

Research Methodology in Computer Science (AI800)

Lecture 7

Research Proposal Writing



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Outlines

- Learning Outcomes
- What is a research proposal?
- Computer Science Research Essential Ingredients
- Making Research Proposals
- Writing Research Proposals
- Formatting Research Proposals
- Research Proposal Structure and Tips to Write each content.



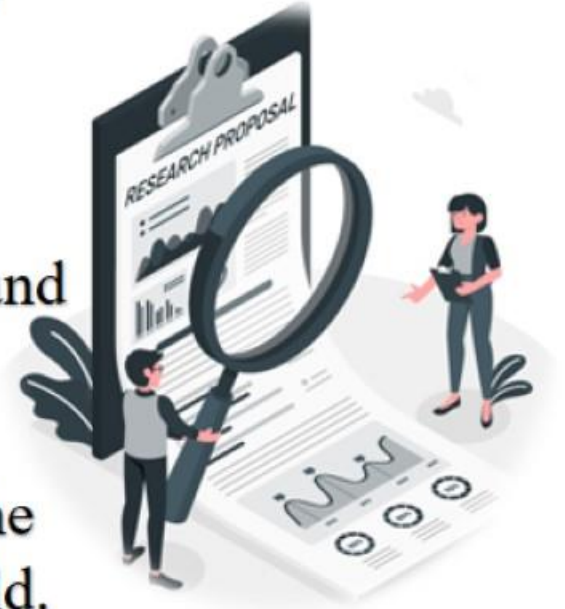
Learning Outcomes

- To cover the essential components of a research proposal, including the introduction, literature review, methodology, and expected outcomes.
- To help you to gain an understanding of the importance of clearly stating the research objectives and research questions in a proposal.
- To help you learn how to structure their proposal in a logical and coherent manner to effectively communicate their research ideas.
- To help you learn how to write a research proposal effectively and efficiently.



What is a research proposal?

- A research proposal is a document that outlines the objective, methodology, and significance of a research project.
- A research proposal serves as a blueprint for conducting the study and provides a clear plan for data collection, analysis, and interpretation.
- A research proposal highlights the potential contribution of the research to the existing body of knowledge in a particular field.





What is a research proposal? (cont.)

- **Statement of intent**

- ☐ prepared academically to complete the research.
- ☐ audience: coworkers, managers, and examiners

- **"Your PLAN is a research proposal."**

- ☐ It thoroughly describes your study.
- ☐ Decisions about your study are made based on how well the proposal was written.
- ☐ approvals from the Institutional Review Board to move forward





What is a research proposal? (cont.)

➤ Research proposal describe the research proposed plan

❑ The scope and research questions

❖ What you intend to study?.

❑ The Research methodology.

❖ How you intend to study your research?

❑ The importance of research.

❖ Why this topic needs to be studied ?

❑ The Research duration

❖ When you plan to finish the research?.



Computer Science Research Essential Ingredients

Issue

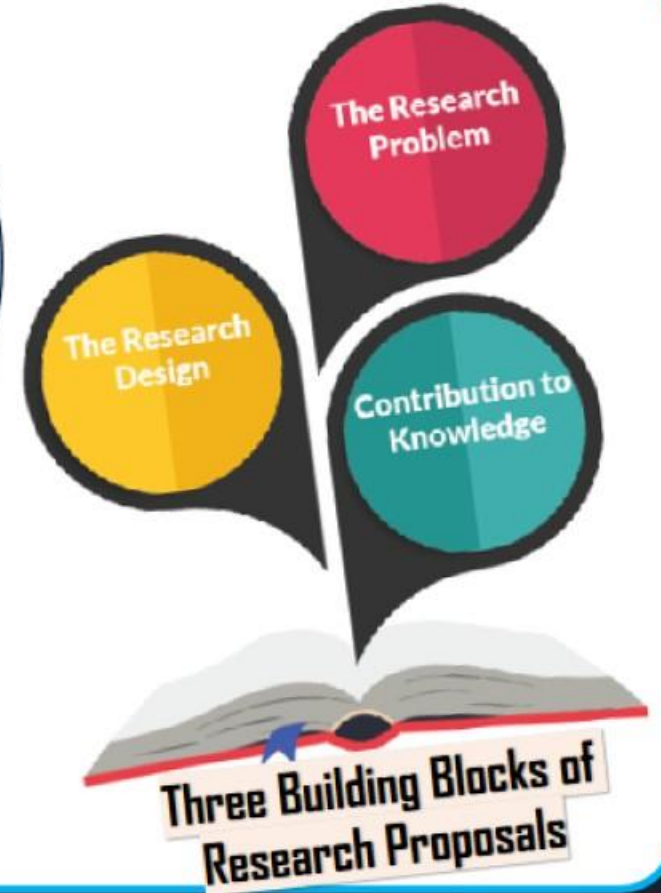
Which problem
are you
attempting to
solve with your
research?

