

Module -2

Research Design: What is a Research Problem? Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, Meaning of Research Design, Need for Research Design, features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs

5 Hours

What is a Research Problem?

A "research problem" is a specific issue, gap in knowledge, or challenge within a field that a researcher aims to investigate and address through a research study;

Essentially, it's the core question or concern that drives the entire research process, guiding the data collection and analysis to find solutions or new insights.

Components

Steps to Formulate

Characteristics

Statement

Definition

Example

RESEARCH
PROBLEM





HOW DO WE KNOW WE HAVE A RESEARCH PROBLEM?



- Customer complaints
 - Conversation with company employees
 - Observation of inappropriate behaviour or conditions in the firm
- Deviation from the business plan
- Success of the firm's competitor's
 - Relevant reading of published material (trends, regulations)
- Company records and reports.

Statement of research problem

- A clear concise description of the issue
- one or two sentences in length that outlines the problem addressed by the study

A good **problem statement**

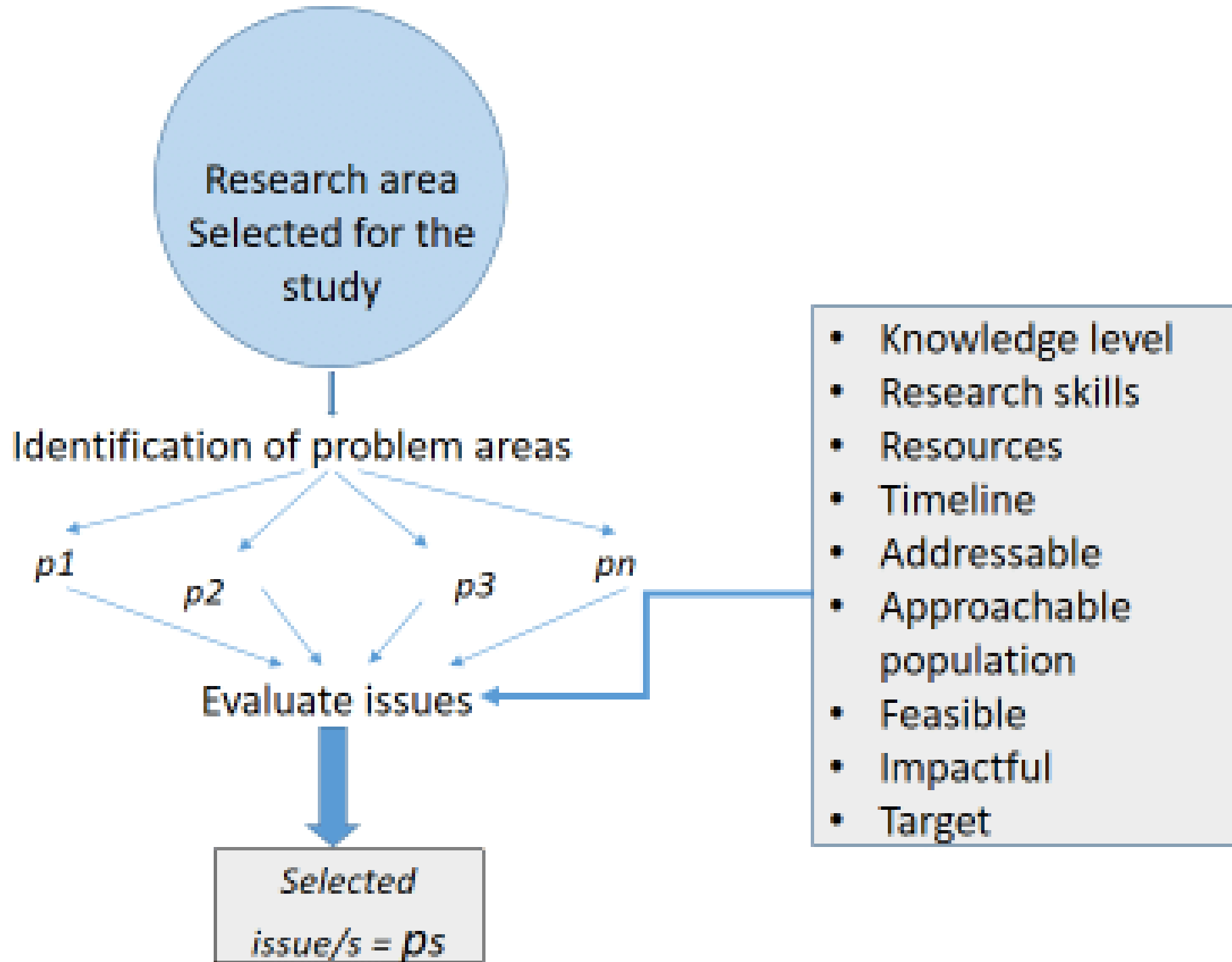
- What is the problem?
- Who is the client?
- What form can the resolution be?
- **Research-worthy problem statement** should address all six questions: what, how, where, when, why, and who.

Characteristics of a research problem:

- **It should be clear, concise, and specific**
- **It should be original and unique**
- **It should address a gap in knowledge or application**
- **It should guide the process and contribute to the definition of research project objectives**

Types of research problems:

- **Theoretical research problems:** Contribute to the overall information and knowledge in an area of study
- **Descriptive research problems:** Observe the problem or phenomena to define the characteristics
- **Applied research problems:** Resolve a practical issue
- **Action research problems:** Offer solutions for issues in a time frame



Key points about selecting a research problem:

- **Identifying a gap:**

A good research problem usually arises from an area where existing knowledge is incomplete, contradictory, or lacks sufficient understanding.

- **Relevance and significance:**

The problem should be important to the field of study, have practical implications, and contribute to new knowledge.

- **Feasibility:**

Consider the researcher's skills, available resources, time constraints, and accessibility to data when selecting a problem.

Factors to consider when selecting a research problem:

- **Personal interest:** Choose a topic that genuinely interests you, as it will motivate you throughout the research process.
- **Expertise and knowledge:** Select a problem within your area of expertise to ensure you can effectively analyze the research.
- **Current trends and issues:** Look for emerging problems or contemporary debates within your field.
- **Ethical considerations:** Ensure the research is ethical and will not harm participants.

