Literature Review

Chapter 2

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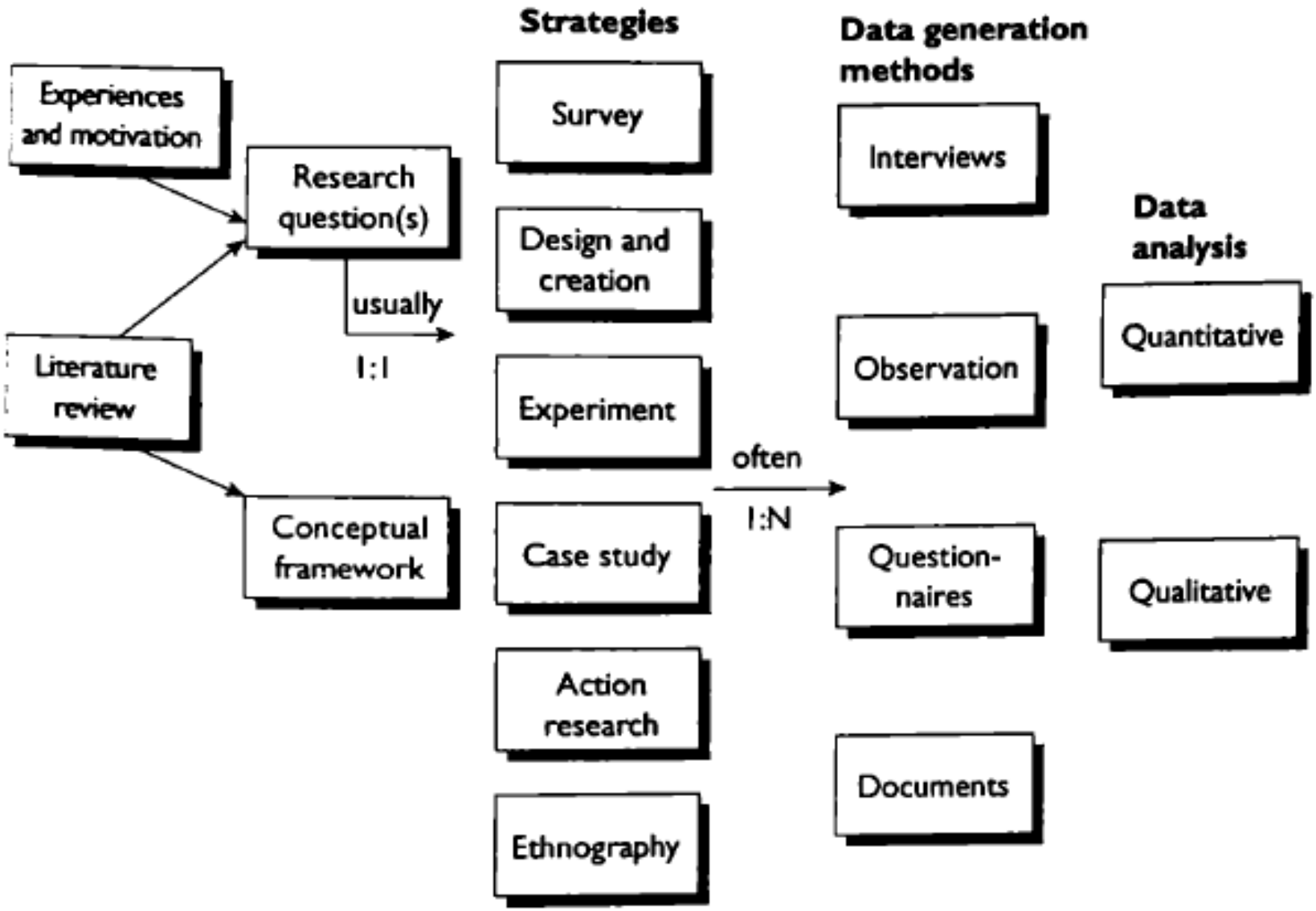
Research Techniques

