U O W

Research Methodology

Critical Literature Review

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Contents

- **What** is literature review (definition)

- **Why** literature review is needed (significance)

- **How** to conduct literature review (procedure)

Literature Review

- According to Creswell 2005, a literature review is a written summary of journal articles, books and other documents that describes the past and current state of information, organizes the literature into topics and documents a need for a proposed study. (pp. 79)

- Literature review is the presentation, classification and evaluation of what other researchers have written on particular subject.

Literature Review

- Help to understand a **background** **context** and to explain its importance.

- Reveals the gaps in the literature and points out problems worth pursuing for further research.

- A major part of the thesis or research report that the student (or researcher) submits for assessment or publication.

Literature Review

Literature Review

- Material required is from the papers you have collected, collated and annotated

- Include the books and articles which relate directly to your topic.

- You need to be analytical and critical, and not just describe the works that you have read.

Literature Review

- Essential preliminary task in order to familiar yourself with the **available body of knowledge** in your area of interest.

  – Literature review is integral part of entire research process and makes valuable contribution to every operational step.

  – Reviewing literature can:

  a. Broaden your knowledge and contextualise your findings

  b. Bring clarity and focus to your research problem;

  c. Improve your methodology;
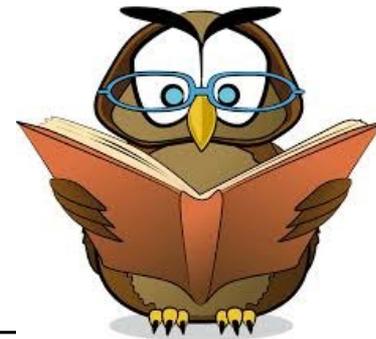
- **Broaden your knowledge base** in your research area:
    - It ensures you to read widely around the subject area in which you intend to conduct your research study.
    - It also helps you to understand how the findings of your study fit into the existing body of knowledge.

- Bring clarity and focus to your research problem
  - The process of reviewing the literature helps you to understand the subject area better and
  - thus helps you to conceptualise your research problem clearly and precisely.
  - It also helps you to understand the relationship between your research problem and the body of knowledge in the area (gap)

- **Improve your methodology**:
  - A literature review tells you if **others** have used **procedures and methods** similar to the ones that you are proposing,
  - and what problems they have faced with them.
  - Thus you will be **better positioned to select** a methodology that is capable of providing valid answer to your research questions.

Procedure for reviewing the literature:

- 1. Search for existing literature in your area of study;

- 2. Review the literature selected;

- 3. Develop a theoretical framework.

1. Searching Literature

- There are various components to this process which include:
  - what you search
  - what you search it for
  - how you search it.

What you search

- Search for existing literature:

    1. books
    2. journals
    3. conference proceedings
    4. Internet

- Internet: the main source of information
  - Online books, journals, conference proceedings, etc.
  - Convenient for searching by various search engines
  - Free resources of information such as DBLP, Google Scholar,
  - Available on most university libraries
    - IEEE Explorer, Springerlink, ScienceDirect, etc.

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Books

- Advantage:

  - material published generally is of good quality and the findings are integrated with other research to form a coherent body of knowledge.

  - useful for providing basic knowledge of the field you are working on.

- Disadvantage:

  - material is not completely up to date, as it can take a few years between the completion of a work and publication in the form of a book.

Journals:

- Provide the most up-to-date information and also the history of the research topic.
    - May contain the original work of the field and
    - the latest development of research

- Conference proceedings
  - Reputable IT/CS conference proceedings are as important as good journals.
  - In some research fields, conference proceedings are more important than journals.
  - Speedy publication - the latest results in the field.

- Internet: the main source of information
  - Online books, journals, conference proceedings, etc.
  - Convenient for searching by various search engines
  - Free resources of information such as DBLP, Google Scholar,
  - Available on most university libraries
    - IEEE Explorer, Springerlink, ScienceDirect, etc.