NECESSITY OF DEFINING THE PROBLEM

- The problem to be investigated must be defined unambiguously for that will help to discriminate relevant data from the irrelevant ones.
 - Questions like:
 - What data are to be collected?
 - What characteristics of data are relevant and need to be studied?
 - What relations are to be explored.
 - What techniques are to be used for the purpose?
 - similar other questions crop up in the mind of the researcher who can well plan his strategy and find answers to all such questions only when the research problem has been well defined.
 - **It is only on careful detailing the research problem that we can work out the research design and can smoothly carry on all the consequential steps involved while doing research.**



TECHNIQUE INVOLVED IN DEFINING A PROBLEM

- Defining a research problem properly and clearly is a crucial part of a research study and must in no case be accomplished hurriedly. However, in practice this is frequently overlooked which causes a lot of problems later on. Hence, the research problem should be defined in a systematic manner, giving due weightage to all relating points
- The technique for the purpose involves the undertaking of
- the following steps generally one after the other:
 - (i) statement of the problem in a general way;
 - (ii) understanding the nature of the problem;
 - (iii) surveying the available literature
 - (iv) developing the ideas through discussions;
 - (v) rephrasing the research problem into a working proposition.



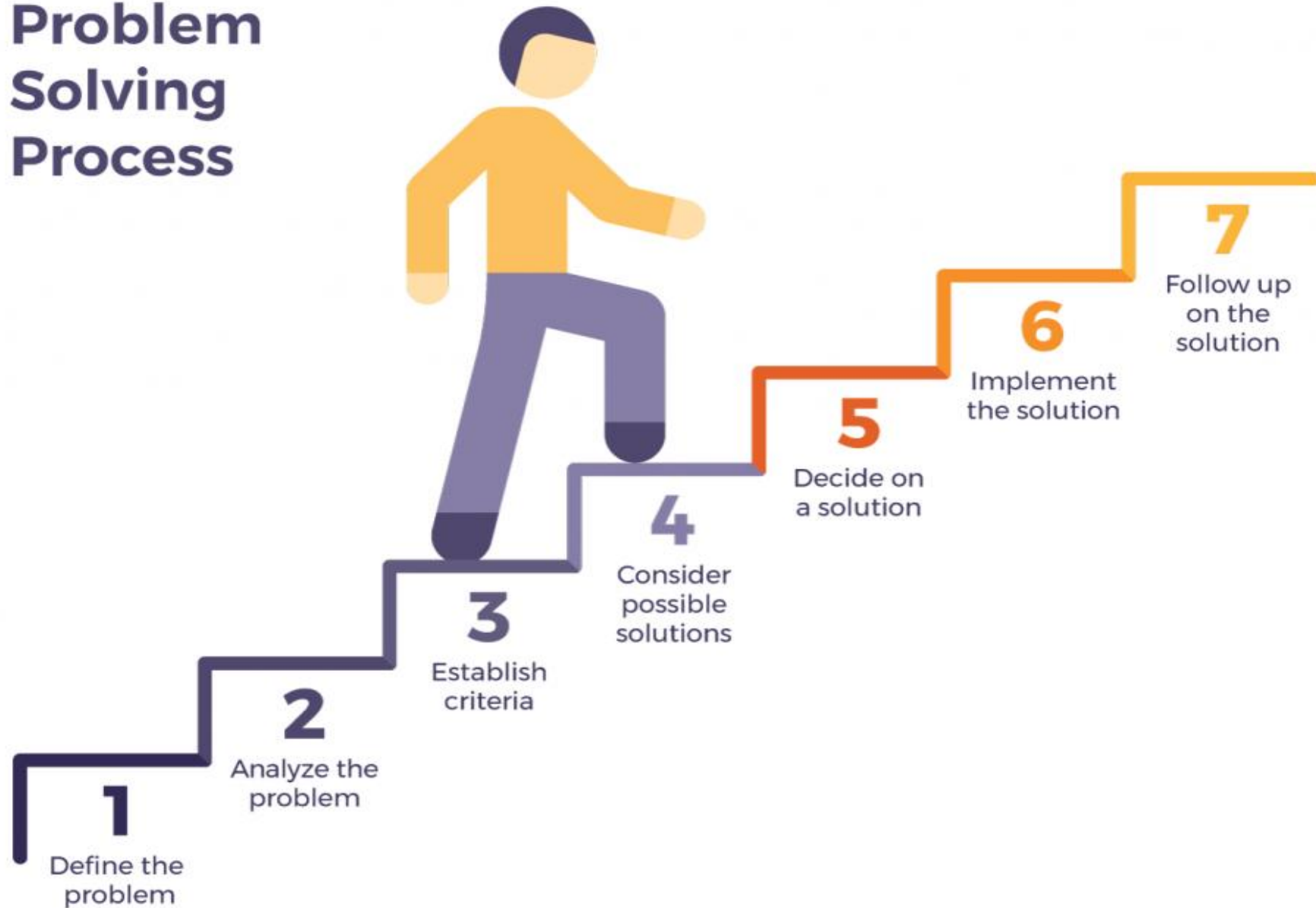
CRITERIA OF A GOOD RESEARCH PROBLEM



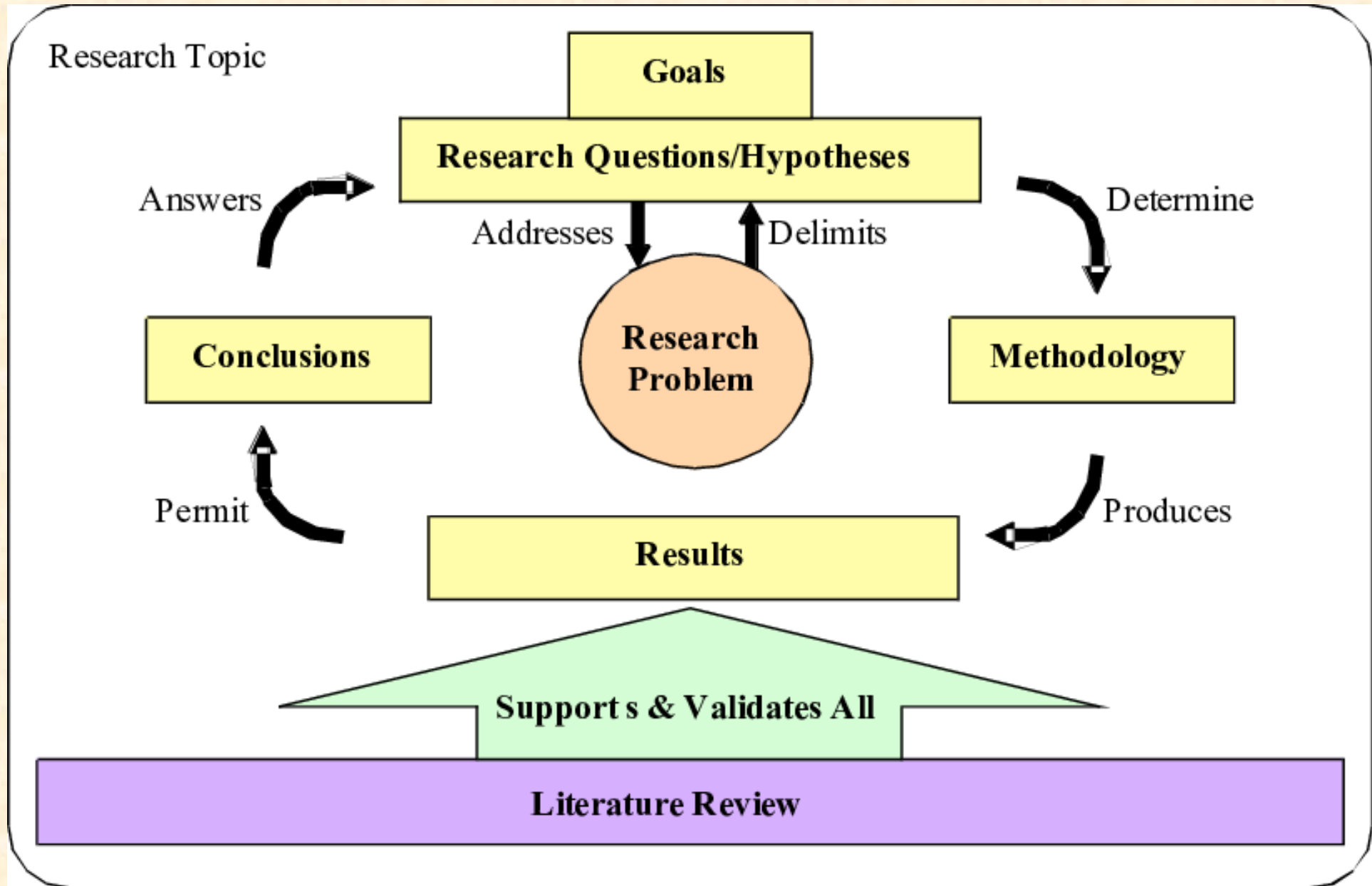
- Clear and Unambiguous
- Empirical
- Verifiable
- Interesting
- Novel and Original
- Availability of Guidance

