

# **RESEARCH METHODOLOGY**

**METHODOLOGY : System of Methods**

**METHOD: An orderly procedure for  
doing something**

# RESEARCH

Research is *a quest for knowledge* through diligent search or investigation or experimentation **aimed at the discovery and interpretation of new knowledge. (WHO)**

# RESEARCH

**A systematized effort to gain new knowledge (Redman).**

**A careful investigation or inquiry specially through **search for new facts** in any branch of knowledge (Advanced Learners' Dictionary)**

# RESEARCH METHODOLOGY

- *Research methodology* is a way to systematically solve the research problem.
- It may be understood as a science of studying how research is done scientifically.
- In it we study the various steps that are generally adopted by a researcher in studying his research problem along with the logic behind them.

# RESEARCH OBJECTIVES

- The purpose of research is to discover answers to questions through the application of scientific procedures.
- The main aim of research is to find out the truth which is hidden and which has not been discovered as yet.

# THE PURPOSE OF RESEARCH IS TO:

- Review or synthesize existing knowledge
- Investigate existing situations or problems
- Provide solutions to problems
- Explore and analyze more general issues
- Construct or create new procedures or systems
- Explain new phenomenon
- Generate new knowledge



# DIFFERENT TYPES OF RESEARCH

- Exploratory Research
- Descriptive Research
- Analytical Research
- Predictive Research

# Exploratory Research

Exploratory research is undertaken when few or no previous studies exist. The aim is to look for patterns, hypotheses or ideas that can be tested and will form the basis for further research.

Typical research techniques would include case studies, observation and reviews of previous related



# Descriptive Research

Descriptive research can be used to identify and classify the elements or characteristics of the subject, e.g. number of days lost because of industrial action.

Quantitative techniques are most often used to collect, analyse and summarise data.

# Analytical Research

Analytical research often extends the Descriptive approach to suggest or explain **why** or **how** something is happening, e.g. underlying causes of industrial action. An important feature of this type of research is in locating and identifying the different factors (or variables) involved.

# Predictive Research

The aim of Predictive research is to speculate intelligently on future possibilities, based on close analysis of available evidence of cause and effect, e.g. predicting when and where future industrial action might take place.

# RESEARCH APPROACHES

- **Quantitative/Qualitative**

- The emphasis of **Quantitative** research is on collecting and analysing numerical data; it concentrates on **measuring** the scale, range, frequency etc. of phenomena.
- **Qualitative** research is more subjective in nature than Quantitative research and involves examining and reflecting on the less tangible aspects of a research subject, e.g. values, attitudes, perceptions.

- **Applied/Basic**

- **Basic Research** is to improve knowledge generally, without any particular applied purpose in mind at the outset.
- **Applied Research** is designed from the start to apply its findings to a particular situation

# Scientific Research Steps

1. Formulating the Research Problem
2. Extensive Literature Review
3. Developing the objectives
4. Preparing the Research Design
5. Collecting the Data
6. Analysis and Interpretation of Data
7. Preparation of the Report or Presentation of Results-Formal write ups of conclusions

# Scientific Research Steps

**1** • **Research question / Problem**

*What are you interested in?  
What do you have to know about it?*

**2** • **Background / Observation**

Make observations & gather background information about the problem

**3** • **Formulate hypothesis**

*An educated guess ...*  
It shall be possible to measure / test it  
It should help answer the original question

**4** • **Design experiment**

How will you test your hypothesis?  
What tests will answer your question?

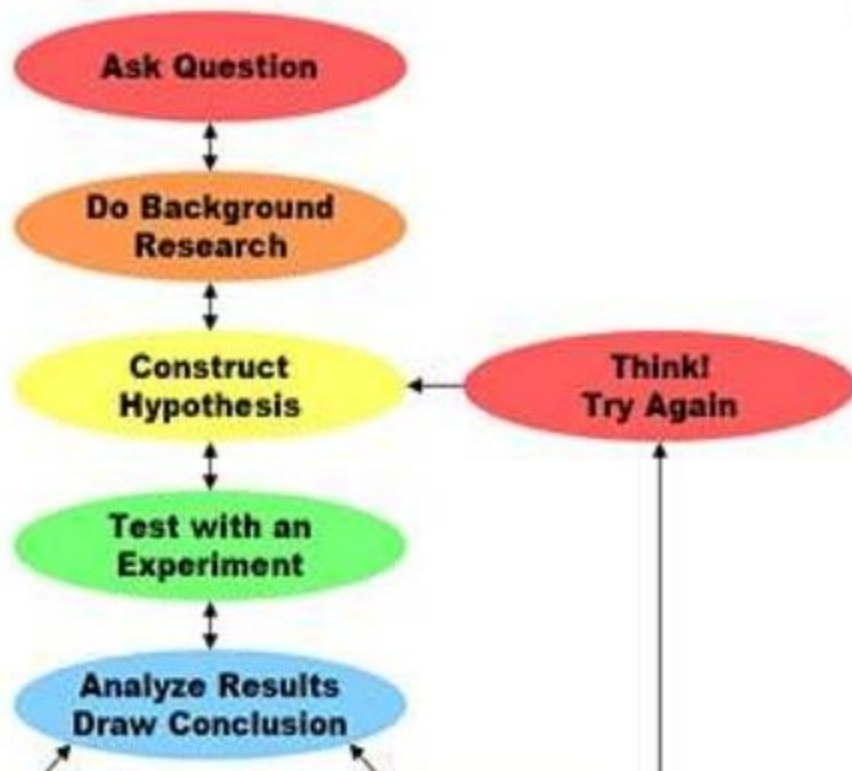
**5** • **Test hypothesis / Collect data**