1. Research Process
2. Literature Review
   - Literature Resources
   - Conducting a Literature Review
3. Research Question

Research Process



Literature Review

- **Reviewing related literature:** a crucial step in any research project
  - helps to understand the existing knowledge, identify gaps, and position your work within the scholarly context
- What has been done (searching, organizing, summarizing literature on a topic)?
- What needs to be done

Literature Review

- A literature review is an assessment of a body of research that addresses a research question
- An organized written presentation of what has been published on a topic by the scholars
- An Account of what has been published by accredited scholars and researchers

Objective of Literature Review

1. Demonstrate Awareness of Existing Work
   - shows that the researcher is familiar with prior studies related to their chosen topic
   - highlights the depth of understanding and awareness of the existing body of knowledge
2. Contextualize the Research
   - By placing the researcher's work within the context of what has already been published, the literature review establishes the relevance and significance of the new study
   - It helps readers understand how the current research contributes to the ongoing scholarly conversation
3. Evaluate Strengths, Weaknesses, and Bias
   - The literature review identifies strengths and weaknesses in previous work.
   - It also points out any biases or limitations present in the existing literature.

4. Identify Key Issues and Questions
    - Researchers use the literature review to pinpoint critical issues or unanswered questions in their field.
    - These unresolved matters guide the direction of the new research.
5. Address Research Gaps
    - The review identifies gaps—areas that have not been thoroughly explored or addressed by previous researchers
    - These gaps become opportunities for the current study to contribute new insights
6. Theories to Test or Explore
    - Researchers identify theories they will test or explore by collecting data from the field
    - The literature review informs the theoretical framework for the study
    - When researchers gather data, the literature review suggests theories that might explain their findings
7. Application Development
    - For computer applications, the literature review identifies relevant theories, genres, methods, or algorithms.
    - This informs the design and development process

8. Research Methods and Strategies
    - The review outlines the research methods or strategies the researcher will employ
    - It ensures transparency and rigor in the research process
9. Facilitate Understanding for Future Researchers
    - A well-structured literature review enables subsequent researchers to grasp the field's context and the significance of the current study

General Guidelines to Writing a Literature Review

- Don't attempt to cover everything written on the topic
- You need to pick out the research most relevant to the topic you are studying
- Only review work that is related to your topic and research questions or problem statement
- For new topics, review literature that is related to your topic

Roles of the Literature review

- A literature review helps establish the boundaries of the research area
  - By examining existing studies, you can identify what has already been explored and where gaps exist
    - gaps: help you to understand where you need to focus your efforts
  - Searching the literature involves reading and refining your problem
  - Understand what other scholars have asked, studied, and discovered
- Based on research gaps: formulate research questions or problem statement
  - determines which literature makes a significant contribution to the understanding of the research area or topic
- By reviewing the literature, you gain insights into research methodologies and tools that have proven effective
- Avoiding unintentional replication of previous studies

Steps for Writing your Literature Review

1. **Identify a research area or topic for investigation:** Begin by selecting a specific research topic or area
   - Consider what interests you and aligns with your field of study or research gap
2. **Locate the relevant literature:** Search for scholarly articles, books, and other academic sources related to your chosen topic
3. **Critically evaluate existing literature:** Read and analyze the literature you've gathered
   - Assess the quality, methodology, and relevance of each source
   - Look for gaps, contradictions, and areas where further research is needed
4. **Organize quality and relevant information:** Create an outline or framework to group similar studies together and identify key themes or trends
5. **Present the information effectively:** summarize the existing research
   - Highlight key findings, methodologies, and theoretical frameworks

Example: AI-based Intrusion Detection Systems

A literature review would help:

- Identify existing AI models used for cybersecurity.
- Understand challenges in real-time anomaly detection.
- Discover gaps, such as the lack of research on adversarial attacks in IDS.