Benefit:

What will this
research add to
the field of
computer
science?

Design:

What methods
will be used to
accomplish the
research's goals?





Making Research Proposals Allows You To:

- *OUTLINE* the steps in the research you propose.
- Put yourself in a scholarly *CONTEXT*
- *VALIDATE* your research
- Be *INNOVATIVE*
- *CONSIDER* your test results.
- Be aware of potential issues
- Expect a reasonable *TIMETABLE*



Writing Research Proposals

LET'S START!

Writing Research Proposals



Formatting Research Proposals





Research Proposal Title

- Title should be concise and descriptive.
 - Orient your readers to your research topic.
- Title accurately reflects the focus and objectives of the proposed research.
 - Indicate the type of study you will conduct.
- Title should be engaging and capture the interest of potential readers or reviewers.





Title Page

The research title is required to appear on the title page of a research proposal but may be revised after being reviewed by the supervisors.

The title page must include a separate page declaring:

- Name & Surname of the Researcher
- Date of Submitting the Research Proposal
- Course Applied for the Research



Research Proposal Abstract

- Begin by clearly stating the *purpose* of your research and the *problem* you aim to address.
 - This will help readers understand the significance of your study and its potential impact.
- *Summarize* important *elements*:
 - Introduction, Statement of the Problem, Background of the Study, Research Questions, and Methods and Procedures.
- Include a *brief description* of your *expected results* or *findings*, *emphasizing* their *potential implications* and *contributions* to the field.



