

27-2-2023

# RESEARCH METHODOLOGY

# Course Objectives

To give the students:

- A comprehensive understanding on all aspects of research.
- A guide on how to conduct research in a systematic way.
- A guide to solve and analyze data and results.
- A guide on writing techniques and presentation skill.

# Course Contents

- Introduction
- Literature Review
- Research Design
- Result and Analysis
- Writing and Presentation
- Evaluation of Research and Thesis
- Research Organization

# What is Research?

- **CASE 1**

En. Samad prepared a paper on “Computer usage in secondary schools” after reviewing literature on the subject available in his university library and called it a piece of research.

- **CASE 2**

En. Ali says that he has researched and completed a document which gives information about age of his students, their SPM results, their parents’ income and distance of their schools from home.

# What is Research (cont.)?

- **CASE 3**

Mr Wilson participated in a workshop on curriculum development and prepared what he calls, a research report on the curriculum for building technicians. He did this through a literature survey on the subject and by discussing with the participants of the workshop.

# What is Research (cont.)?

- **CASE 4**

A general manager of a car producing company was concerned with the complaints received from the car users that the car they produce have some problems with rattling sound at the dash board and the rear passenger seat after a few thousand kilometers of driving.

# What is Research (cont.)?

## What he did?

He obtained information from the company workers to **identify** the various factors influencing the problem. He then **formulated the problem** and generated guesses (hypotheses). He **constructed checklist** and obtained requisite information from a representative sample of cars. He **analyzed the data** thus collected, **interpreted** the results in the light of his hypotheses and reached **conclusions**.

# What is Research (cont.)?

**CASE 4** is an example of research because:

- The researcher went through a sequence of steps which were in order and thus systematic.
- The researcher did not just jump at the conclusions, but used a scientific method of inquiry in reaching at conclusions.



# What is Research (cont.)?

Research may be defined as a careful and **systematic process** of inquiry to find **answers to problems** of interest

To do research is to investigate the problem systematically, carefully, and thoroughly

# What is Research (cont.)?

Research is an organized, systematic, database, critical, scientific inquiry or investigation into a specific problem, undertaken with the objective of finding answers or solution to it.

# Two Important Characteristics

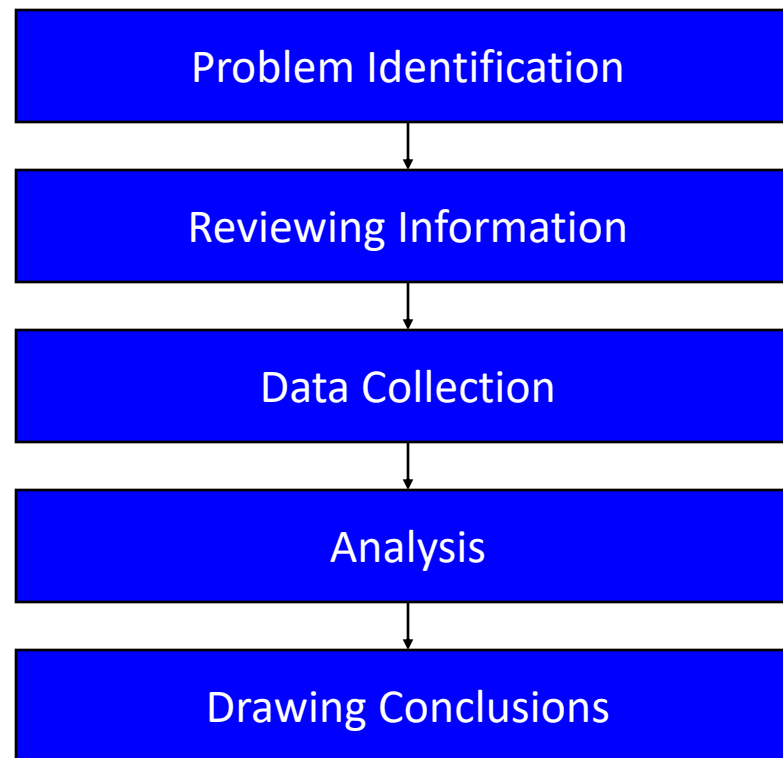
## 1. Systematic

Research is systematic, because it follows certain steps that are logical in order. These steps are:

- Understanding the nature of problem to be studied and identifying the related area of knowledge.
- Reviewing literature to understand how others have approached or dealt with the problem.
- Collecting data in an organized and controlled manner so as to arrive at valid decisions.
- Analyzing data appropriate to the problem.
- Drawing conclusions and making generalizations.

# Two Important Characteristics

## Systematic characteristic of research



# Two Important Characteristics (cont.)

## 2. Follows a scientific method

This means that it makes an integrated use of **Inductive** and **Deductive** reasoning. This makes it very useful for explaining and predicting phenomena.