Organization of the Review

1. **Introduction:**
   - Content - what is covered: focus on the main area
   - Structure - how it is organized: follow a chronological order, thematic grouping
   - Boundaries - what is outside of its scope
2. **Body:**
   - discussed and evaluated
     - Discuss the studies, theories, and concepts related to your topic
     - Evaluate the strengths, weaknesses, and relevance of each source
   - summarized and related to your research project
     - Summarize key findings from each study
     - Relate these findings to your own research project—how do they inform your work?
3. **Conclusion:**
   - Highlight the most relevant points: Recap the most significant findings or insights from the reviewed literature
   - Relate these back to the need for research
   - Reiterate what these mean for the research design

How To Write A Literature Review

- Formulate a problem
- Search
- Refine Topic
- Analyze, Construct Review
- Reference works

Literature Resources

1. Books
2. Journal articles
3. Conference papers and workshop proceedings

Books

- Textbooks can be useful as introductory sources: explain a field and the main approaches or theories used within it
  - gives guidance on particular methods or techniques
- Aimed at students on taught courses, not at academic researchers, which aspire
  - rarely cited in a literature review
- Some books, sometimes called '*monographs*' are aimed at an academic audience
  - can be cited in a literature review
  - theoretical rather than practical slant, do not contain exercises for the student to complete
  - authors can survey a field in depth develop ideas and discuss them in detail
- All books, whether textbooks or monographs: may be outdated even by the time of their first publication
  - contains theories or views that are out of line with current thinking

Academic journal articles

- Academic journal articles are where you should find information on the current thinking and research in your area of interest
- can be difficult to read at first, so you might find it is best to gain an understanding of the area through books before exploring journal articles for the latest developments
- Journal articles are
  1. Peer reviewed: academics unknown to an article's authors assess its suitability and quality before a decision is taken on whether to publish it in the journal
  2. Not peer-reviewed: can be biased towards the author's views or those of the organisation concerned.
- Some highly rated-journals
  1. IEEE Transactions
  2. ACM Transactions
  3. ScienceDirect
  4. MIS Quarterly

Conference and workshop proceedings

- Researchers will present their work initially via a paper at a conference or workshop before writing and submitting a more detailed journal article
- Conference and workshop proceedings: where you are likely to find the most up-to-date theories as well as suggestions for further research

Conducting a Literature Review

1. searching
2. obtaining
3. assessing
4. reading
5. critically evaluating
6. writing a critical review

Searching

- Scans the journals in your subject on an online database or a search engine
- To search resources you first have to define some keywords or search terms and then use them methodically to produce a list of potentially useful references
- Create a list of alternative terms for each concept, e.g., “selling” vs. “sales”
- Select an appropriate resource for your search such as book, online databases, catalogs, or search engines
  - Decide which source aligns with your research perspective
- Continue searching, using different combinations of search terms
  - Take advantage of features like symbols (e.g., AND, OR, NOT) for electronic searches

Obtaining

- Obtaining relevant sources is essential for building a solid foundation for your research
- Obtain full-text articles, books, or other materials through your institution's library or interlibrary loan services or online repositories such as arXiv, ResearchGate, or institutional repositories

Assessing

- Assessing the credibility of sources is indeed crucial when conducting a literature review
  - do not just take it at face value of literature review
- Ask questions yourself about books, journals, conferences
- Assess the **book** itself by asking:
  - Is the author someone eminent in the field? : well-regarded in the field
  - Have you heard of the publisher before? (MIT Press, Oxford University Press)
  - Is the book in a second or subsequent edition, or has it been reprinted?
    - Multiple editions or reprints indicate demand and relevance
    - A book that has been updated or reprinted suggests its enduring value