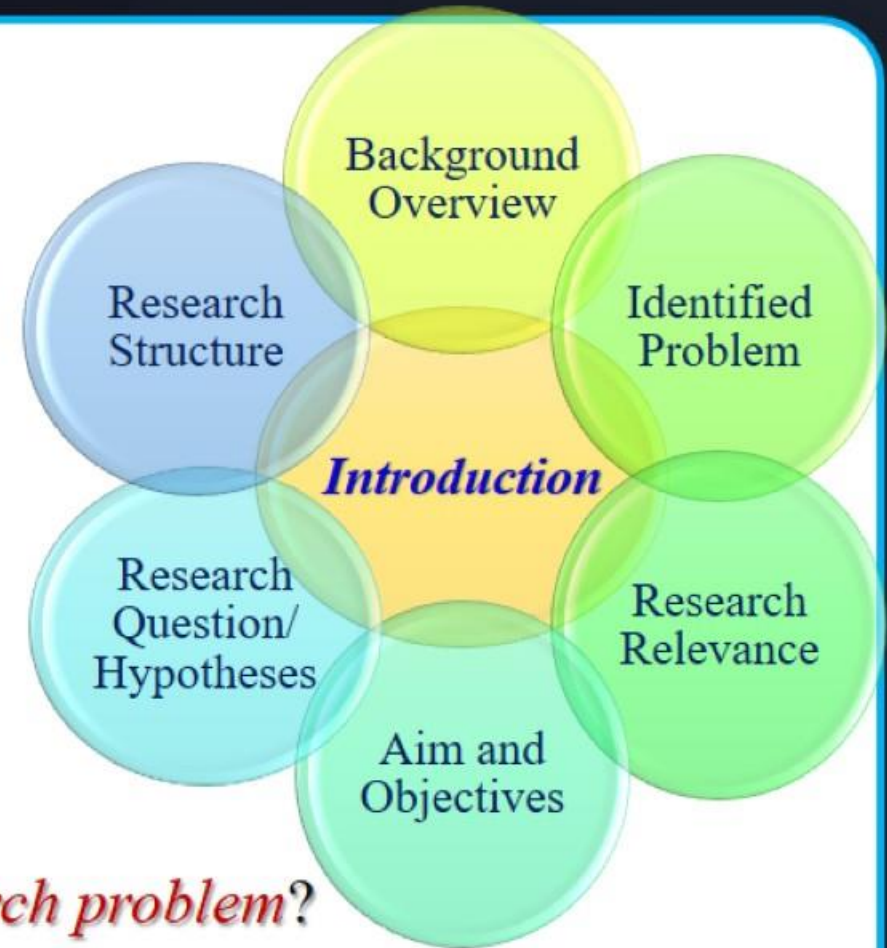
Introduction/ Background

- Begin by providing a **concise overview** of the **current state** of computer science research.
- **Introduce** the specific **problem** or **gap** in knowledge that your research *aims to*
 - *Address*
 - *emphasizing* its importance
- Consider including a brief discussion on any previous studies or existing literature related to your research topic
 - highlighting their limitations or areas that have not been adequately explored.



Introduction

- *What* is the major *research problem*?
- *How* is the study's topic *related* to that *problem*?
- *Why care* about the *outcomes* of the study?
- *Why* this research is *important*?
- *What* is its *significance*?
- *What methods* must be used to *analyze* the *research problem*?





Tips to Write Introduction/ Background

- Determine the **broad** subject area.
- Describe the **main principles** of your **research**.
 - **give** readers **enough** background **information**.
- Give a **brief description** of **each** section that will **be included** in your proposal (optional).
- Keep readers **interested**.



Problem Statement

focus

- ✓ What is present issue or business problem?
- ✓ Why has no one approached the problem?
- ✓ Why is the present research novel?

Purpose:

- ✓ Blueprint for your literature review
- ✓ Focus your committee at the beginning
- ✓ Keep them on track throughout your proposal



Tips to Write Problem Statement

- **Explain** What is the gap that needs to be filled ?
as well as "What **issue** needs to be **resolved**?"
- Clearly state the **issue** at the **beginning of** the paragraph.
- **Keep** the variables you **mention** in your problem **statement to a minimum.**



Purpose/ Aim / objectives

- The *purpose* of a research proposal is to *outline* the *objectives* and *goals* of a research study.
 - ❑ It serves as a blueprint for the research project, providing a clear direction and focus.
- The *aims* of the proposal are to *identify* the specific research *questions* that will be *addressed* and to *justify* why these questions are *important* and *relevant*.
- Research proposal *objectives* refer to the *specific goals* and *outcomes* that a researcher *aims to achieve* through their study.
 - ❑ By defining these objectives, researchers can establish a framework for their research, ensuring that their efforts are focused and aligned with their intended outcomes.



Rationale and context

- The *rationale* of a research proposal refers to the *underlying reasons* and *justifications* for *conducting* the proposed research.
 - ❑ It explains why the research is important, what gaps or problems it aims to address, and how it contributes to existing knowledge in the field.
- The *context* of a research proposal refers to the *background information* and *circumstances* that frame the proposed research.
 - ❑ It includes relevant literature, theories, methodologies, and any other factors that provide a framework for understanding the research topic.
- *Understanding* the *rationale* and *context* of a research proposal is essential for *evaluating* its *potential impact* and *feasibility*.



Research Questions

- *Research questions* are *specific inquiries* that a researcher *aims* to *answer* through their study.
- *Researcher* provide a *clear focus* and *direction* for the research, *guiding* the collection and *analysis* of data.
- These *questions* *should be* *well-defined*, *concise*, and *aligned with* the *objectives* of the study.
- By *formulating research questions*, researchers can *explore* various *aspects of a topic* and *contribute* to *existing knowledge* in their field.



Tips to Write Purpose/Aims/Rationale/Research Questions

- Describe the study's **aims** and objectives.
- Show your study's original contributions, **if applicable**.
- Give a more **thorough explanation** of the **ideas outlined** in the introduction.
- Provide a **sound rationale** for the study.
- Clearly state the topics that **your study will not cover**.
- Describe the study's research questions.
- Add a section **that defines key** terms.
- Describe the research's **constraints**.
- Give a justification for the study's **specific** subjects.