Finding and Solving a Worthwhile Problem

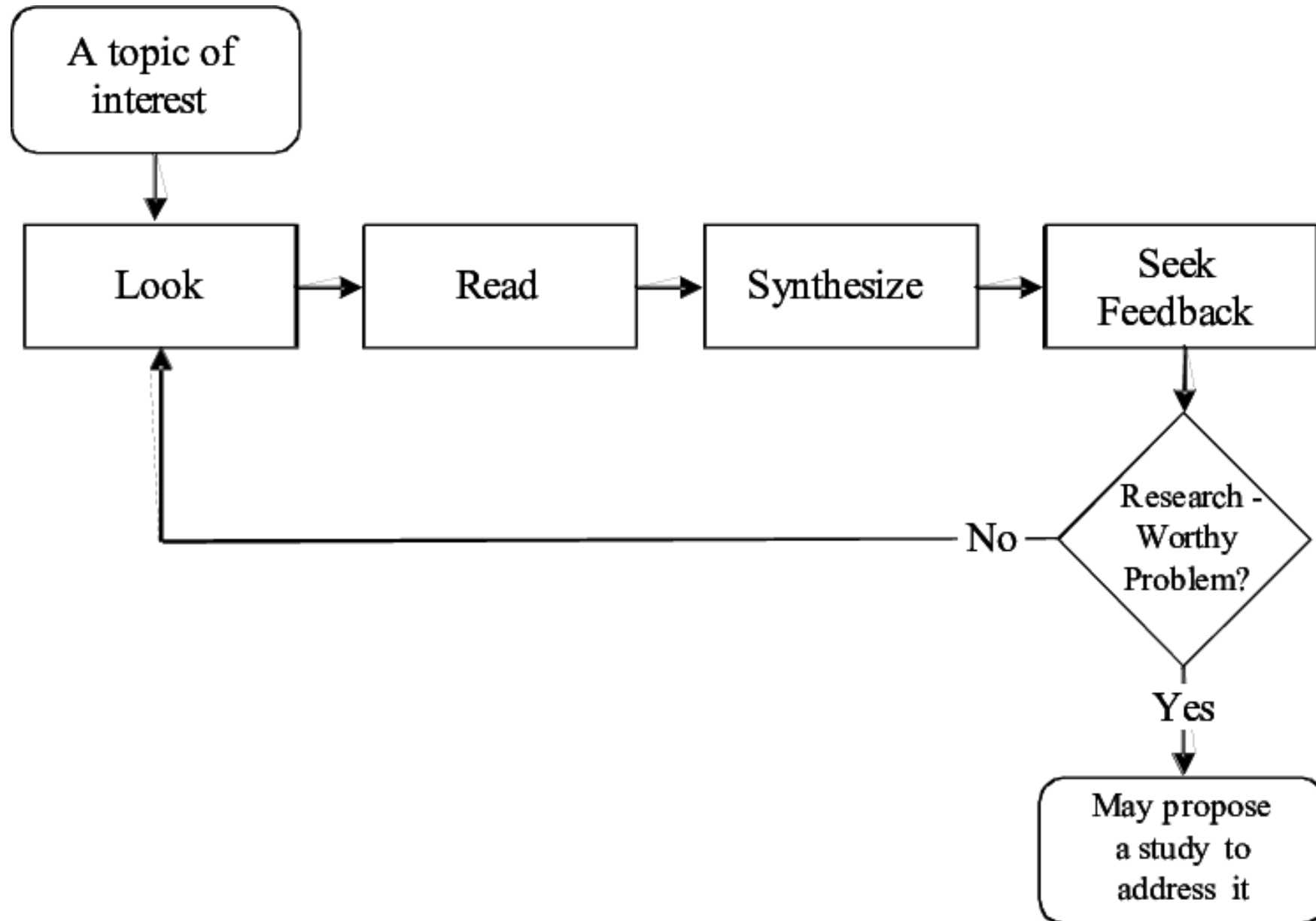
Problem Solving Process



Finding and Solving a Worthwhile Problem



Finding and Solving a Worthwhile Problem



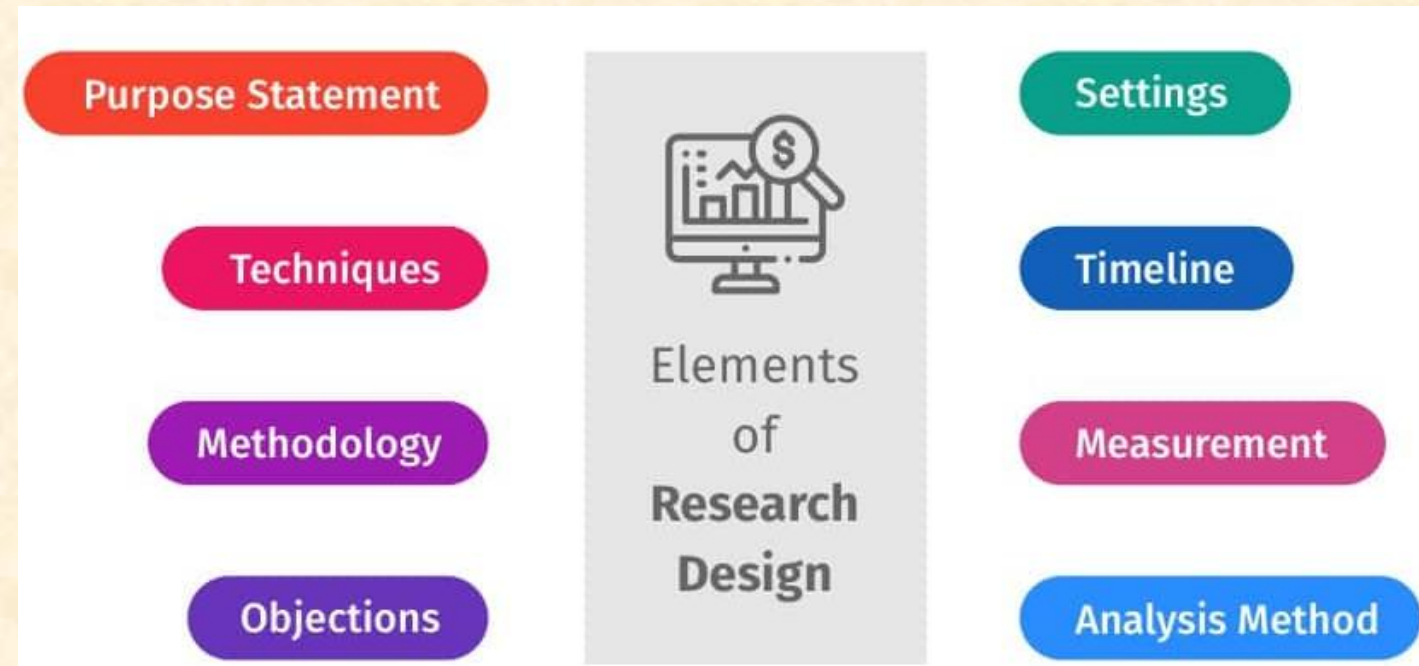
What is a Research Design?

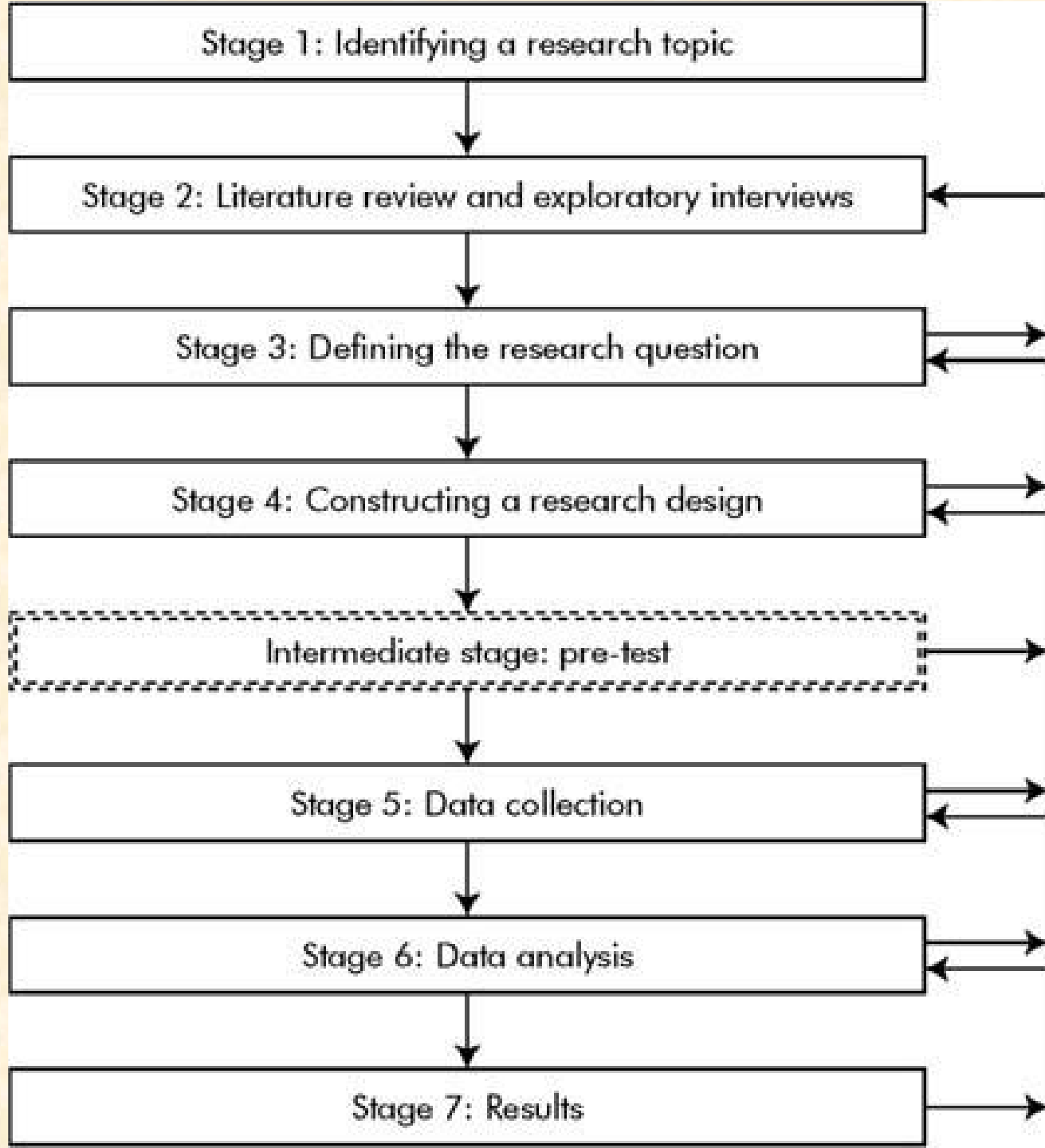
A research design is defined as the overall plan or structure that guides the process of conducting research. It is a critical component of the research process and serves as a blueprint for how a study will be carried out, including the methods and techniques that will be used to collect and analyze data.



