

CM-2603 Data Science Group Project

Problem domain Identification , Literature Review ,
Introduction to Research

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Learning Outcomes

- Covers LO1 for Module
- On completion of this lecture, students are expected to be able to:
 - Identify the problem domain
 - How to start a Research
 - How to do a Literature review

CONTENT

- What is a Problem Domain?
- Difference between Problem Domain & Solution Domain
- What is a Research?
- Research Types
- How to Read a Research Paper
- What is a Literature Review?

What is a Problem?

- An issue that needs to be dealt with.
- Every solution is an answer to a problem.
- Why it is problem?
- **DO NOT REVERSE ENGINEER THE SOLUTION**

Writing a Problem Statement

- The first step in determining the Problem Domain of a program is to ask yourself what your application is supposed to do
- The above is referred to as the “Problem Statement.”

eg 1: Rough Problem Statement for a Computer Program

“My program will solve basic mathematical expressions”

eg 2: Refined Problem Statement for a Computer Program

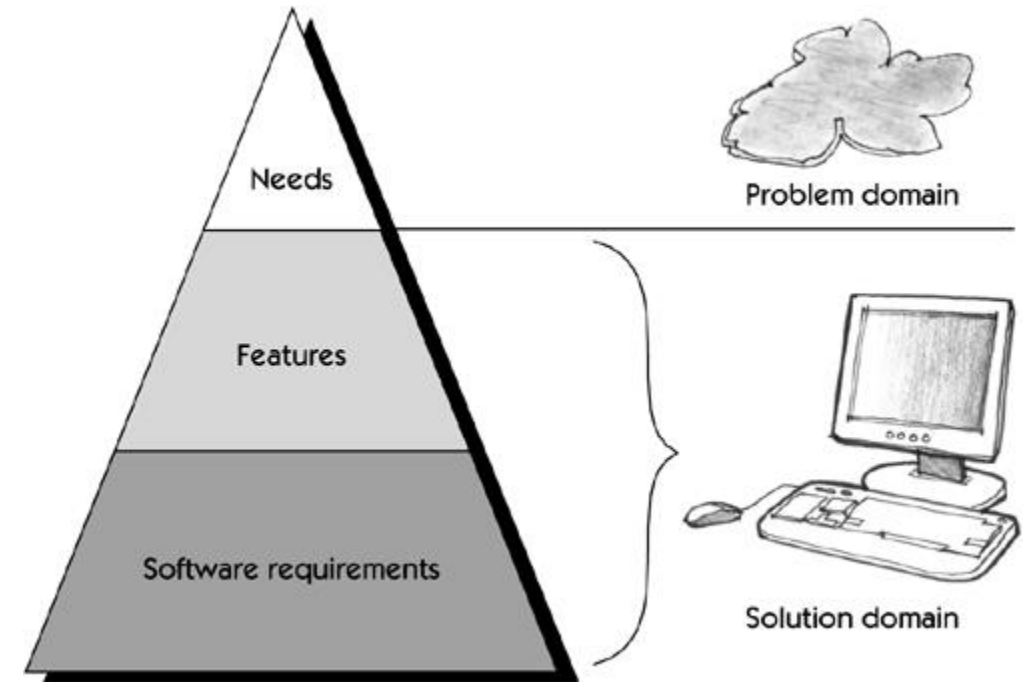
“My program will display the result of solving valid binomial expressions limited to addition, subtraction, multiplication, and division. If an expression is invalid, an error message will be displayed instead of the result of solving the expression.”

Difference between Problem Domain & Solution Domain

! PROBLEM DOMAIN



🎯 SOLUTION DOMAIN



What is Research?

Definition 1 : Research is a process to discover new knowledge.