Review of Literature

This is NOT just a summary of literature

Show how your research study:

- ✓ Literature **SUPPORTS** your hypothesis
- ✓ **EXTENDS** previous work
- ✓ **AVOIDS** previous mistakes
- ✓ IS **UNIQUE** to previously followed paths



Review of Literature (cont.)

By writing the literature review, you can understand:

- How other **academics** have **discussed** your topic.
- The **various** theories **that have been** used to **examine** materials or data.
- The **most effective** research methodologies and techniques for your **specific** topic.



Background vs Review of Literature

Background of the Study

- ☐ About the research area
- ☐ What is the present scenario about the topic
- ☐ If the research is about an industry, kindly be more specific about the industry
- ☐ Elaborate on the key statistics evident

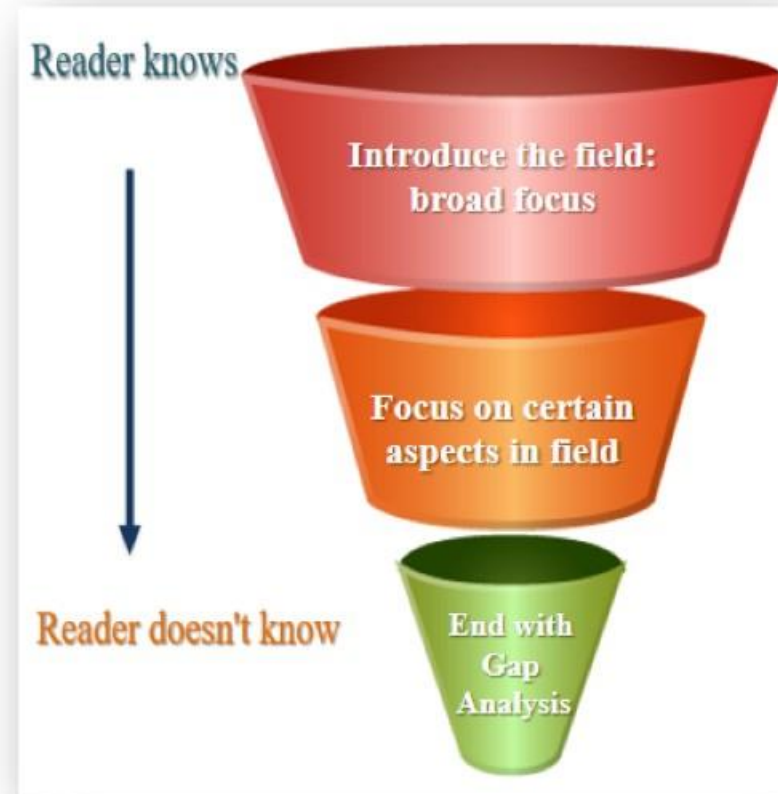
Review of Literature

- ☐ Concepts and definitions
- ☐ Theories
- ☐ Related works
- ☐ Research gap



Tips to Write Review of Literature

- **Places** the current study in the **context of a larger** disciplinary **discussion to show** where your research stands within the existing body of knowledge and ongoing conversations in your field.
- **Demonstrates** the **significance**, and **necessity** of your **specific** project.
- **Supports** methodological **decisions**.
- **Exhibits** familiarity with the **subject** and appropriate **methods of study**.





Methodology

- *Methodology section* involves outlining the steps, procedures, and tools that will be employed to collect and analyze data, as well as the rationale behind their selection.
- *Methodology section* address any potential limitations or challenges that may arise during the research process to ensure the validity and reliability of the findings.
- Methodology section is divided into several sections:
 - Study groups
 - Ethics
 - Access to samples
 - Infrastructure
 - Data analysis.



Tips for Writing Methodology

- Clearly *define* the *research objectives* and the *problem statement* that the methodology *aims to* address.
 - This will *provide* a clear framework for *designing* and *implementing* the methodology.
- *Choose* appropriate *research methods* and *techniques* that align with the *objectives* of your study.
 - Consider factors such as data collection, analysis, and evaluation methods that are commonly used in computer science research.
- *Provide* a detailed description of each step *involved* in your methodology, *ensuring* that it is *logical* and *coherent*.