Key elements of research design include:

- **Research Objectives.**
- **Research Questions or Hypotheses.**
- **Data Collection Methods.**
- **Sampling.**
- **Data Collection Instruments.**
- **Data Analysis.**
- **Time Frame.**
- **Ethical Considerations.**
- **Resources.**
- **Data Presentation and Reporting.**

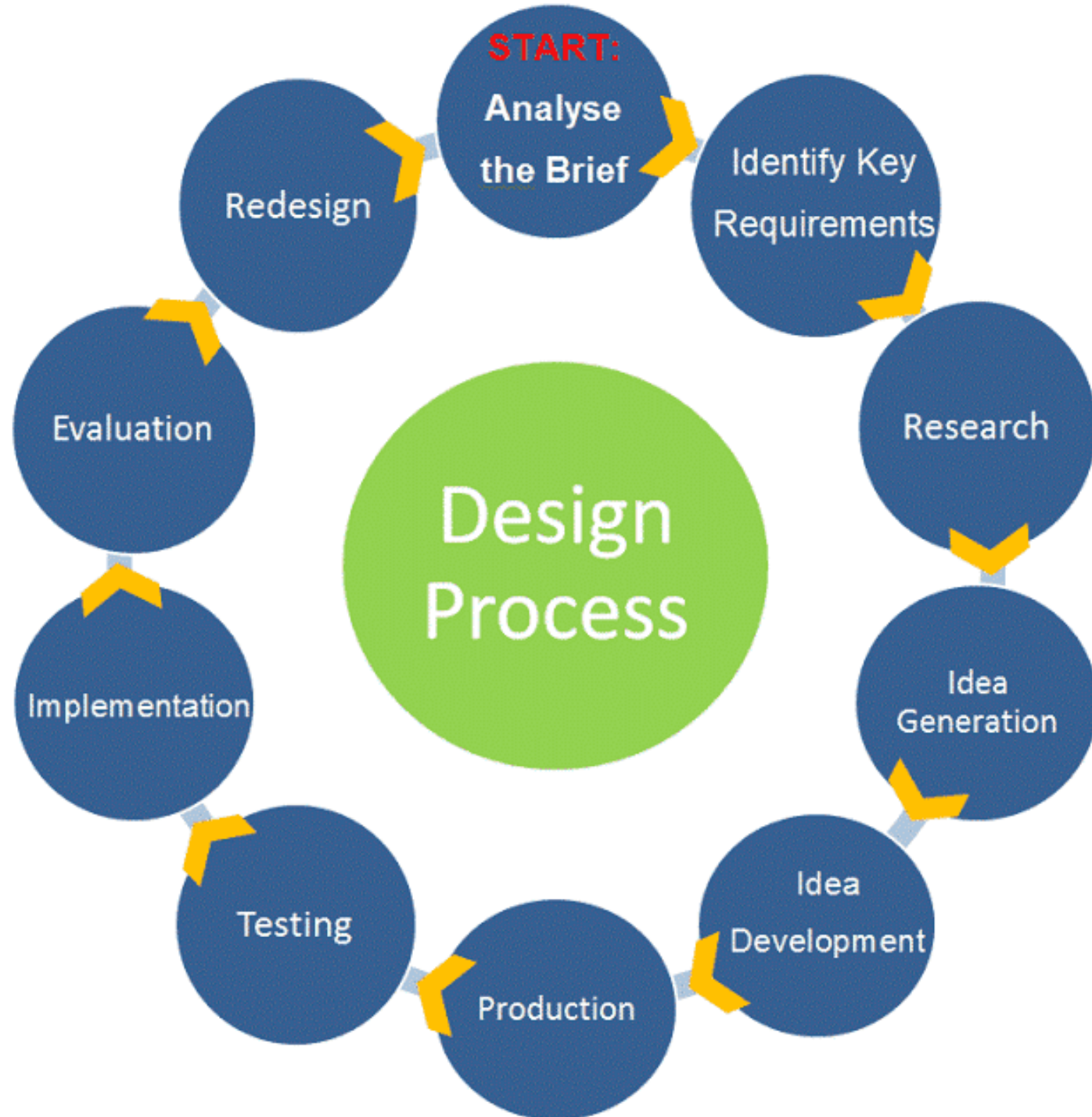




Outline Figure of Research Design

The essential characteristics of a research design :

- (a) It is a plan,** which specifies the sources and types of data relevant to the research problem.
- (b) It is a strategy,** which decides the approach that will be used to collect and analyse the data.
- (c) Since most of the research studies are conducted under these two controls, it also includes the time and cost budgets.**



Steps in Research Design

NEED & IMPORTANCE

- Smooth sailing of research operations.
- Stands for advance planning of the methods.
- Great bearing on reliability of the results.
- Helps to give directions.
- Helps in decision making.
- Research design prevent blind searching.
- Helps researchers to anticipate potential problems in collecting data etc.

