Research Methodology

Overview of Research and its Methodology

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Overview

- What Is Research?
- Different Kind of Research
- What Is Research Methodology?

What Is Research?

- What?
- Why?
- Who?
- When?
- Where?

What Is Research?

- You will know it when you have understood the concept of the term ‘research’.
- Hunting for facts or truth about a subject
- Organized scientific investigation to solve problems, make and test hypotheses, develop or invent new products

What Is Research?

- The researcher did not just jump at the conclusions but used a scientific method of inquiry in reaching at conclusions.
- The researcher went through a sequence of steps which were in order and thus systematic.
- The two important characteristics of research are: it is systematic and secondly it follows a scientific method of enquiry.

What Is Research?

- 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.

What Is Research?

- Collecting data in an organized and controlled manner to arrive at valid decisions.
- Analyzing data appropriate to the problem.
- Drawing conclusions and making generalizations.

What Is Research?

- It is based on the work of others.
- It can be replicated (duplicated).
- It is generalizable to other settings.
- It is based on some logical rationale and tied to theory.
- It is doable!
- It is incremental.

What Is Research?

- It generates new questions or is cyclical in nature.
- It is apolitical activity that should be undertaken for the betterment of society.

What Is Research?

- Research 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/or predicting phenomena.
- The basic assumption of the scientific method is that every effect has a cause.

What Is Research?

- It starts with the construction of hypotheses from casual observations and background knowledge (inductive reasoning) to reasoning out consequences or implications of hypotheses (deductive reasoning) followed by testing of the implications and confirmation or rejection of the hypotheses.

What Is Research?

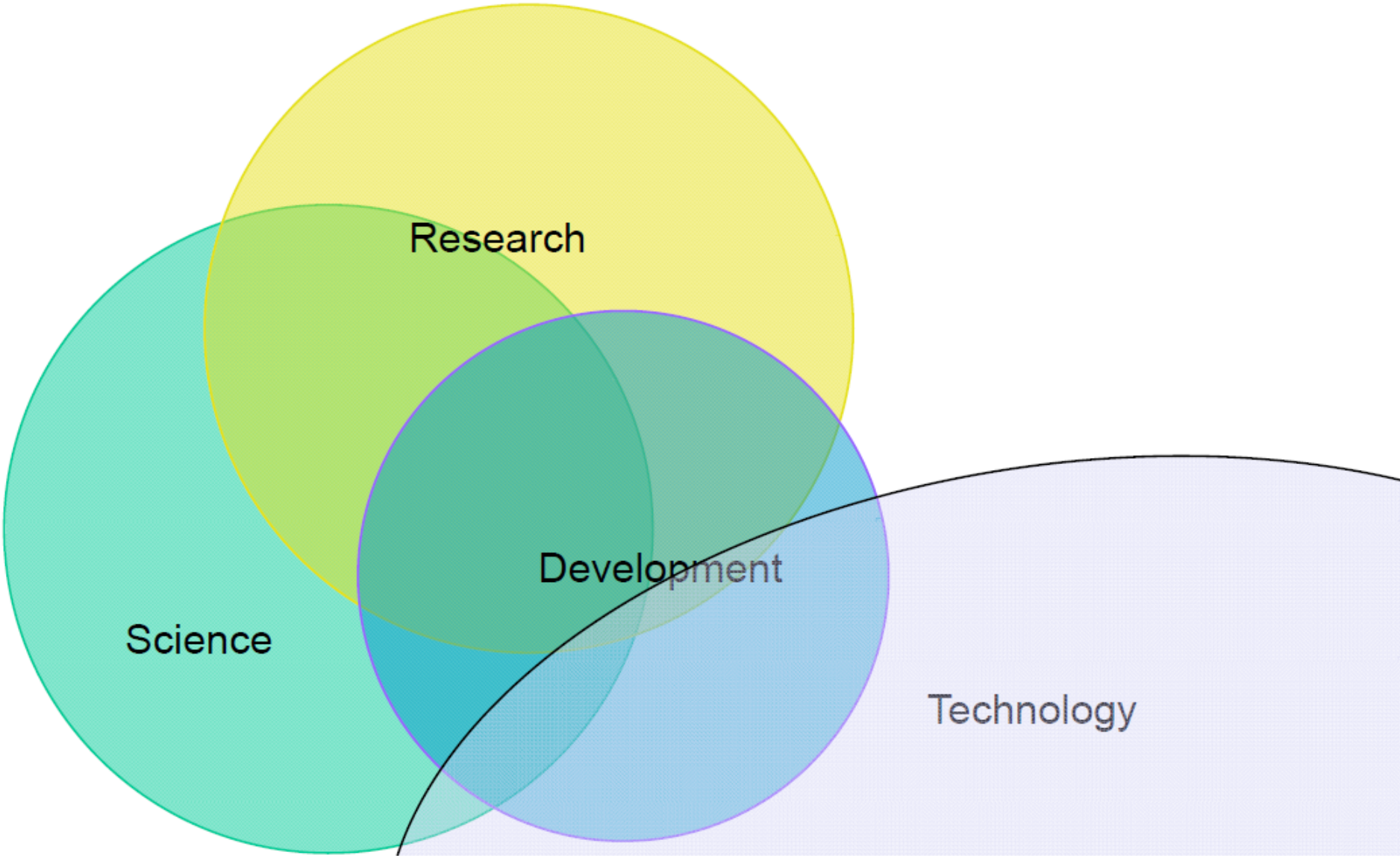
- Integrated use of inductive and deductive reasoning is, therefore, the essence of scientific method.