The basic assumption of the scientific method is that every effect has a cause.

# Two Important Characteristics

## Inductive reasoning

- Construction of hypotheses from casual observations and background knowledge.
- From the examination of these, the researcher establishes certain expectations.

## Deductive reasoning

- Reasoning out consequences or implications of hypotheses followed by testing of the implications and confirmation or rejection of the hypotheses.

# Two Important Characteristics

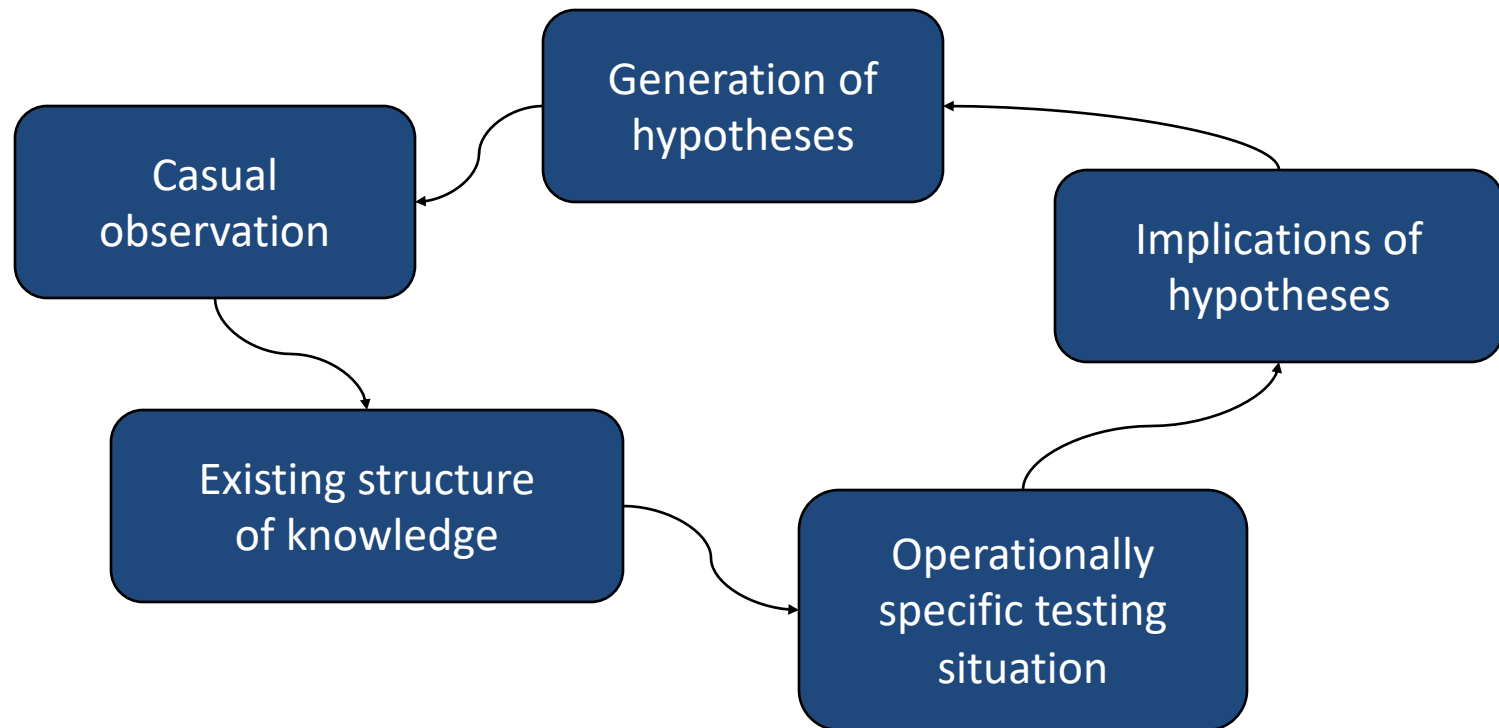
The finding of investigation add new knowledge to the existing structure of knowledge.

Further hypotheses are generated from the existing structure and the casual observations and testing of these may add to the new applicable knowledge.

This process continues in this manner, and therefore research becomes cyclic and dynamic.

# Two Important Characteristics

## Scientific method of inquiry





# The aims of research

- The goal of research is to solve problems of interest.

These problems may be of a theoretical or practical in nature

The scientific community tend to be more interested in research that pushes the frontier of knowledge

- the aims of research should be to describe, predict, explain, interpret or demystify phenomena

# Research Type

- There are many ways of classifying research. One way is to classify it by function.
- Basic or pure research is motivated by curiosity and aims to advance theoretical knowledge.
- Applied research is concerned with applying scientific theory to real-life problems
- Although research activities are classified according to their different natures, they will overlap and merge from one into the other.