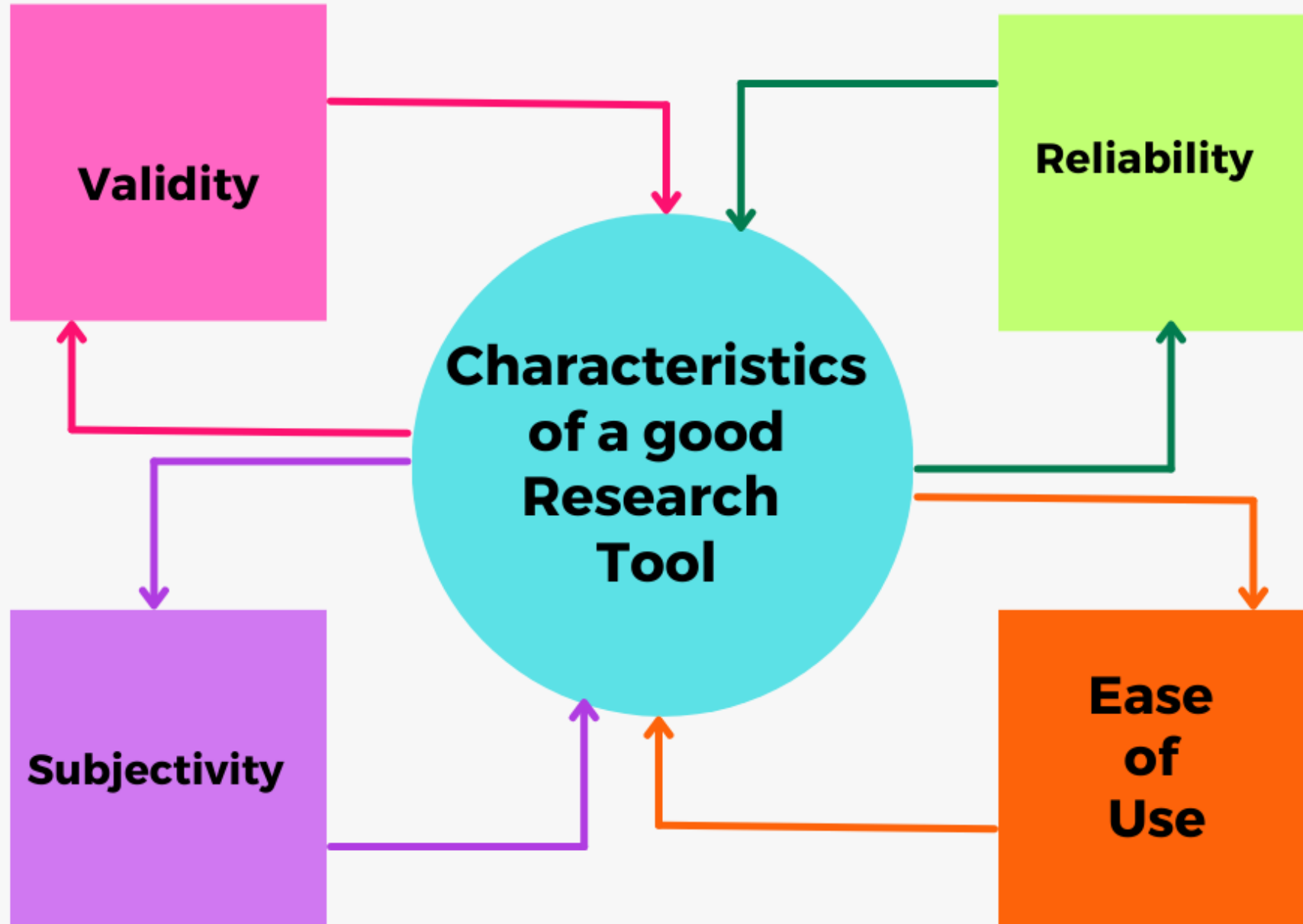
The Need for Research Design

- It reduces inaccuracy;
- Helps to get maximum efficiency and reliability;
- Eliminates bias and marginal errors;
- Minimizes wastage of time;
- Helpful for collecting research materials;
- Helpful for testing of hypothesis;
- Gives an idea regarding the type of resources required in terms of money, manpower, time, and efforts;
- Provides an overview to other experts;
- Guides the research in the right direction.

An effective research design should include ...

- A statement of objectives of the study or the research output.
- A statement of the data inputs required on the basis of which the research problem is to be solved.
- The methods of analysis which shall be used to treat and analyze the data inputs.

Characteristics of a Good Research Tool



Features of a Good Research Design

- ❖ A good research design is often characterized by adjectives like *flexible, appropriate, efficient* and economical and so on.
- ❖ It minimizes bias and *maximizes the reliability* of the data collected and analyzed is considered a good design.
- ❖ The design which gives the smallest experimental error is supposed to be the best design and *yields maximal information* and provides an opportunity for considering many different aspects of a problem is considered most *appropriate and efficient design* in respect of many research problems.

Features of a Good Research Design

- i) It is a plan which describes the *sources and kinds of information* strongly related to the research problem.
- ii) It is a strategy indicating which method will be employed for *collecting and examining the data*.
- iii) It also consists of the *time and cost budgets* because most studies are done under these two.

A *research design appropriate* for a particular research problem, usually involves the following factors -

- 1) The means of *obtaining information*
- 2) The *availability and skills* of the researcher and his staff, if any
- 3) The *objective* of the problem to be studied
- 4) The *nature* of the problem to be studied
- 5) The *availability of time and money* of the research work.