Test your hypothesis by executing your experiments. Collect data from them





# Other Variant

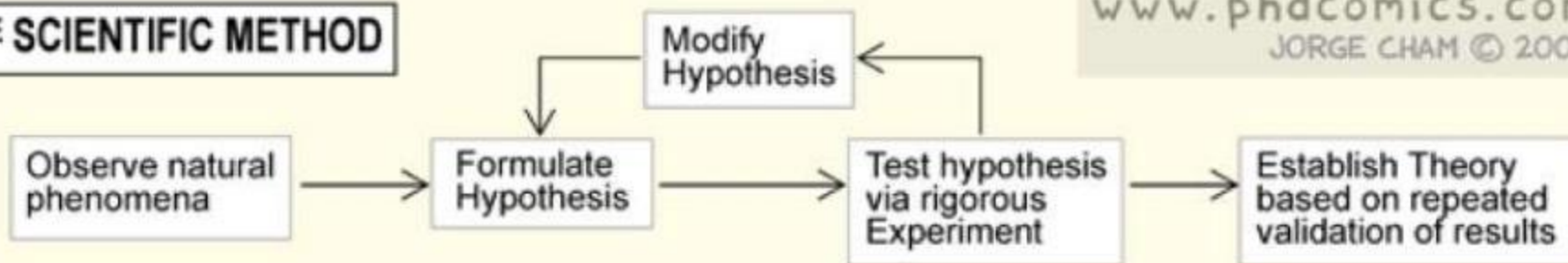


1. Define the question
2. Gather information and resources (observe)
3. Form hypothesis
4. Perform experiment and collect data
5. Analyze data
6. Interpret data and draw conclusions that serve as a starting point for new hypothesis
7. Publish results

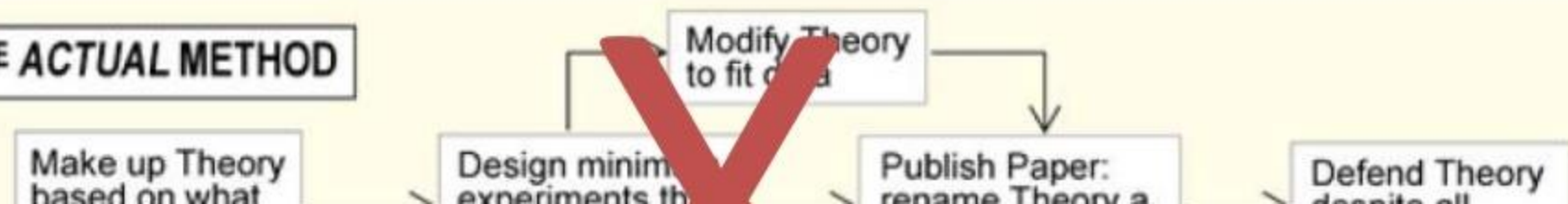
# IN PRACTICE

## THE SCIENTIFIC METHOD

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## THE ACTUAL METHOD



## Step 1: Steps in formulation of a research problem

1. Identify a broad field or subject area of *interest* to you.
2. *Dissect* the broad area into sub areas.
3. *Select* what is of most interest to you.
4. Raise research questions.
5. Formulate objectives.

## Step 2: Background/Observation

- How has the work been done previously?
- What similar work has been leading up to this point?
- Study state of the art
  - (literature review, projects, informal discussions, etc)
  - Optional realization of preliminary experiments

# Reviewing the literature

- Essential preliminary task in order to acquaint yourself with the available *body of knowledge* in your area of interest.
- Literature review is integral part of entire research process and makes valuable contribution to every operational step.
- Reviewing literature can be time-consuming, daunting and frustrating, but is also rewarding. Its functions are:
  - Bring clarity and focus to your research problem;
  - Improve your methodology;

# Procedure for reviewing the literature

1. Search for existing literature in your area of study;
2. Review the literature selected;
3. Develop a theoretical framework;
4. Develop a conceptual framework.