What you search

Start
- Encyclopaedias
- Books

Middle
- Review articles

End
- Journal papers
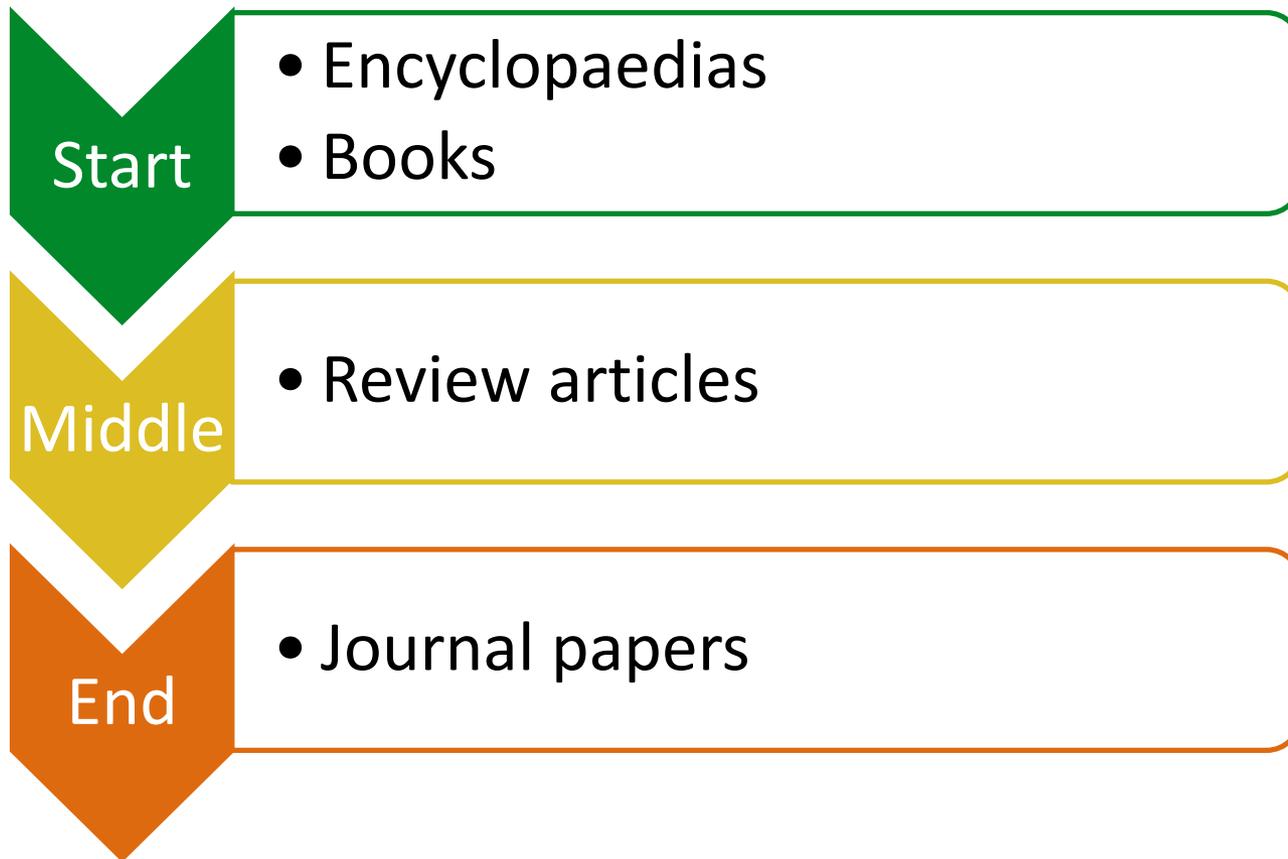
What you search it for

- The research area or the project you are interested
- Searching for entire area for related literatures
  - Read briefly what they are about
  - Write notes
  - Summarise them (texts, tables for comparison)