# Research Type

Research can be divided into 5 categories:

1. Basic/pure/fundamental Research
2. Exploratory Research
3. Applied Research
4. Development Research
5. Design Research

# 1) Basic/Pure/Fundamental Research

Refers to original investigations for the advancement of scientific knowledge that do not have the specific objective of application to practical problems.

[Lee *et al.* 1990]

# 1) Basic/Pure/Fundamental Research

- It is research devoted to achieving a fuller knowledge or understanding rather than practical application of the subject under study.
- It is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts with or without any particular immediate application or use in view.
- It is not subject to a time-restraint and it is an open-ended

## 2) Exploratory Research

- Aims to clarify concepts and problems. Closely allied to underlying basic research, in which there is an objective.
- It is open-ended, looking for something which might form the basis for a successful research project development,

eg. Research for a new drug and examining the biological effects of a new range of chemical

### 3) Applied Research

- Research directed towards the practical application of knowledge.
- It involves the application of basic knowledge for the solution of a particular problem, the creation and evaluation of a new concepts or components but not development for operational use.

eg. Application of existing scientific knowledge to the problems of own institution.

## 4) Development Research

- Systematic use of scientific knowledge directed towards the production of useful materials, devices, systems or methods, including design and development of prototypes and processes.



## 4) Development Research

Can be further classified into:

### 1. Product development

- Refers to research regarding new products and products new to industry or combination of product components in a new way [Lee *et al.* 1990].

## 4) Development Research

### 2. Process development

- Refers to research into new or improved methods of control and control systems and changes or improvements in manufacturing and processes technologies.

## 5) Design Research

- Research directed at cost/performance improvement to existing products, processes or systems; recombination, modification and testing of systems using existing knowledge; or opening new markets for existing products.  
e.g. Parts and components research.

# Major Stage of Work

For conducting research, a researcher / investigator goes through 4 major stages of work:

1. Preparing research proposal
2. Organizing and conducting research
3. Writing a research report
4. Evaluating research

# Preparing Research Proposal

- Describes why of research
- What of research
- Questions about which researcher is seeking answers
- Hypotheses (expected relations) he would like to test
- How of research (methodology)

# Organizing & Conducting Research

- Researcher conducts research following methodology / plan.
- Makes small deviations, if necessary.

# Writing Research Report

- Researcher writes report which outlines the findings of study and its implications.

# Evaluating Research

- In order to find any gaps or weakness in study.
- Help in modifying the study and improving research in future.



# Capabilities Requirement

Capabilities required to undertake work:

1. Selecting and defining research problem.
2. Describing methodology of research.
3. Collecting data.
4. Analyzing data and interpreting the results.

# Selecting & Defining Research Problem

- Carry out literature review related to problem.
- Make thorough diagnosis to specify problem, research questions or hypotheses.

# Describing Methodology

- Select appropriate research design.
- Select subjects on whom the study has to be conducted.
- Select or develop instruments for measuring variables in study.

# Data Collection

- Develop capabilities of administering instruments, recording data, scoring and tabulating for analysis.

# Analyzing data & Interpretation of Results

- Acquire capabilities of selecting and applying appropriate statistical methods for handling and analyzing the collected data, so as to arrive at valid conclusions.

# Selecting a Problem

- Personal practical experiences.
- Critical study of literature.
- Interaction with others.

# Problem Selection Criteria (cont.)

- Interest:
  - If you are not interested in the area you want to research, what will the quality of the product be like?
  - By being interested, you are more likely to read widely on the topic and have more thorough knowledge of the situation.

# Problem Selection Criteria (cont.)

- Size:
  - Remember, a problem is often too large when it is first considered.
  - Further analysis can reduce large problem into a smaller, manageable research problem.



# Problem Selection Criteria (cont.)

- Economy:
  - Research are often confronted with practical constraints, not the least of which are time and money.
  - If your problem situation is macro in size, is it possible for you to find the answers to your question? Do you have enough time and money?

# Problem Selection Criteria (cont.)

- Capabilities and Limitations:
  - A researcher should not be too ambitious and must recognize your own capabilities.
  - Wise, especially at prior planning stage to seek advice from more experienced persons.
  - If inexperienced in educational research, then it is highly likely that you will need some guidance.

# Problem Selection Criteria

- Uniqueness:
  - Findings from research should contribute to body of knowledge already in existence, not merely duplicate existing study.
  - However, to pursue a study similar to one already in existence but change the methods used, or modify the design, or use a different sample, or choose to perform different statistical analyses.

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# THANK YOU