Assessing

- Assess the **journal article** itself by asking:
  - Is it aimed at academics or practitioners?
    - Focus on journals aimed at academics rather than practitioners
  - How long has the journal existed?
    - Established journals (with higher volume numbers) are generally respected
    - However, new journals can also be valuable.
  - Does the journal provide a list of its editorial board and advisors, and do these people seem to be of high standing?
    - If they are, then the journal is probably an acceptable resource
- Does the journal state its policy for reviewing articles? Are all articles peer-reviewed, some, or none at all?
  - You should concentrate on those articles that are peer-reviewed

Conferences and Workshops

For conferences and workshops, you need to ask:

- Is it an academic conference or one aimed solely at practitioners?
- Is the conference/workshop well established? As with journals, conferences held annually for many years are likely to be respected, but the converse is not necessarily true.
- Does the conference/workshop give details of its programme committee? Do they appear to be scholars of high standing?
- Does it make clear its reviewing policy, or were all papers accepted for presentation?

Reading

- Having obtained and assessed a literature source, you need to read it
- Reading and quickly extracting the necessary information from a text, often referred to as "**gutting**" a text, is a valuable skill, especially when working with a large volume of literature
- Structured approach is needed to effectively and efficiently gut a text:

1. For Journal Articles or Conference Papers:
   - Start with the abstract. It provides a concise summary of the entire article, including the research question, methods, results, and conclusions
   - Read the introduction to understand the context, background, and objectives of the research
   - Move to the conclusion to see the main findings and the significance of the study
   - Skim through the section headings to get a sense of the structure and main topics covered in the paper
   - Focus on the first and last sentences of each paragraph, as they typically contain the key points and summarizing ideas

2. For Books:
    - Review the table of contents to get an overview of the book's structure and main topics
    - Scan the index to identify specific topics of interest and to see how extensively they are covered
    - Read the preface or introduction to understand the purpose and scope of the book

Once you have gained an overview of a text's content, you can decide if it is necessary to read the whole thing

Critically evaluating

- Determine if the text provides information or insights that are directly applicable to your research.
  - Ask yourself why you are reading this paper and what you hope to gain from it
- Assess the quality and reliability of the data presented
- Are the methods used to collect and analyze the data appropriate and robust?
  - Are there parts you disagree with? Why?
- Evaluate whether the results are clearly presented and whether they convincingly support the conclusions
  - Is there some false logic or unwarranted assumptions?
- It can be difficult at first to have the confidence to criticize a paper or disagree with its content
- Identify any gaps in the research, such as areas
  - the author might have failed to address significant questions
  - Look for any methodological flaws or weaknesses that could impact the validity of the findings

Writing a critical review

- involves synthesizing and evaluating the existing literature on your research topic to demonstrate the relevance and necessity of your study
- This can be one chapter in a thesis, or one section in a paper, or it can be spread across your whole thesis/paper as you tackle different issues
- Link together the different ideas you have read in the literature into a coherent and persuasive argument for the value and necessity of your research
    - Organize the review around key concepts, themes, or issues rather than individual authors

Write the critical review in funnel approach (start board than narrow)

- Begin by discussing broad concepts and key ideas in the field
- Gradually narrow down to the specific research questions your study addresses
- Identify gaps in the existing literature and explain how your research will address these gaps
- Instead of summarizing each paper individually, synthesize the findings
  - Combine insights from multiple studies to build a comprehensive understanding of the topic
  - Cite multiple authors within the same theme to show the wide/breadth of research
- Evaluate the quality and relevance of the studies, pointing out strengths, weaknesses, and areas of controversy
- Create a matrix to map out which papers cover which concepts
  - This will help you organize your review thematically and ensure that you cover all relevant literature
- Follow the referencing style required by your institution, journal, or conference