What you search it for

- Each topic or real world problem can be seen from many viewpoints
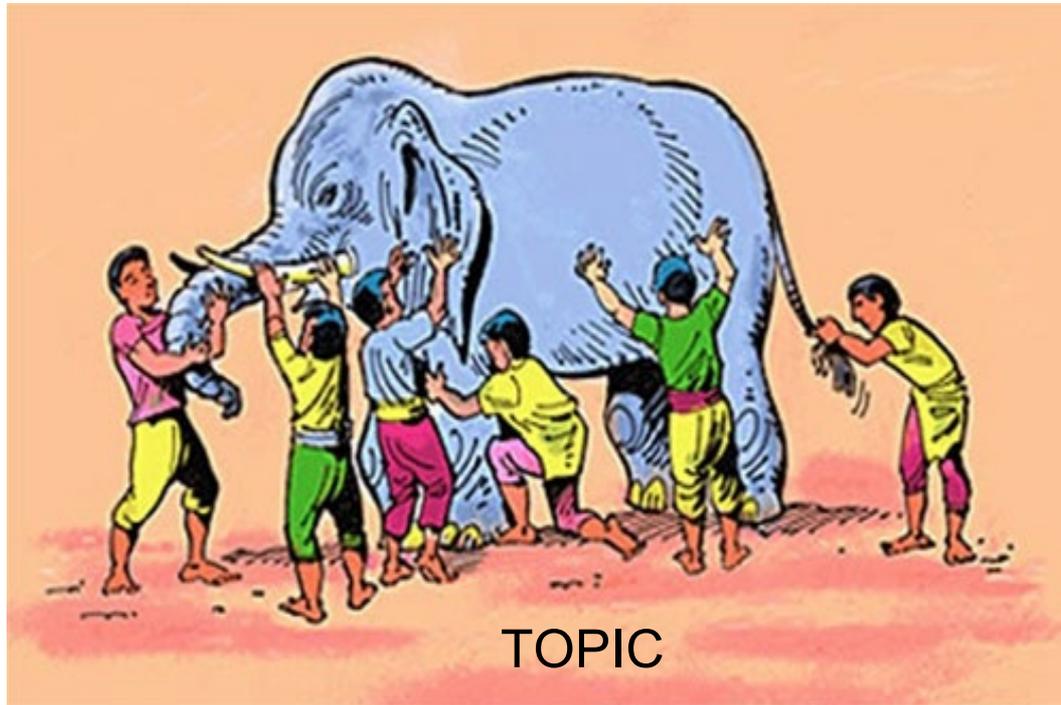
TOPIC

What you search it for

- If the area is new to you, a good step is to **read an introduction** to the topic before conducting a general search.

- Another good place to look for an **overview** of the field is in the **introduction section of a recent journal article** on the topic.

- **Seminal articles** are the ones which first introduce a concept to the world, or at least introduce it to a field where it was not known previously

- **Milestone articles** are similar to seminal articles, except that they mark a place where research in a field made a significant advance, or took a marked turn in a particular direction

- **Refined research**
  - After reading, you will know more about the area
  - Find more related literatures (from references of previously found literatures for instance)
- From **continuous reading**, you will find more relevant works which are worth reading
- **Summarise** them again for the final report of literature review

How you research

- Books, journals, conference proceedings, bibliographic databases, and more, providing accurate and comprehensive descriptions of previous approaches.

- The internet (Google Scholar)

- Library (hard copies or soft copies)

2. Review the literature selected

- After identifying information as useful, the next step is to start reading them **critically** to pull together themes and issues that are associated.
  - Find the **gaps** that exist in the body of knowledge.
- If you do not have a **theoretical framework** of themes in mind to start with, read some introductory articles and then carry out in-deep reading.
  (The <u>theoretical framework</u> is a summary of your theory regarding a particular problem that is developed through a review of previous research on the variables involved.
  More in: http://www.statisticssolutions.com/theoretical-framework/)
- Once you develop a rough framework, slot the findings from the material so far reviewed into that framework.

How to start?

- First **read the abstract (only)** of the paper. Does this clearly state the focus of the research and the authors' main findings? **Next** read the **introduction** and **conclusion** (only).

- Do you now have a better understanding of the paper and its significance? **Lastly**, read **the whole paper** (or as many parts as are necessary) to deepen your understanding of the paper.

- Note that this may require several iterations.

Annotated Bibliography

- As you read each article, you should make notes either on paper or on computer
  - Keep the full bibliographic details for each article in case you decide to use it
  - Indicate why it is relevant to your project
  - Indicate whether it supports your point of view or not
  - Indicate if there are any errors in the article
  - The bibliography note should be as comprehensive as possible

Example

Martn Abadi and Leslie Lamport. *Conjoining specifications*. ACM Transactions on Computing Systems (TOCS), 17(3):507–535, 1995.

This article shows how to specify components of concurrent systems. The specification of a system is the conjunction of its components' specifications. Properties of the system are proved by reasoning about its components. The authors consider both the decomposition of a given system into parts, and the composition of given parts to form a system.

