

# INTRODUCTION TO RESEARCH METHODOLOGY

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# Research?

- A careful investigation for new facts in any branch of knowledge
- **Redman and Mory:** Research is a systematic effort to gain new knowledge

# Research?

- **Clifford Woody:** Research-
- defining and redefining problems, formulating hypothesis/objectives;
- collecting, organizing and evaluating data;
- making deductions and reaching conclusions;
- testing the conclusions to determine whether they fit the formulating hypothesis/objectives

# Why do research?

- Desire to get a research degree along with its consequential benefits
- Desire to face the challenge in solving the unsolved problems
- Desire to get intellectual joy of doing some creative work
- Desire to be of service to society
- Desire to get respectability
- Directives of government, employment conditions etc.

# Why do research?...

- ◉ **Validate intuition**
- ◉ **Improve methods**
- ◉ **Demands of the Job**
- ◉ **For publication/patent**

# Choose a subject

- Based on an idea
- Based on your experience
- Based on your reading
- Originality

# The important features of a research design

- **A plan**

Specify the sources & types of information relevant to the research problem

- **A strategy**

Which approach will be used for gathering and analyzing the data

- **The time and budgets**

Most studies are done under these two constraints

# CHARACTERISTICS OF RESEARCH

- **Systematic**- All steps must be inter related- one to another
- **Logical**- Agreeing with the principles of logic
- **Empirical**-Conclusions should be based on evidences/observations



# CHARACTERISTICS OF RESEARCH...

- **Objectivity-** It must answer the research questions
- **Replicable-** reproducible
- **Transmittable**
- **Quality control-** Accurate measurements
- **All well designed and conducted research has potential application**

# Define Your objectives

- Try to keep these simple
- The more variables the more difficult
- Use the opportunity
- Get help at this stage
  - Senior colleagues
  - Experienced researchers

# Literature search

- Check to see if your idea is original
- Get articles
- Read articles and their references
- Most of these will be vital when writing up reports
- Find gap areas
- Find obsolete measurements and results
- Define objectives of the study

