabilities” (p. 172).
- A literature reviews is an argumentation for the research problem.
  - After the reader has read your literature review, there must be no doubt that your work has some significance.
  - Show your significance by constantly indicating what the gap is in the existing literature.
    - *“While contributing … (XYZ, 2018) does not address [your originality]”*
    - *“However, he does not consider the problem in the context of … [while you do]. ”*
- If you have identified gaps and your work addresses these gaps, it is obvious that your work is original.

Fitting the literature into your research

- An effective and quality literature review is based upon a ***concept-centric*** approach rather than chronological or author-centric approach

A & B (1998) introduced X. Another approach is the Y method: C et al. (1999) discuss how ... can be achieved through... In (D 2002), the Z is mentioned, which takes a perspective similar to (A & B 1998)... Finally, (E & F 1999) have to be mentioned, who further develop the approach of (C 1999)...

Better would be:

For the task of TT, two approaches can be distinguished

- using X/Z, as discussed by (A & B 1998; D 2002)
- following the Y method as suggested by (C et al. 1999) and further developed by (E & F 2004)

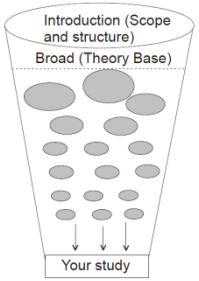
Anything wrong with this?

Criteria for a sound argument

Structure	use a reliable structure that is explicit following proper argumentation.
Definition	define the terms you will use carefully with clear examples and backed by quality peer-reviewed sources.
Reasons	provide reason for everything you have included as support.
Assumptions	substantiate your assumptions; do not leave them as implicit. Use only reliable assumptions that are free of subjective judgment and are based on valid reasoning.
Fallacies	avoid fallacies, such as generalization, abstraction and misplaced concreteness.
Evidence	use only reliable documented evidence from quality peer-review sources that is legitimate and relevant, not trivial.

Adopted from (Hart 1998)

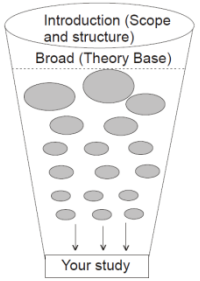
Selecting Works to include



- How many works in a literature review?
- There is no golden number.
- Important – include newer references!
- Stay away from too many general works – especially text books.
- Don’t get carried away for pages and pages on irrelevant work.
- Look at your thesis statement: how does the work relate to this?
- References should support your arguments!
- Limit your literature review at the end if it is too comprehensive in the beginning.

Thanks to Prof. Alta van der Merwe

Introduction/Conclusion



- Write your introduction of your literature review lastly. You then know the order of the works that you will address and can give a better overview of what the reader should expect.
- Give a summary of the state of the scholarship as it pertains to your thesis in the conclusion. Note the preference of the word conclusion / summary at the end of a chapter.

Thanks to Prof. Alta van der Merwe