Limitations:

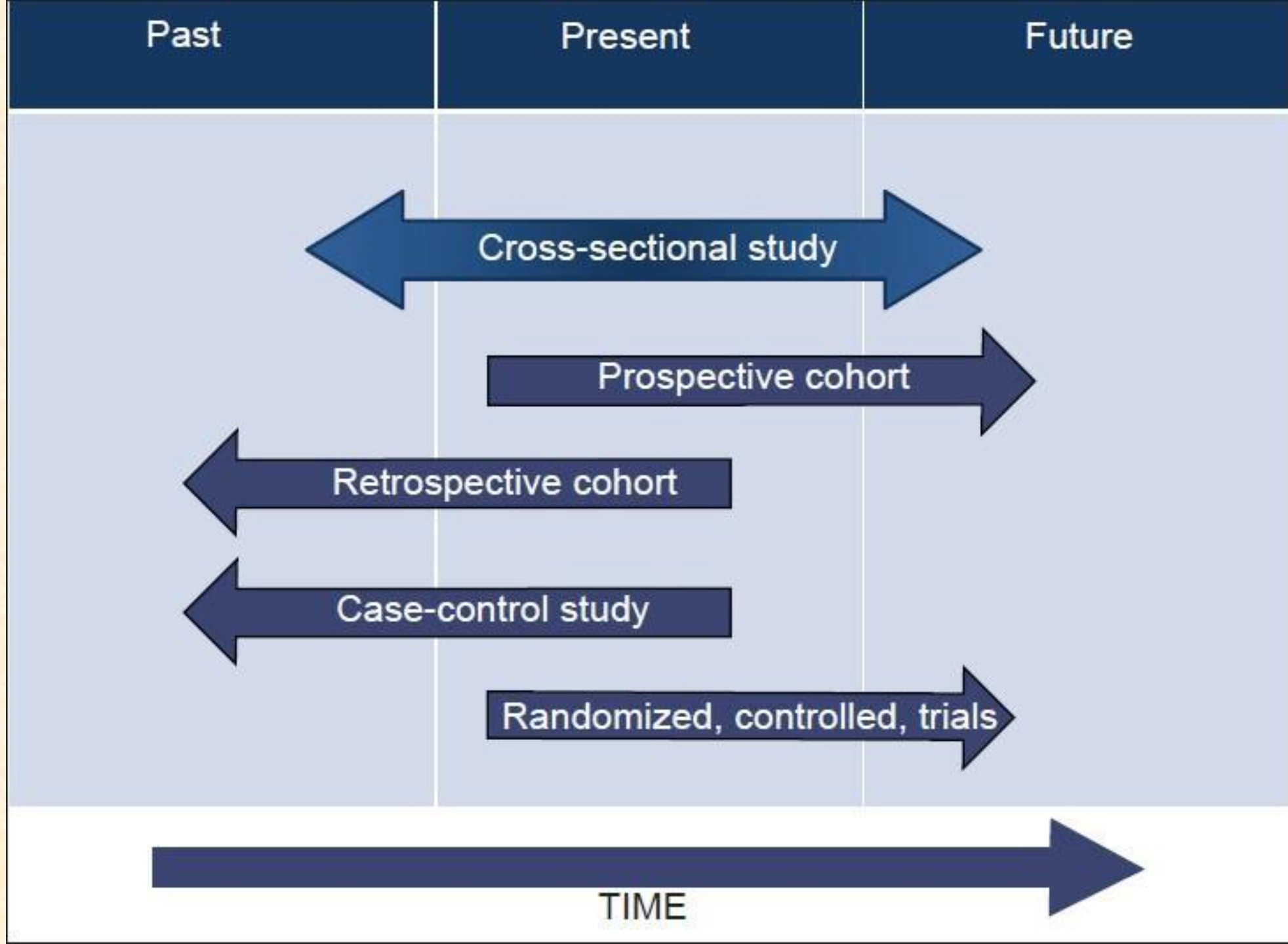
In a nutshell, research design must, at least, contain -

- (a) a ***clear statement*** of the research problem.
- (b) ***Processes and methods*** to be utilized for collecting data.
- (c) The ***population*** to be researched.
- (d) ***Techniques*** to be employed in processing and examining data.

Advantages of research design:

1. Consumes ***less time***.
2. Ensures project ***time schedule***.
3. Helps researcher to prepare himself to ***carry out research*** in a proper and a systematic way.
4. Better documentation of the ***various activities*** while the project work is going on.
5. Helps in ***proper planning*** of the resources and their procurement in right time.
6. Provides ***satisfaction and confidence***, accompanied with a sense of success from the beginning of the work of the research project.

**Basic Concepts
of Research
Design**



IMPORTANT CONCEPTS RELATING TO RESEARCH DESIGN

1. Dependent and Independent Variables
2. Extraneous Variable
3. Control
4. Confounded Relationship
5. Research Hypothesis
6. Experimental and Non-experimental Hypothesis-Testing Research
7. Experimental and Control Groups
8. Treatments
9. Experiment
10. Experimental Unit(s)

Important concepts relating to research design

➤ *Dependent and independent variables:*

A concept which can take on different quantitative values is called a variable.

A phenomena which can take on different qualitatively values even in decimal value are called continues.

➤ *Extraneous variables*

That are not related to the purpose of the study but may effect on the dependent variables are termed as the extraneous variables

➤ *Control*

One important characteristic of a good research is to minimize the influence or effect. The terminal term used when we design the study minimizing the the effect of extraneous independent variable

➤ *Conformed relationship*

When the dependent variable is not free from the influence of extraneous variable .the relationship between the depended and independent v variable is said to be confused by an extraneous variable

➤ *Research hypothesis*

The researcher hypothesis is a predicative statement that relates an independent variable to dependent variable.

➤ *Experimental and non-experimental hypothesis testing*

When the purpose of research is to test a research hypothesis, it is termed as hypothesis testing research .

It can be experimental or non-experimental

➤ Experimental and control groups

When a group is exposed to usual conditions, it is termed as a control group.

But when the group is exposed to be some special condition, it is termed as Experimental group

➤ Treatments

The different conditions under which Experiment and control groups are put up usually referred to as treatment.