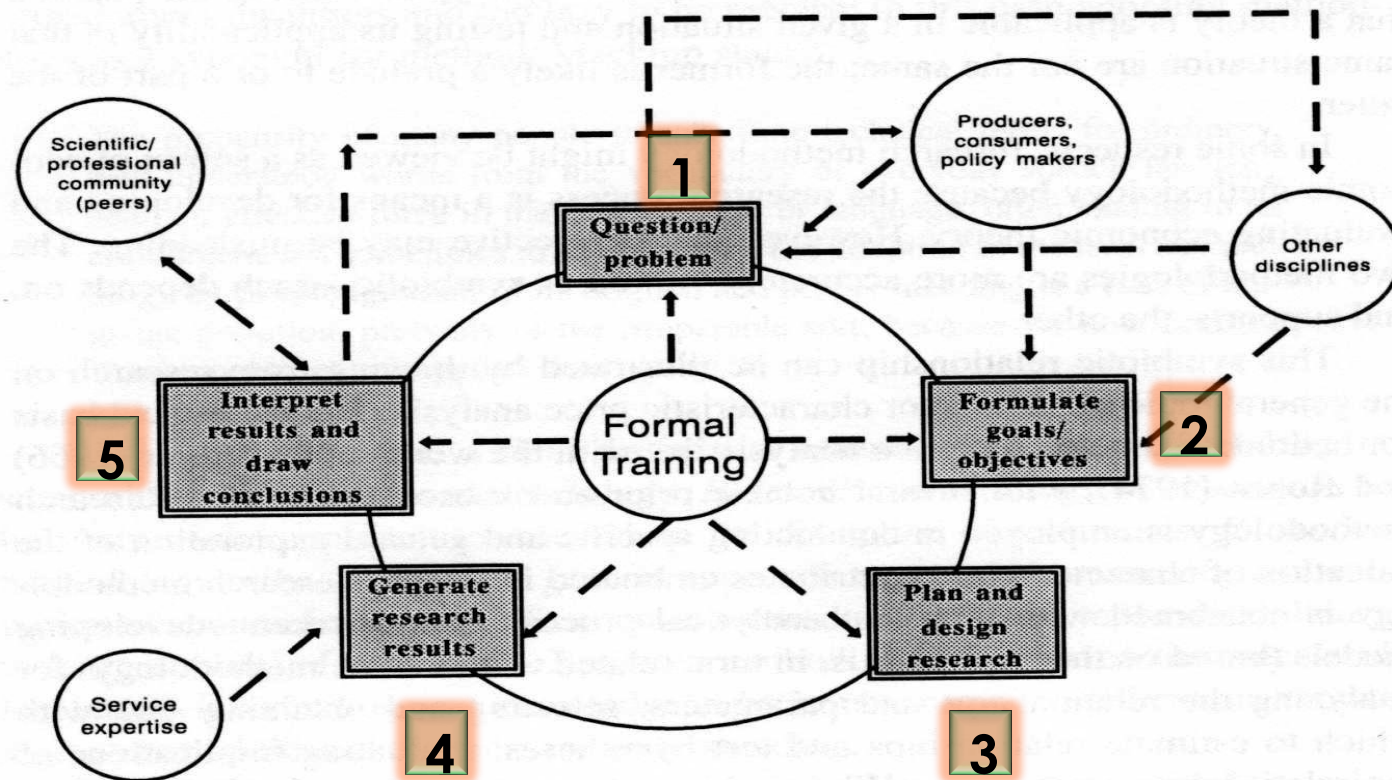
# Steps involved in a research

- ◉ Choose a subject
- ◉ Literature survey
- ◉ Defining and formulation of specific objectives
- ◉ Prepare Synopsis
- ◉ Procuring of suitable apparatus/materials
- ◉ Design of experimental set up
- ◉ Preliminary experiments
- ◉ Execution of the project
- ◉ Accurate measurements/data collection

# Steps involved in a research...

- ◉ Data analysis and error compounding
- ◉ Hypothesis testing and verification
- ◉ Results and discussion
- ◉ Generalization, interpretation and drawing conclusions
- ◉ Preparation of the project report or writing thesis

# The Process of Research



**Figure 2.2.** Schematic of research process.

# Research article writing

- Find suitable/specified journals
- Get copy of Instructions to authors
- Prepare article as per instructions
- Select suitable titles
- Authors and affiliations
- Abstract
- Highlights
- Novelty statements
- Introduction
- Materials and methods
- Results and discussion
- Conclusions
- Acknowledgements
- References

# Authorship/ethics

- All authors should directly involved in entire study
- Article is free from plagiarism
- Should follow ethics



# A Research Report

*A Research Report generally include:*

- Introduction and Statement of problem
- Review of relevant literature
- Statement of hypothesis or research objectives
- Theoretical resume
- Description of research design
- Description Experimental design
- Description of measurement and data analysis
- Error compounding
- Presentation of Results
- Discussion
- Conclusion, limitations, and implications
- Suggestions for future work
- Acknowledgements
- References cited
- Appendices

# Types of research

## 1. **Application-** Pure and Applied Research

**Applied-** Finding solutions for immediate problems facing a society/industry

**Pure-** Concerned with generalization and formulation of a theory

## 2. **Inquiry Mode-** Quantitative and qualitative

**Quantitative-** Measurements of quantity or amount

**Qualitative-** Concerned with qualitative phenomena (reasons for human behavior)

# Research Studies

- Based on research objectives:
  - ❖ *Exploratory or formulative research*- To gain familiarity with a phenomenon or to achieve new insights into it
  - ❖ *descriptive research*- To study accurately the characteristics of a particular individual, situation or a group-includes survey

# Research Studies

- ❖ **Diagnostic research-** To determine the frequency with which something occurs or with which it is associated with something else
- ❖ **hypothesis-testing research-** To test a hypothesis of a causal relationship between variables

## + Research methodology

- + Methodology is a theoretical aspect on how research should be undertaken.
- + Research methodology is a systematic way to solve a problem. It is a science of studying how research is to be carried out.
- + Essentially, the procedures by which researchers go about their work of describing, explaining and predicting phenomena are called research methodology.
- + It is also defined as the study of methods by which knowledge is gained. Its aim is to give the work plan of research.
- + Research methodology seeks to answer: how did the researcher complete his study.

## + Research Methods/design

- Research methods are the various procedures, schemes, steps and algorithms used in research.
- All the methods used by a researcher during a research study are termed as research methods.
- They are essentially planned, scientific and value-neutral. They include observations, theoretical procedures, experimental studies, numerical schemes, statistical approaches, etc. Research methods help us collect samples, data and find a solution to a problem.
- A subset of research methodology
- Research method seeks to answer: what did the researcher use to complete his research.

**“Science is not belief,  
but the will to find out.”**

Thank you