Don’ts In Research

- Plagiarizing other people’s work.
- Falsifying data to prove a point.
- Misrepresenting information and misleading participants.

Who and Why?

- To get PhDs, Masters and Bachelors
- To provide solutions to complex problems
- To investigate laws of nature
- To make new discoveries
- To develop new products
- To save costs
- To improve our life
- Human desires


Research
Development
Science
Technology

Technology

- New development of collaborations between different research disciplines is enabled by the progress of technology.

Different Kind of Research

- There are two ways of classifying research.
  - One way is to classify research based on its purpose.
  - The other is to classify research based on the method employed in research.

Different Kind of Research

- Based on purpose
  - Basic or pure research
    - No immediate application
  - Applied research
    - immediate application
  - Development research
  - Strategic research

Different Kind of Research

- Based on Method
  - Historical (past)
  - Descriptive (current)
  - Correlational (relationship/ prediction/ future)
  - Experimental
  - Explanatory
  - Evaluation

Different Kind of Research

- Based on position
  - Academic
  - Industrial
  - Market
- Based on data
  - Quantitative
  - Qualitative
  - Quantitative/ Qualitative

What Is research Methodology?

- Find a problem …
- Is the research earned or given?
- Who can do research?
- Genius is 1% inspiration and 99% perspiration
- Scientific research method by Francis Bacon, Centurions, Galileo

What Is research Methodology?

- Scientific research method requires
  - Science
  - Methodology
- Scientific research method
  - Conductivity
  - Doable
  - Repeatable

What Is research Methodology?

- Goals
  - Proper explanation
  - Discovering the reasons
  - Inference
  - Conduction