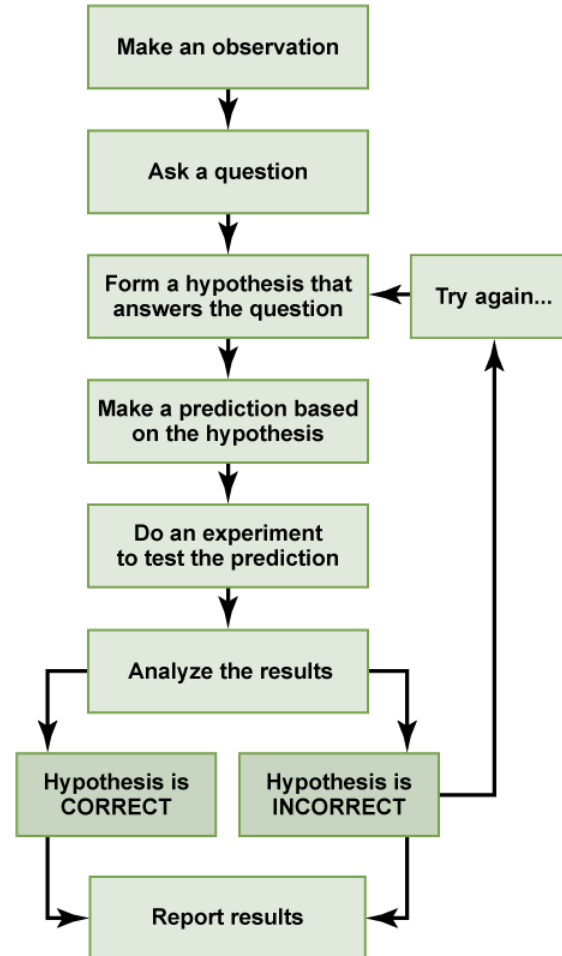
Definition 2 :

“Research is a process of systematic inquiry that entails collection of data, documentation of critical information, and analysis and interpretation of that data/information in accordance with suitable methodologies set by specific professional fields and academic disciplines.”

- *hampshire.edu*

Note : Research is conducted to evaluate the validity of a hypothesis or an interpretive framework; to assemble a body of substantive knowledge and findings for sharing them in appropriate manners; and to generate questions for further inquiries.”





Research Approach

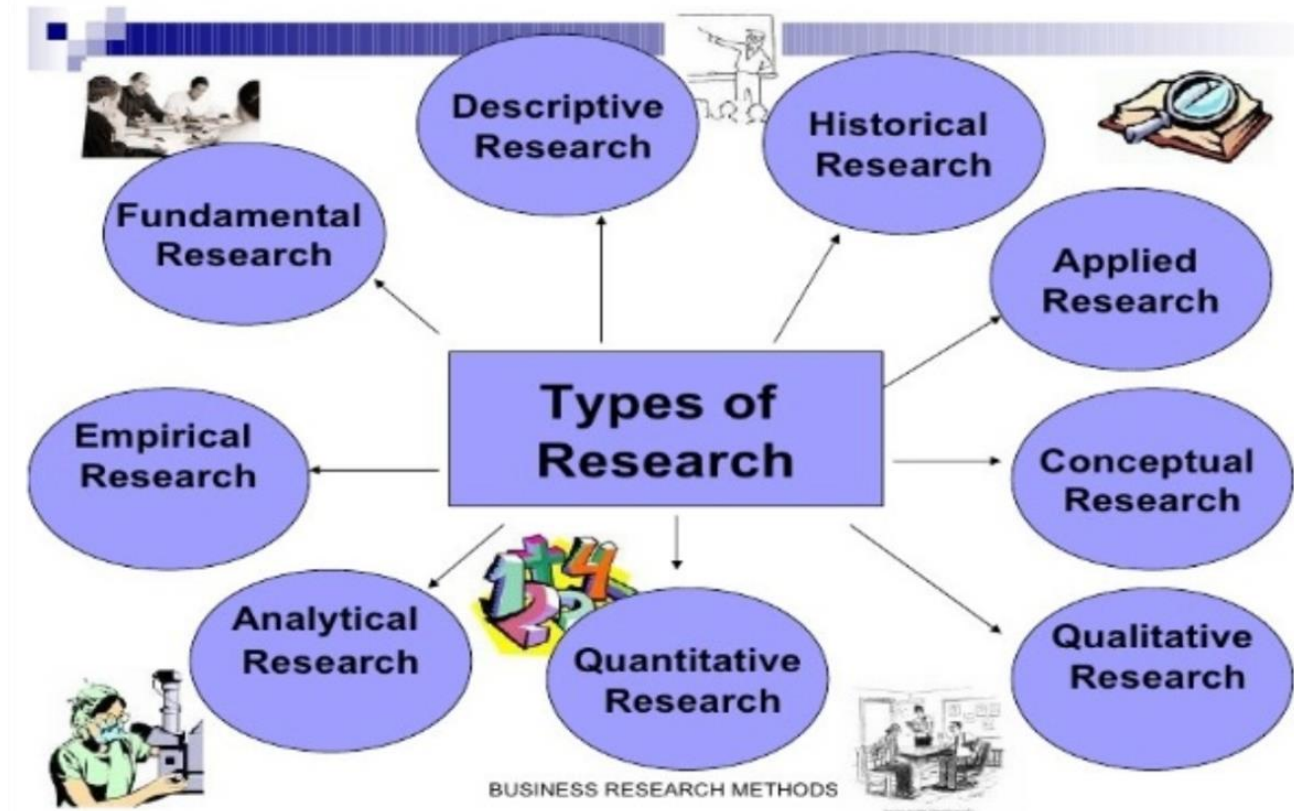
The research approach can be broken down into two categories