Tips for Writing Methodology (cont.)

- *Discuss* any *potential limitations* or *challenges* that may *arise* during the *implementation* of your methodology and *propose* strategies to mitigate them.
 - This will help *ensure* the feasibility and effectiveness of your research approach.
- Finally, *consider* the *ethical implications* of your methodology and *address* any potential *risks* or *concerns related to data privacy*, *participant consent*, or any other *ethical considerations relevant to* your study.
 - By incorporating these elements into your methodology, you can enhance the rigor and credibility of your research findings.



Research Design and Methods

This section of a research proposal aims to convince the reader that the research design and methods will solve the identified research problem and accurately interpret the results, The section should be:

- Well-written, clear, and logically organized, demonstrating the researcher's knowledge and ability to complete the study in a timely manner.
- Tied to the study's objectives and include examples from the literature review related to the design and methods.
- Demonstrate how the study utilizes and builds upon past studies, considering both existing and potential methods.

The methods section is not just a list of tasks, but also an argument for why and how the tasks will help investigate the research problem and answer the research question(s).



Tips for Writing Research Design and Methods

- Indicate which methodological strategies you plan to use to gather information and which techniques you will apply to the data analysis.
- Indicate the types of research operations you plan to conduct and how you plan to interpret the findings in relation to the research problem.
- When conducting your research, be prepared for and aware of any possible obstacles you may run into. Then, plan how you will overcome these obstacles.
- Describe the areas you anticipate facing difficulties in gathering data, such as gaining access to participants and data.



Significance/ Implications

- The *significance* of the research proposal in computer science lies in its:
 - ✓ Potential to advance technological innovations.
 - ✓ Address current challenges within various fields:
 - ❑ Artificial intelligence.
 - ❑ Cybersecurity
 - ❑ Data analytics
 - ❑ Software engineering.
- Exploring different aspects of computer science through a research proposal, researchers can contribute to the development of cutting-edge technologies that have practical applications across industries and societal domains.
- Investigating the implications of the proposed research project is crucial for understanding how it could impact existing systems or introduce novel solutions.



Significance/ Implications (cont.)

The Significance and Implications may include the following items:

- *Reference to* overall **aims** of the study and a summary of the **major findings**.
- *Reference to* key **results**
- *Discussion of* the significance of the study and results (**what they mean**)
- *Discussion of* the implications of the study and results (**how they affect the wider field**)
- *Limitations* of the **results**.
- *Discussion of* **changes**, if any, in **research design** for the main study.



Overview of Chapters

The research proposal will consist of several chapters that provide a comprehensive overview of the study.

- The first chapter will introduce the research topic and its significance, highlighting the gaps in existing literature.
- This will be followed by a review of relevant theories and concepts in the second chapter, which will serve as the foundation for the study.
- The third chapter will outline the research methodology and data collection techniques to be used.
- Finally, the last chapter will present the expected findings and their implications for future research and practice.



Plan of work

- The research proposal plan of work includes a breakdown of the team members' responsibilities and timelines; therefore, a Gantt chart and a Division of Work chart are necessary.
- The plan of work includes a detailed description of the research objectives, methodology, data collection methods, and analysis techniques.
- The plan of work provides a clear outline of the resources needed, such as equipment, software, and personnel.
- The project's phases and their deadlines are shown in a Gantt chart.