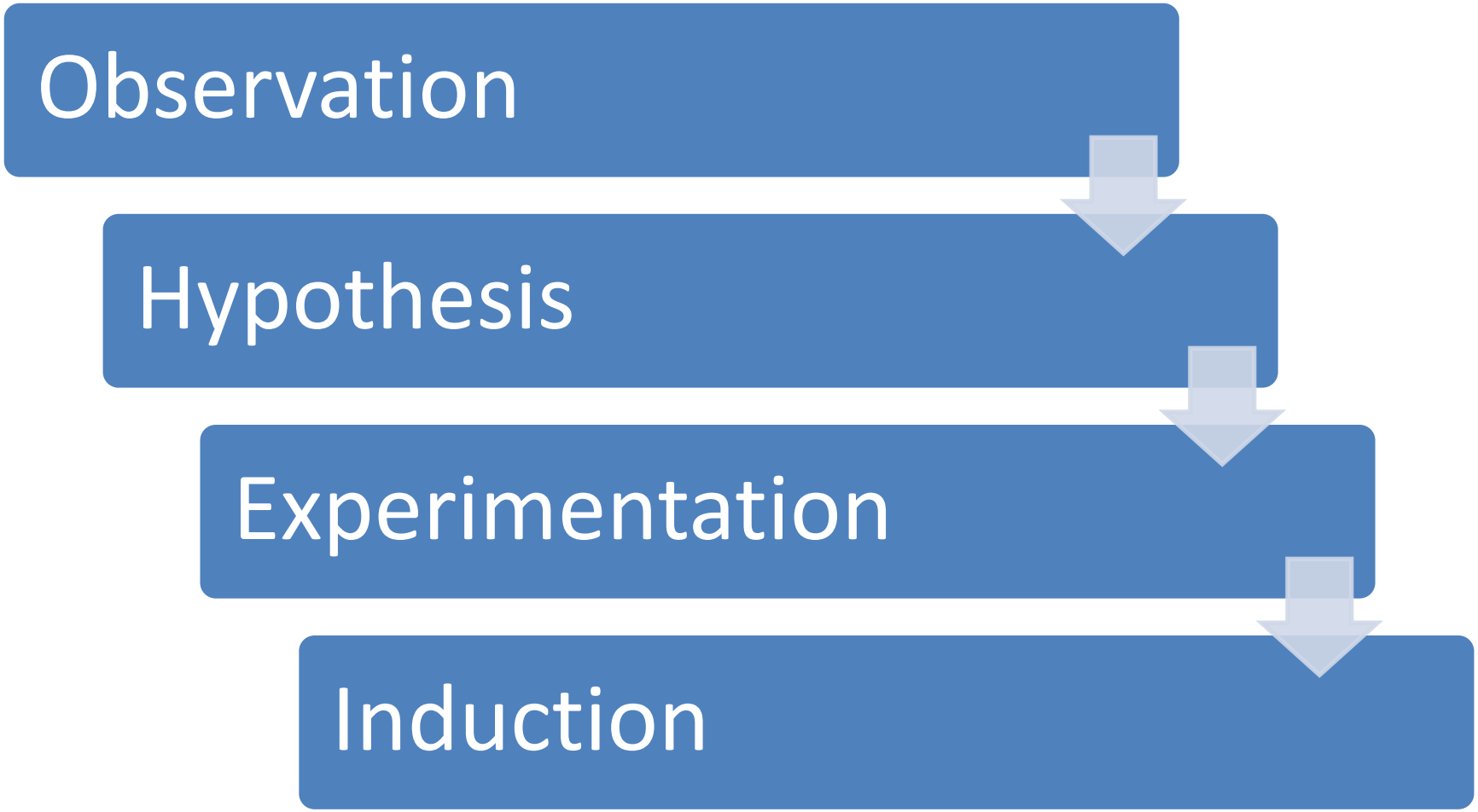
Scientific Research Methodology

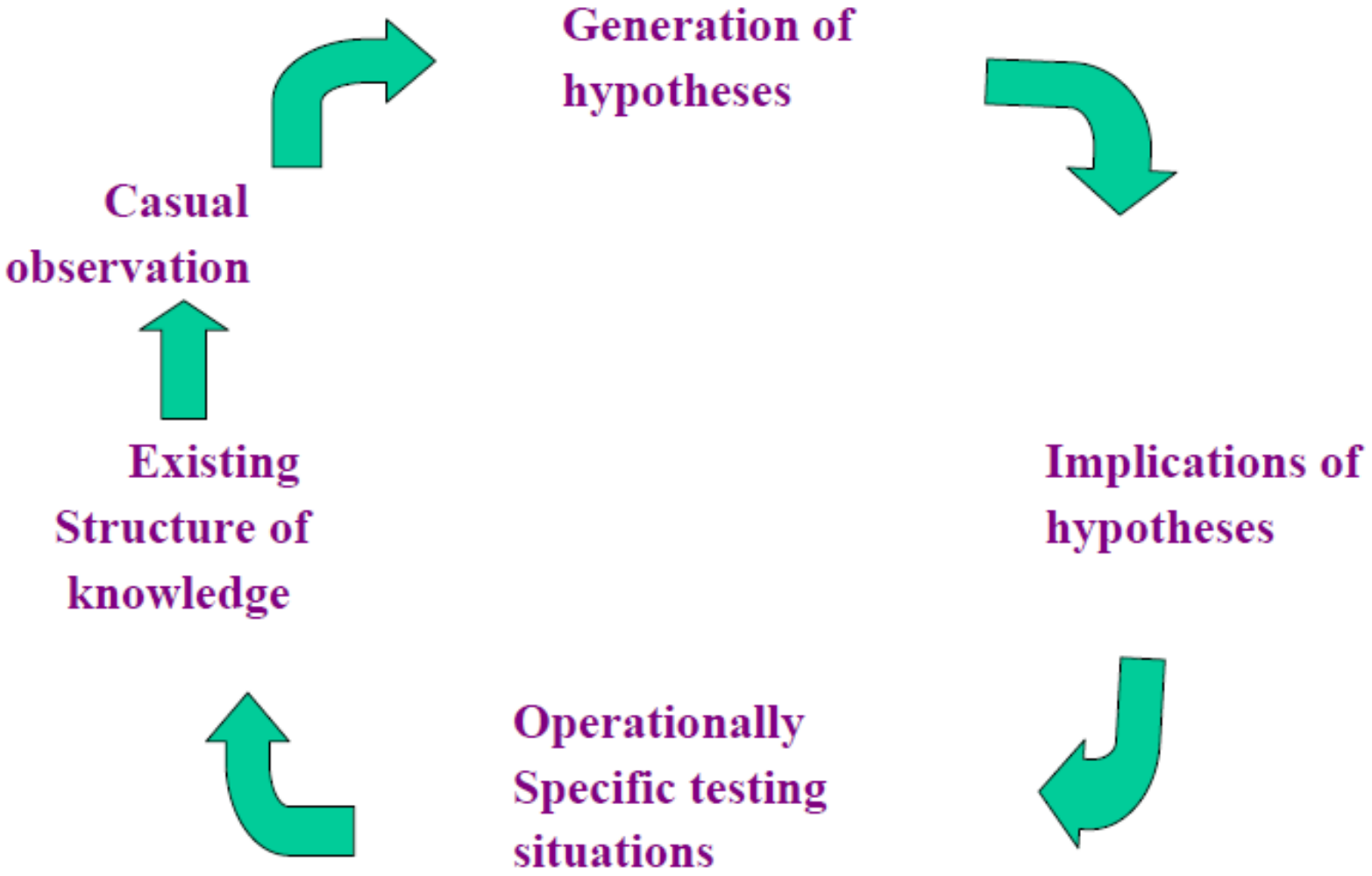
- **Engineers make the things work**
  - **Solving problems**
    - Understand the problem
    - Analyze the problem
  - **Find solutions**
    - Constructing the solution from parts that address the problem's
    - Various aspects - do a synthesis

Scientific Research Methodology

- **To achieve the goal engineers**
  - Apply theories, methods and tools from different disciplines
  - Search for solutions even when there is not theory or methods