- Deductive approach
- Inductive approach

The deductive approach aims to prove and test a hypothesis.

The inductive approach is focused with the generation of a new theory emerging from the data.

Types of research



Qualitative Research

Qualitative Research is a process that is about **inquiry**, that helps in-depth understanding of the problems or issues in their natural settings. This is a **non- statistical research method**.

Qualitative research is heavily dependent on the **experience of the researchers** and the **questions** used to probe the sample. The sample size is usually restricted to 6-10 people in a sample. Open-ended questions are asked in a manner that one question leads to another. The purpose of asking open-ended questions is to gather as much information as possible from the sample.

- **Methods used for Qualitative Research:**

- One-to-one interview, Focus groups, Ethnographic Research, Text Analysis, Case study research

Quantitative Research

Quantitative research is defined as a the systematic investigation of phenomena by **gathering quantifiable data** and performing **statistical, mathematical or computational** techniques. Quantitative research gathers information from existing and potential customers using sampling methods and sending out online surveys, online polls, questionnaires etc., the results of which can be **depicted in the form of numericals**. After careful understanding of these numbers to predict the future of a product or service and make changes accordingly.

• Methods used for Quantitative Research:



Qualitative vs Quantitative



Where to find Research Papers/Journals?

- Google Scholar
- IEEE Xplore
- Research Gate
- ACM Digital Library
- Springer
- Sci-Hub

How to read a Research paper?

- Abstract
- Introduction
- Conclusion

If the above fits your topic or if it interests you, then read the entire paper once and then read it again and make notes.



What is a literature Review?

- A type of academic essay / document / review that summarizes the key literature regarding a particular domain.
- A **literature review** is a comprehensive summary of previous **research** on a topic.
- This summary is written in a an extremely logical order, composed of critical arguments and justifications.
- Usually concludes with your own reflections on the most important insights that you have gathered

The importance of literature review

‘I not only use all the brains that I have,
but all that I can borrow.’