Plagiarism

- Plagiarism is a serious academic offence that involves using someone else's words or ideas without proper attribution
- Plagiarism occurs when:
  - You use someone else's words or ideas without giving them credit
  - You present someone else's work as your own
  - You copy and paste text from electronic sources without proper citation
- How to avoid plagiarism
  - When you restate someone else's ideas in your own words, you still need to cite the original source
  - When you use an author's exact words, put them in quotation marks and cite the source
  - Familiarize yourself with the required citation style (e.g. IEEE, Harvard, APA, MLA, Chicago) and apply it consistently
  - By being careful to cite the paper:
    - you cannot be accused of plagiarizing
    - you demonstrate how aware you are of other published work

Citation Styles

- standardized ways of giving credit to the sources you have used in your writing
- Different academic fields and journals prefer different citation styles
- Three common citation styles:
  1. IEEE (Institute of Electrical and Electronics Engineers)
  2. APA (American Psychological Association)
  3. Harvard
- Always be consistent with the citation style you are using
- **In-text citations:** Provide brief details in the text and direct readers to the full reference list
- **Reference list:** Include full publication details at the end of your document, formatted according to the citation style guidelines
- **Check Guidelines:** Always check the specific guidelines of the journal or institution to ensure compliance with their preferred citation style

IEEE Citation Style

- citation style is commonly used in technical fields, particularly in electrical engineering and computer science
- uses numbered references in the text, corresponding to a numbered list of references at the end
- **In-text citation:** Numbers are placed in square brackets within the text such as [1]
  - Once citing several sources at once, it is recommended to list each number in separate brackets
  - A comma or a dash should be placed for separation. As an example: [2], [11], [34]. Alternatively, students can use [5] – [12]
  - Example:
    - "...end of the line for my research [13]."
    - "... as shown by Brown [4][5], as previously stated."
    - "The theory was first put forward in 1987 [1]."
    - "Several recent studies [3, 4, 15, 16] have suggested that..."

- **Reference list:** At the end of the document, the references are listed in the order they were cited in the text in a section headed References, in numeric order
  - Align references left
  - Place the number of entry at left margin, enclosed in square brackets
  - If there are six or more authors, then abbreviate them using '*et al*'
- **Reference examples**
  1. **Book**
     - [*Refno*.] Author's initials. Author's Surname, "Title of chapter in book," in *Book Title*(in italic), edition (if not first), Editor's initials. Editor's Surname, Ed. Place of publication: Publisher, Year, page numbers.
     - [2] C. W. Li and G. J. Wang, "MEMS manufacturing techniques for tissue scaffolding devices," in *Mems for Biomedical Applications,* S. Bhansali and A. Vasudev, Eds. Cambridge: Woodhead, 2012, pp. 192-217.

IEEE Citation Format

Bracketed numbers have to be placed before the start of each entry.

The author's name should be listed as First Initial and Last Name. For example, Einar Jonas Halldorsson should be cited as O. Jonas Halldorsson and not as Jonas Einar, Halldorsson.

[Number] First Name Initial(s) Last Name. "Page Title." Website Title. Web Address [accessed Month Day Year].

Articles have to be put in quotation marks.

Journal or book has to be in italics.

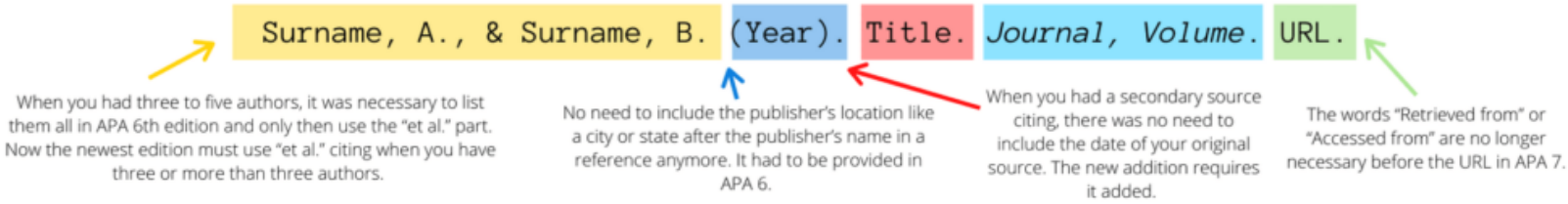
Example in Bibliography:

[8] D. Wilson. "Aeronautics Management and Psyche: Templates." Nevada Center Engineering Institute. http://www.site.org [accessed Feb. 14, 2018].