Example

Lenstra, A. K.; Lenstra, H. W., Jr.; Lovász, L. *(1982). "Factoring polynomials with rational coefficients".* Mathematische Annalen*. **261** (4): 515–534*

This article introduces an efficient algorithm to compute a reduced basis of a given integral lattice. A reduced basis for a lattice is one with short vectors and those basis short vectors are almost orthogonal. The authors applied that algorithm to find an efficient method to factorize a polynomials with rational coefficients.

Q: Can we generalize this algorithm for lattices over rings of integers of number fields? …

3. Develop a theoretical framework:

- As you start reading the literature, you will realise that it deals with a number of aspects on your research topic.

- Use these aspects as a basis for developing your theoretical framework.

- A framework your research based on.
  - E.g. the framework about cloud data integrity:
    - methods for data integrity
    - data integrity audit
    - data integrity models and proofs
    - …

Writing up the literature reviewed

Provide theoretical background to your study:

- List the **main themes** that have emerged while reading literature.

- Convert them into **subheadings**. These subheadings should be precise, descriptive of the theme in question, and follow a logical progression.

- Under each subheading, record the **main findings** with respect to the theme in question, highlighting the reasons for and against an argument if they exist, and **identify gaps and issues**.

Writing up the literature reviewed

- **Contextualising the findings of your study** - requires you to systematically **compare** your findings with those made by others.

    – Quote from these studies to show how your findings contradict, confirm or add to them.

    – It places your findings in the context of what others have found out.

    – This part is undertaken when writing about your findings i.e. after analysis of your data.

Writing up the literature reviewed

Using tables

- After having selected most relevant articles, use a table to summarise their main features.
- Find the pros and cons in previous work.
- Identify the research gaps from the table.
- Help to identify a suitable research project.

Use Tables

An example

TABLE I.   FEATURES COMPARISON

Author & Contribution	Threshold policy	Key Policy	Ciphertext Policy	Non-Monotonic Policy	Decentralized Authority	Asynchronous Authority	Scalability	Efficient Revocation	Key Delegation	Privacy Preservation	Fast Decryption	Accountability
[3] Sahai, 2005: Fuzzy IBE	•											
[4] Goyal, 2006: Key policy		•							•			
[5] Bethencourt, 2007: Ciphertext policy			•					•	•		•	
[16] Pirretti, 2010: Security	•							•				
[17] Chase, 2007: Multi-Auth.	•	•					•					
[18] Bozovic, 2012: Decentralized	•						•					
[20] Ostrovsky, 2007: Non-monotonic policy		•		•								
[21] Muller, 2009: Multi-Auth.			•				•					
[22] Muller, 2008: Distributed Auth.			•				•		•			
[23] Wang, 2010: HABE			•				•		•			
[25] Chase, 2009: Improved Multi-Auth.					•		•			•		
[26] Lewko, 2011: Decentralized Auth.			•		•	•	•					
[27] Liu, 2011: W/O Random Oracle			•		•		•					
[28] Lin, 2008: W/O Centrol Auth.	•				•		•					
[29] Hur, 2013: Revocation+Delegation			•				•	•	•	•		
[30] Han, 2012: Privacy+Decentralized		•	•		•	•	•			•		
[31] Wang, 2011: Revocation			•				•	•	•	•		
[32] Liang, 2010: Revocation			•					•	•			
[33] Attrapadung, 2012: Const Size Ciphertext	•	•	•	•				•	•		•	
[34] Cheng, 2013: Revocation			•					•				
[35] Li, 2011: Accountability			•		•		•			•		•
[36] Hinek, 2008: Anti-key-cloning		•	•					•		•		•
[38] Hohenberger, 2013: Fast Decryption		•	•								•	
[11] Boyen, 2013: Lattice	•											
[12] Zhang, 2012: Ciphertext from Lattice			•									
[13] Wang, 2013: Lattice in Standard Model			•									

Bibliography

- The bibliography should give a clear, complete description of the sources that were used while preparing the report.

- Various styles of bibliography.

    –It is usually an alphabetical list as per the author's surname.

    –Journal

    –Conference Proceedings

    –Book

Bibliography - Example

- **Journal**

  Halevi, S., Kalai, Y. T.: *Smooth Projective Hashing and Two-message Oblivious Transfer*. J. Cryptology 25(1), 158–193 (2012)

- **Conference Proceedings**

  Wu Q., Mu Y., SusiloW., Domingo J., and Bo Q. *Asymmetric Group Key Agreement*, Advances in Cryptology -Eurocrypt2009, Lecture Notes in Computer Science 5479, Springer Verlag, Berlin, pp153-170, 2009

- **Book**

  Kaufman C., Perlman R., and SpecinerM., *Network Security: Private Communication in A Public World*, 2nd edition, Prentice Hall, 2002.