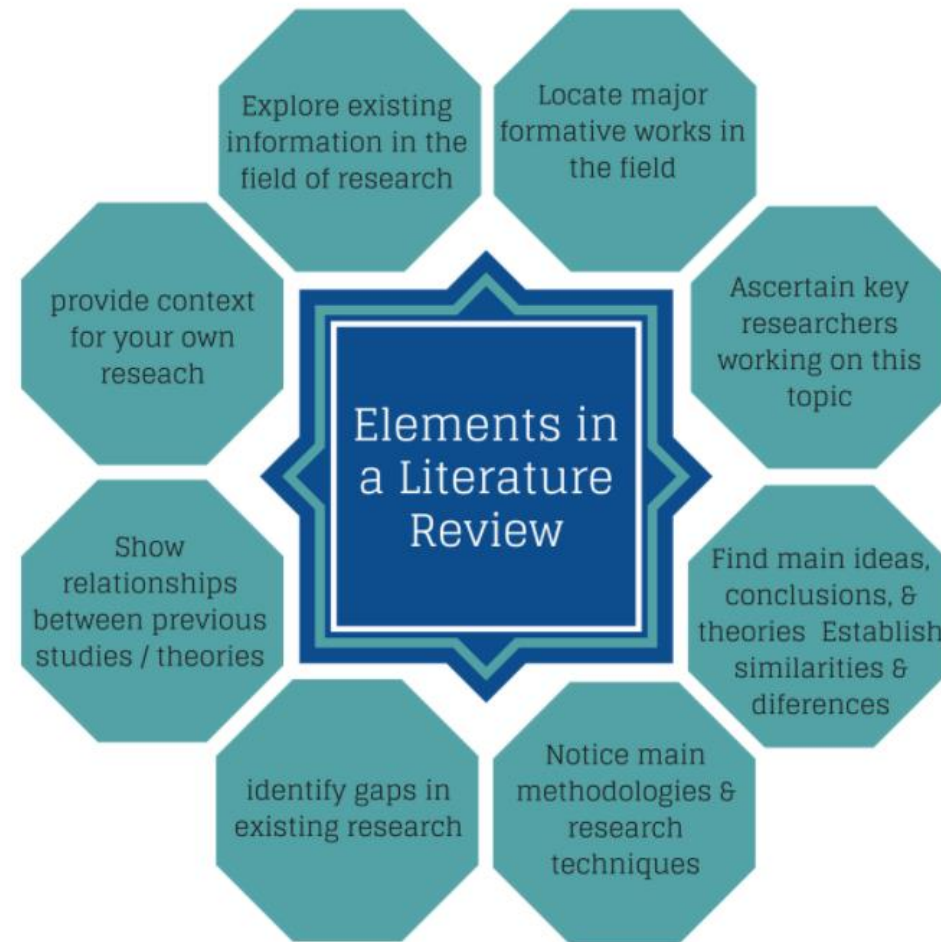
- Woodrow Wilson

Research may be done alone — but it is
never done in isolation. The production of
new knowledge is fundamentally
dependent on past knowledge.



Why do you need a literature review?

- Provide foundation of knowledge on a particular topic
- Identify areas of prior work to prevent duplication and give credit to other researchers
- Identify inconsistencies: gaps in research, conflicts in previous studies, open questions left from other research
- To identify data sources that other researchers have used.
- To contribute to the field by moving research forward. Reviewing the literature lets you see what came before, and what did and didn't work for other researchers.



Important Objectives of the LR

- To demonstrate your ability to scan relevant literature efficiently and identify a set of useful resources for your research.
- To demonstrate your understanding, and your ability to critically evaluate research in the field.

How to get started on the LR

- **Read Research Papers**

Types of literature

- Journals
- Books
- Conference proceedings
- Internet
- CD-ROMs
- Government Publications
- Publications of International organizations
- Thesis and dissertations
- Newspaper articles

**Opinions, however true it maybe, do not
carry any weight.**

We need facts.

Tips to keep in mind while writing the LR

- Always begin with an introduction to the review & end with a summary
- LR is your creative contribution, so long as it is arranged in a logical order with subtopics that help organize the content
- Use direct quotations infrequently
- Summarize each subtopic
- LR is written in a third person format
- Always cite your sources

Cite / Reference knowledge that you are borrowing

The act of referencing

- It is essential that you reference all items that you use in your work to ensure good academic practice by acknowledging other people's ideas
- Enables others to see what sources you have used
- Gives more authority to your arguments
- Allows readers to find the original sources
- Avoids plagiarism

Citing / Referencing the right way

- https://www.westminster.ac.uk/sites/default/public-files/general-documents/Referencing%20Your%20Work%20booklet_06.1.pdf
- <https://www.youtube.com/playlist?list=PLYQnRNlgH1KGDMYKSLVrQyRTMZHZoHUht>
- Use Harvard Referencing (Westminster Style)
- Use a software for referencing (EndNote, Zotero, Mendeley etc.) or an online tool (ZoteroBib)

To avoid Plagiarism...

- Use quotation marks for the extracts you copy directly from a source and acknowledge the source.
- Use proper paraphrasing and acknowledge the source.
- Keep careful notes of your source when you read. Keep the bibliographical information that you will need to write a full reference for the source.
- Common mistake – reference is in the text but not listed in the bibliography or references