APA Citation Style

- Citation style is commonly used in the social sciences, such as psychology, sociology, and education
- In-text citation: The author's last name and the year of publication are included in parentheses
  - Basic Format: (Author's Last Name(s) or Organization, Year)
  - Example:
    - According to research, there are... (Wagner & Phelps, 2017)
    - visibility of acoustic waves becomes transparent and the waveforms are not affected (Wagner, 2012, p.104)
- Reference list: At the end of the document, references are listed alphabetically by the last name of the first author

APA 7th Citation Format



Example in Bibliography:

Soranzo, A., & Grassi, M. (2014). Psychoacoustics: a comprehensive MATLAB toolbox for auditory testing. *Frontiers In Psychology, 5*. https://doi.org/10.3389/fpsyg.2014.00712

Harvard Citation Style

Harvard Citation Format

If you're interested only in one chapter of some book, you should cite it separately instead of referencing the entire source. Just add "Ch. 4" (or a number you need) at the very end.

Capitalize the document's title (unless it's an article).

Author, A. A., Year of publication. Title of Document. [medium] Name of Organization/Publisher. Available at: <link> [Accessed Day Month Year].

For many authors, list all authors in the order they're mentioned in the source itself. Put 'and' before the final name.

For journal articles, you're going to need volume and issue numbers. Remember that journals' and magazines' titles must be in italics while titles of articles shouldn't be formatted.

Example in Bibliography:

Loms Group Ltd., 2017. Use of Ethical Practices. [online] Loms Group Ltd. Available at: <http://www.loms.com/111> [Accessed 8 April 2019].

Example in Text:

According to Kostins (2009), it is crucial to research rare sea species.