Bibliography - First thing first

- Use a bibliographic organizing tool such as BibTeX or EndNote.

- Maintain an accurate record of all the papers you collect or read.

- Collect papers in and around your field of research. Do not be myopic!

- We look at how BibTeX organizes and documents information about publications.

Bibliography - Types and anatomy of a publication

Publications could be any of the following types:

- Book
- Thesis
- Report
- Article in a conference proceeding
- Article in a journal
- Article on the Web

Bibliography – BibTeX entry of a publication

Example of a book:

```
@book{webb2011statistical,
  title={Statistical pattern recognition},
  author={Webb, Andrew R and Copsey, Keith D
and Cawley, Gavin},
  volume={2},
  year={2011},
  publisher={Wiley Online Library}
}
```

Bibliography – BibTeX entry of a publication

Example of a book:

```
@article{leng2020blockchain,
  title={Blockchain security: A survey of techniques
and research directions},
  author={Leng, Jiewu and Zhou, Man and Zhao, J Leon
and Huang, Yongfeng and Bian, Yiyang},
  journal={IEEE Transactions on Services Computing},
  volume={15},
  number={4},
  pages={2490--2510},
  year={2020},
  publisher={IEEE}
}
```

Bibliography – BibTeX entry of a publication

Example of a book:

```
@inproceedings{lindell2017fast,
  title={Fast secure two-party ECDSA signing},
  author={Lindell, Yehuda},
  booktitle={Advances in Cryptology--CRYPTO 2017:
37th Annual International Cryptology Conference,
Santa Barbara, CA, USA, August 20--24, 2017,
Proceedings, Part II 37},
  pages={613--644},
  year={2017},
  organization={Springer}
}
```

Analysis of a paper - localization issues

- Publication title

- Authors

- Year of Publication

- The publication (i.e. where it appears - journal, conference proceedings, book, etc.)

Analysis of a paper - content questions

- What problem (or research question) is being solved (addressed) and why is it important?

- What have others done about the problem? What solution is being proposed by the authors? What result was obtained?

- How does the solution/result compare/contrast with previous results? What further work is proposed?

- What is the relevance of the work to your current research?

  -- This is an important question for your research

Analysis of a paper - content questions

A publication could be divided into sections:

- Abstract or synopsis or introduction

- Body - with possibly several subsections

- Discussion and conclusion

Analysis of a paper - content questions

A literature review is like any other document. It should have:

- An introduction giving an overview of the subject, issue or theory under consideration, along with the objectives of the review.

- A body in which a critical review of the literature collected is undertaken. There are several ways in which this could be conducted.(see "Forms of literature review")

- Some conclusion that draws out the salient points or observations from the literature and makes statements about the gaps in the literature.

What style of writing is appropriate?

- The body of the review should take up 80% of your writing effort. The literature review is organized around ideas.

- It is not a list of summaries of papers as in annotated bibliography.

- The style could be:

   -- Chronological

   -- Thematic

   -- Methodological

- These forms must be interpreted in the context of your specific area of research.

Forms of a literature review

Chronological - In this form of the review you focus on the materials of the literature according to the time they were developed.

- In the case of "face detection and recognition" it may be chronological review of the methods that have been developed between 1985 and 2009, for example.

Forms of a literature review

Thematic – based on different research aspects

- Cloud data integrity

- Privacy

- Identy-based/attribute-based

- Dynamic operation

- …

Forms of a literature review

Methodological - In this form, one may categorize the various methods or algorithms and review how they have developed in terms of formulation, assumptions, etc.

- Cloud data sharing

- Proxy re-encryption

- Group signature

- Blockchain

How to proceed?

Select one of the forms of literature review.

Use your brainstorming questions.

Come up with headings for the sections of your review?

Maintain a logical presentation of the ideas and reviews.

Write a first draft.

When paraphrasing a source be sure to represent the author's information or opinions accurately and in your own words.

References

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Michael Alley, "The craft of scientific writing", Third Edition, Springer, 1996

Anol Bhattacherjee, "Social science research: Principles, methods and practices", Second Edition, Creative Commons, 2012

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