# Review of Literature

Critically review the literature on the problem under study:

- Any such work done by other in the past.
- State whether you want to confirm the findings.
- Challenge the conclusion.
- Extend the work further.



## Step 3: The formulation of objectives (1)

- Objectives are the goals you set out to attain in your study.
- They inform a reader what you want to attain through the study.
- It is extremely important to word them clearly and specifically.

## The formulation of objectives (2)

- The *main objective* is an overall statement of the thrust of your study.
- It is also a statement of the main associations and relationships that you seek to discover or establish.
- The *sub-objectives* are the specific aspects of the topic that you want to investigate within the main framework of your study.

# Hypotheses

- Hypotheses is an assumption, suspicion, assertion or an idea about a phenomenon, relationship or situation, the reality or truth of which you do not know.
- A researcher calls these assumptions/hypotheses and they become the basis of an enquiry.
- In most studies the hypotheses will be based upon your own or someone else's observation.
- Hypotheses bring clarity, specificity and focus to a

# The functions of hypotheses

- The formulation of hypothesis provides a study with focus. It tells you what specific aspects of a research problem to investigate.
- A hypothesis tells you what data to collect and what not to collect, thereby providing focus to the study.
- As it provides a focus, the construction of a hypothesis enhances objectivity in a study.

# Characteristics of Hypotheses

- Should be simple, specific and conceptually clear.
- ... ambiguity would make verification almost impossible.
- Should be capable of verification.
- ... i.e. There are methods and techniques for data collection and analysis.
- Should be related to the existing body of knowledge.
- ... i.e. Able to add to the existing knowledge.



# Identifying Variables

- In a research study it is important that the concepts used should be operationalized in measurable terms so that the extent of variations in respondents' understanding is reduced if not eliminated.
- Techniques about how to operationalize concepts, and knowledge about variables, play an important role in reducing this variability

## Step 4: Preparing Research Design

- *Research design is the conceptual structure within which research would be conducted.*
- The function of research design is to provide for the collection of relevant information with minimal expenditure of effort, time and money.
- The preparation of research design, appropriate for a particular research problem, involves the consideration of the following :
  1. Objectives of the research study.
  2. Method of Data Collection to be adopted



# EXPERIMENTAL METHOD

- Also called *Empirical Research* or *Cause and Effect Method*, it is a data-based research, coming up with conclusions which are capable of being verified with observation or experiment.
- Experimental research is appropriate when

# DESIGN EXPERIMENT

- Includes planning in detail all the steps of the experimental phase. In engineering research it often includes the design of a prototype / system architecture.
- Identify the variables that will be manipulated and measured – the research outcomes must be measurable.
- In other words:
  - What needs to be controlled in order to get an unbiased answer to the research question.
- Therefore: it is necessary to not only design a prototype / system but also the thesis validation method !

# Guidelines to Construct a Research Tool

- *The underlying principle behind the guidelines suggested below is to ensure the validity of your instrument by making sure that your questions relate to the objectives of your study.*
- *Step I: Clearly define and individually list all the specific objectives or research questions for your study.*
- *Step II: For each objective or research questions, list all the associated questions that you want to answer through your study.*
- *Step III: Take each research question listed in step II and list*

## Step 5: COLLECTING DATA

- Having formulated the research problem,, developed a study design, constructed a research instrument and selected a sample, you then collect the data from which you will draw inferences and conclusions for your study. Depending upon your plans, you might commence interviews, mail out a



## Step 6: ANALYSING AND INTERPRETING DATA

- Processing and analyzing data involves a number of closely related operations which are performed with the purpose of summarizing the collected data and organizing these in a manner that they answer the research questions (objectives).
- Interpretation is to which extent the research and the conclusions of the research apply to the real world. It is not always so that good research will reflect the real world, since we can only measure a small portion of the

# Ethical issues relating to the researcher

## **i) Avoiding bias:**

- Bias is a deliberate attempt to either to hide what you have found in your study, or highlight something disproportionately to its true existence.

## **ii) Using inappropriate research methodology:**

- It is unethical to use a method or procedure you know to be inappropriate e.g. selecting a highly biased sample, using an invalid instrument or drawing wrong conclusions.

## **iii) Incorrect reporting:**



- To report the findings in a way that changes or slants them to

## Step 8: REPORTING THE FINDINGS

- Writing the report is the last, and for many, the most difficult step of the research process. The report informs the world what you have done, what you have discovered and what conclusions you have drawn from your findings. The report should be written in an academic style. Language should be formal



# HOMework

- Choose a research topic following steps in formulation of a research problem. 
- Read at least 5 papers related to your research topic and make critical review 
- Report must be submitted/e\_mailed on or before Oct. 17 midnight.