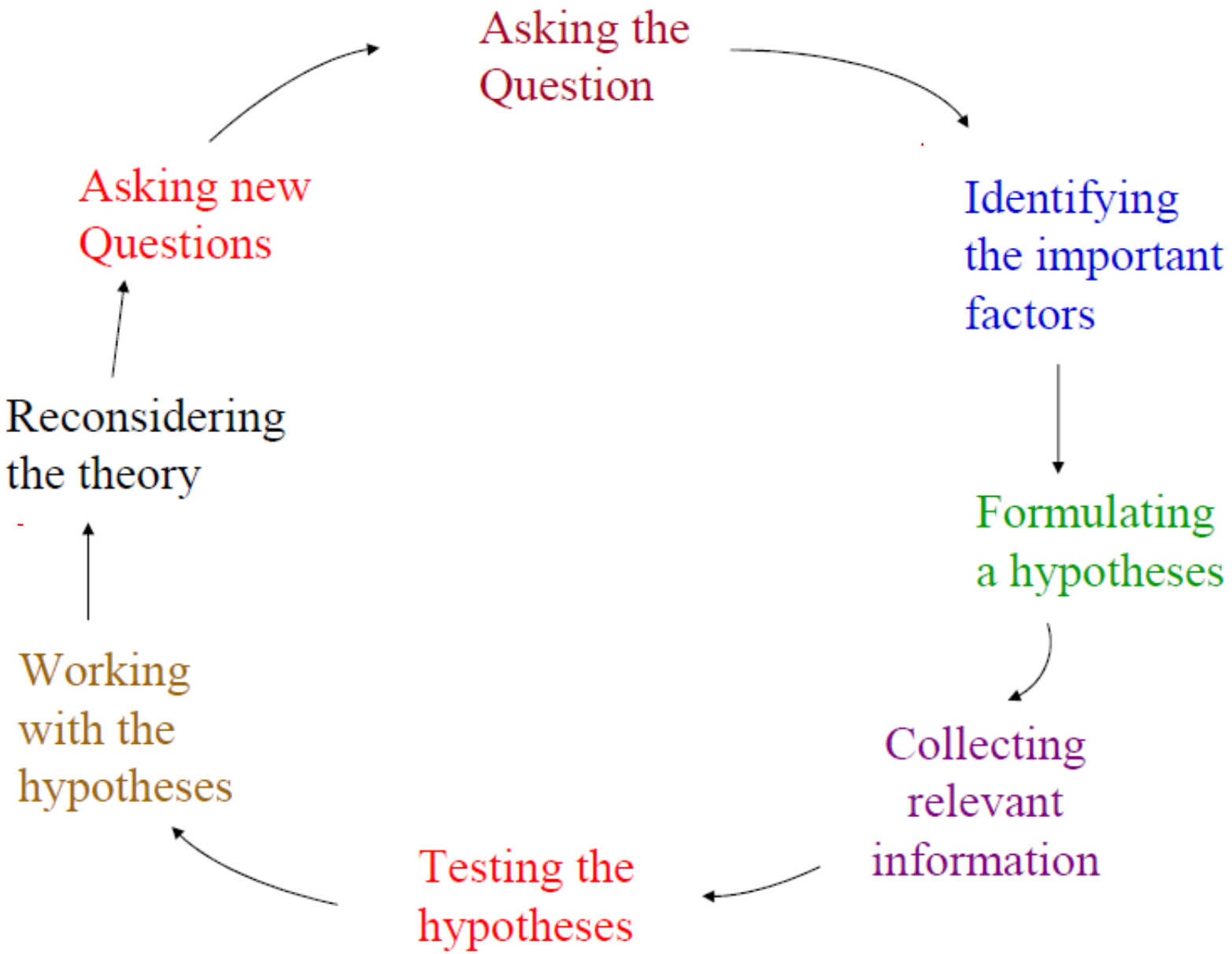
Scientific Research Methodology





Scientific Method of Acquiring Knowledge of Problem Solving

(By courtesy of Yadav & Menon)


Asking the Question
Identifying the important factors
Formulating a hypotheses
Collecting relevant information
Testing the hypotheses
Working with the hypotheses
Reconsidering the theory
Asking new Questions

Scientific Research Methodology

- Observation
  - Science and knowledge
  - Observation and scientific skills
  - Critical mind
  - Management
- Goals
  - Problem definition
  - Data collection

Scientific Research Methodology

- Problem definition
  - Good observation raise good problem definition
  - Conception
  - Problem formulization
- Data collection
  - Good references
  - Creative mind
  - Distinction

Scientific Research Methodology

- Hypothesis
  - Actually, defined in observation step
  - Relation between observation and problem solving
  - It is not always a fact
  - Data collection/ hypothesis definition
  - Induction, deduction, novation