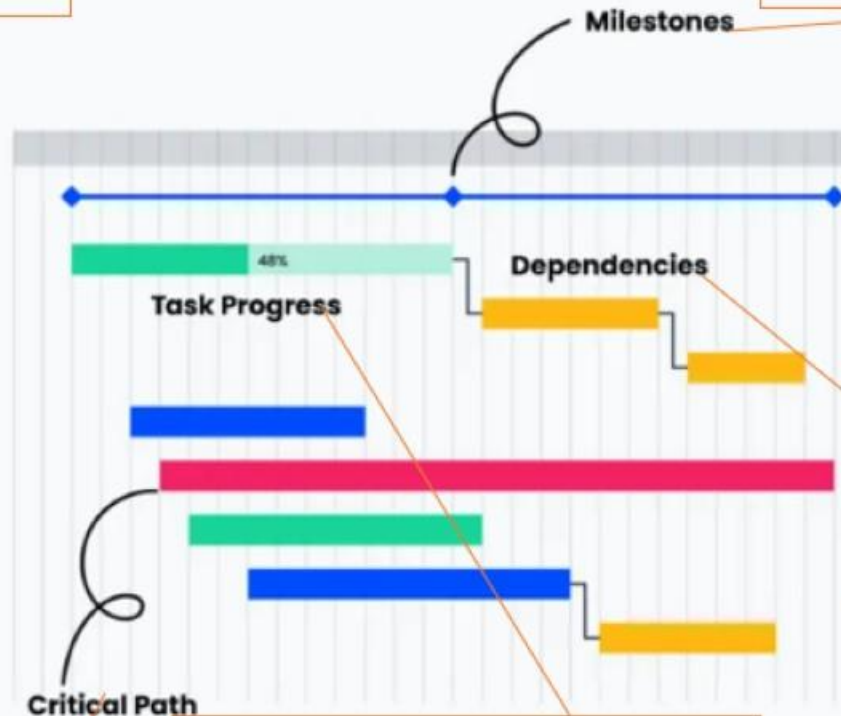
Plan of work: Gantt Chart

what are the activities required for project completion?

The start date and end date of each task

Important milestone dates within the project's timeline

Tasks List	Start & End Date	
SEO	OCT 01	OCT 14
Taxonomy	OCT 15	OCT 20
Backlinks	OCT 22	NOV 1
Website	OCT 05	OCT 12
Content	OCT 06	NOV 3
Branding	OCT 07	OCT 20
Social	OCT 08	OCT 18
Copy	OCT 18	OCT 30



Project Start & End Date

The start date and end date for the entire project

how do the tasks relate to one another?

The set of tasks that take the longest time to complete in a project and so provide an estimate of project duration

The progress made toward the completion of each task: is the task on track, at risk, or delayed?



Timeline

- The research proposal timeline **outlines** the projected schedule for completing the research project.
- The research proposal timeline **includes** key milestones and deadlines that need to be met throughout the research process.
 - Avoids “dead” time.
- The research proposal timeline **provides** a clear overview of the time required for each phase of the study, such as literature review, data collection, analysis, and report writing.
- The timeline **ensures** that the research project stays on track and allows for effective planning and allocation of resources.





Resources / Support

- Exploring the availability and accessibility of resources for research proposal development:
 - This could involve investigating various online platforms, libraries, academic institutions, or other sources that provide support materials such as guidelines, templates, examples, or workshops to help researchers craft effective proposals.
- Evaluating the effectiveness of different support systems for research proposal writing:
 - This topic could delve into analyzing the outcomes and impact of existing support structures designed to assist researchers in their proposal writing process. It may involve examining case studies or conducting surveys



Outcomes

- The outcome **expect** that the **findings** will **contribute to** the existing **body** of knowledge and **fill gaps** in current understanding.
- The results **may have practical implications** and can potentially **inform decision-making processes** in relevant fields.

- What do you expect the results to be?

Measurable

- ☐ E.g. you will get a degree
- ☐ New patent / paper

Qualitative

- ☐ Contribute understanding to subject / new technology / application



Reference list

- The importance of a well-structured and comprehensive reference list in any research proposal.
- Different citation styles commonly used in academic writing and how to appropriately format the reference list accordingly.
- Strategies for conducting thorough literature reviews and identifying relevant sources to include in the reference list.
- The role of primary and secondary sources, including scholarly articles, books, reports, and credible online resources, in building a strong reference list for a research proposal.



References

- ❑ VanderMey, R., Meyers, V., Van Rys, J., Kemper, D., & Sebrank, P. (2011). The college writer: A guide to thinking, writing, and researching (4th ed.). Boston: Houghton Mifflin.
- ❑ Abd Karim Alias (2010). A brief guide to doing a literature review. Retrieved from http://www.slideshare.net/akarim717/doing-a-literature-review6432447?qid=ea37aecb-065c-4ac3-8975-03bd20e0a570&v=&b=&from_search=1
- ❑ Teoh Yew Heng. Seminar on how to write a research plan & tackling a literature review



Thank You