Research Question

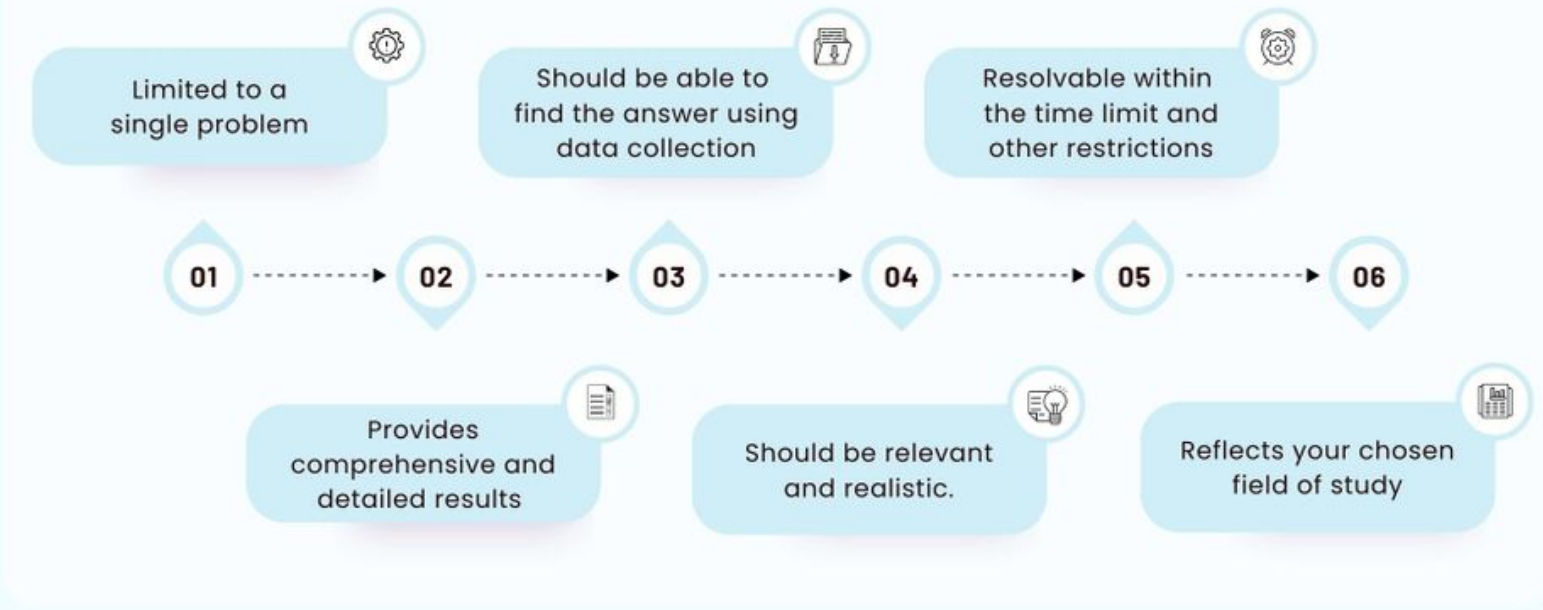
- A research question is an inquiry that the research attempts to answer
  - grounded on research
  - focus on a single research question
- It is the heart of the systematic investigation in any research project
  - narrows down a broad topic of interest into a specific area of study
- A research question is:
  - **Clear:** provides enough detail that the audience understands its purpose without any additional explanation
  - **Focused:** It is so specific that it can be addressed within the time constraints of the writing task
  - **Succinct/concise:** written in the shortest possible words
  - **Complex:** It is not possible to answer it with a "yes" or "no", but requires analysis and synthesis of ideas before somebody can create a solution
  - **Argumental:** Its potential answers are open for debate rather than accepted facts

The Path to a Research Question:
From Broad Topic to a Specific Question

Research.com

SCISPACE

Characteristics of Research Questions



Characteristics of Research Questions

- Should include only one problem in the research question
- Should be able to find the answer using primary data and secondary data sources
- Should be possible to resolve within the given time and other constraints
- Detailed and in-depth results should be achievable
- Should be relevant and realistic
- It should relate to your chosen area of research

Example: Machine Learning for Fake News Detection

- Gap Identified: Existing studies focus on English news, but no research on fake news in regional languages.
- Research Contribution: Develop an AI model for detecting fake news in multiple languages.

Research Question

- A research question is a **specific inquiry** that the study aims to answer.
- It helps guide the research process by defining **what will be investigated**.
- Often Starts with "How," "What," or "Why" – Seeks explanation or exploration

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Example: AI in Healthcare

Research Question:

- "How can deep learning models improve early diagnosis of lung cancer using CT scans?"

Problem Statement

- A problem statement describes the **issue or challenge** that the research aims to address.
- It explains **why** the research is important

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Example: AI in Healthcare

Research Question:

- "Lung cancer is one of the leading causes of death worldwide, but early detection remains challenging. Traditional methods rely on radiologists, leading to delays and subjective diagnosis. There is a need for an AI-based automated detection system to enhance early diagnosis and improve survival rates."

problem statement explains the **issue** (late detection and subjective diagnosis) and **justifies the research** (need for AI solutions)

Example

Topic: "AI in Cybersecurity for Malware Detection"

Problem Statement:

"Traditional signature-based malware detection systems fail to detect new and evolving malware threats effectively. Existing deep learning-based approaches require large amounts of labeled data, which is often unavailable due to privacy concerns. This research aims to explore alternative AI methods for malware detection that do not rely heavily on labeled data."

Example

Topic: "AI in Cybersecurity for Malware Detection"

Research Question:

"How can semi-supervised learning techniques improve malware detection accuracy while reducing the need for labeled training data?"