Scientific Research Methodology

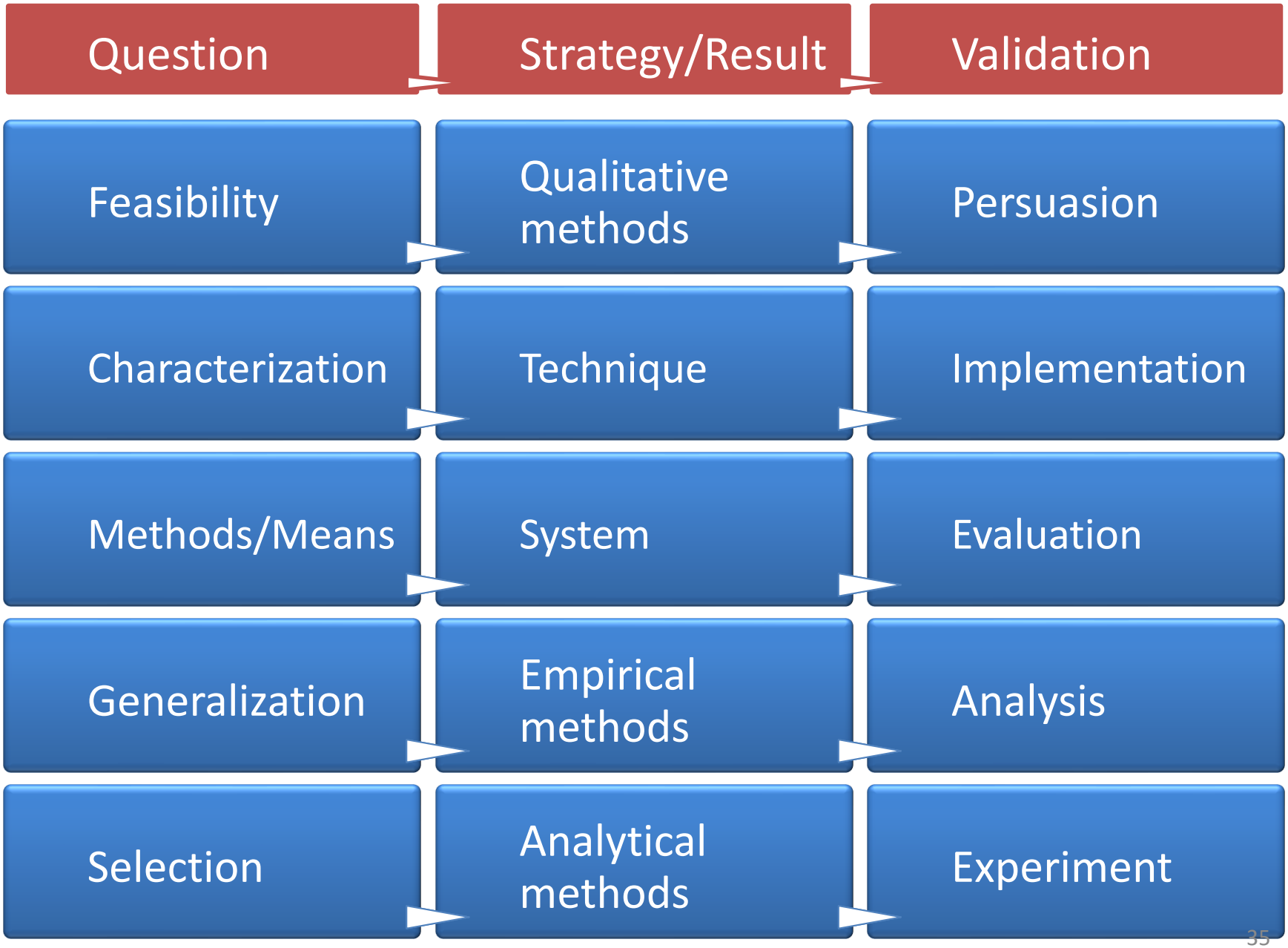
- Hypothesis
  - Scientific meaning
  - Scientific compatibility
  - Interpretable with observation
  - Actually testable

Scientific Research Methodology

- Experimentation (engineering)
  - Good accuracy
  - laboratory
  - Simulation
  - Field experiment/study

Scientific Research Methodology

- Induction
  - Acceptance or rejection of hypothesis
  - Defining new hypothesis
  - Mathematical modeling
  - Statistical analysis
  - Discussion and conclusion


Question
Strategy/Result
Validation
Feasibility
Qualitative methods
Persuasion
Characterization
Technique
Implementation
Methods/Means
System
Evaluation
Generalization
Empirical methods
Analysis
Selection
Analytical methods
Experiment

Any Question?

THANKS FOR YOUR ATTENTION