Experiment

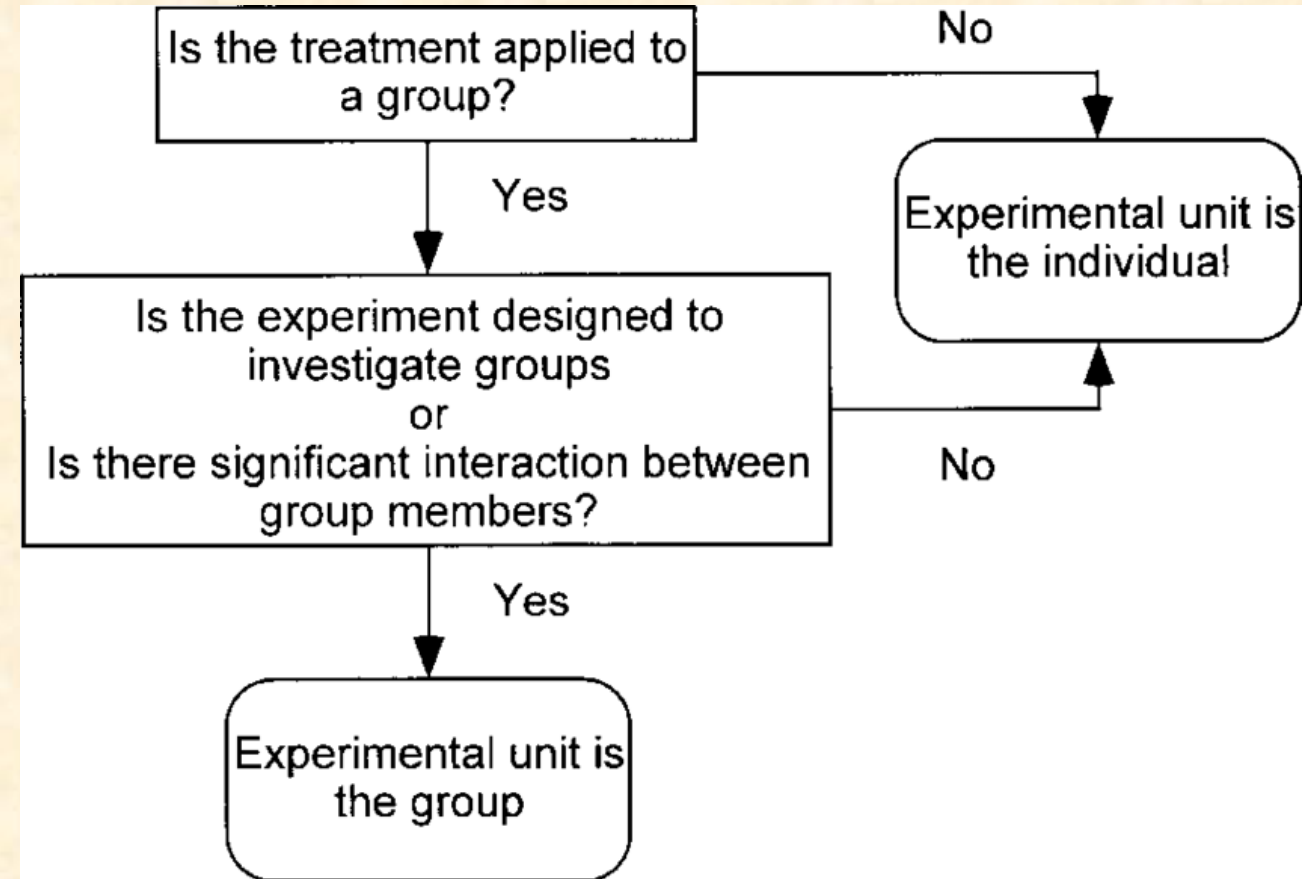
- The process of examining the truth of a statistical hypothesis, relating to some research problem, is known as an Experiment.

E.g.:-

we can conduct an Experiment to examine the usefulness of a certain newly developed drug.

Experimental Unit(s)

Experimental Units represents the pre-determined plots or blocks, where different types of treatments are used. Moreover, such type of experimental units must be selected, as well as defined, very cautiously and thoroughly.



Different research design

In case of
Exploratory
research
study

in case of
descriptive
and
diagnostic
research

In case of
hypothesis
-testing
research
studies

TYPES OF RESEARCH DESIGNS

Exploratory Research

Gathers preliminary information to define the problem and suggest hypotheses
Literature search, expert interviews, focus groups, case studies, company audits, qualitative research

Descriptive Research

Describes things as the market potential of a product, consumer demographics and attitudes
Secondary data analysis, surveys, observations, panels, simulations

Causal Research

Test hypotheses about cause and effect relationships
X causes Y

Research design in case of exploratory research design

➤ exploratory research method are also termed as formulative research studied.

The main purpose is that of formulate the research problem .three methods are

1. The survey of concerning literature
2. The experience survey
3. The analysis of 'inside-stimulating

Exploratory Research or Formulative Research

It aims at gaining information about an issue in hand.

Objective: to gather preliminary information that will help define problems and suggest hypotheses.

Typical techniques used in exploratory research include

- Case studies,
- Observation
- Historical analysis
- In-depth interviews
- Focus Group.

The Case Study Recipe



o**bservation zones**

In case of descriptive and diagnostic research

in case of descriptive research study –one those studied which are concerned with describing the characteristics of a particular individual , or a group.

In diagnostic research study determine the frequency which some thing occur.

Descriptive Research

Usually it forms preliminary study of a research project.

It aims at describe social events, relations and events

It provides background information about an event in question

It is deal with collecting data and answering questions or interviews or by observation (Survey type research).



COMPARATIVE STUDY OF RESEARCH DESIGNS IN EXPLORATORY AND DESCRIPTIVE/DIAGNOSTIC RESEARCH STUDIES

| Research Design | Exploratory/Formulative | Descriptive/Diagnostic |
|----------------------|---|---|
| Overall design | Flexible | Rigid |
| Sampling design | Non-probability sampling (purposive or judgment sampling) | Probability sampling (random sampling) |
| Statistical design | No pre-planned design for analysis | Pre-planned design for analysis |
| Observational design | Unstructured instruments for collection of data | Structured or well thought out instruments for collection of data |
| Operational design | No fixed decisions about the operational procedures | Advanced decisions about operational procedures |

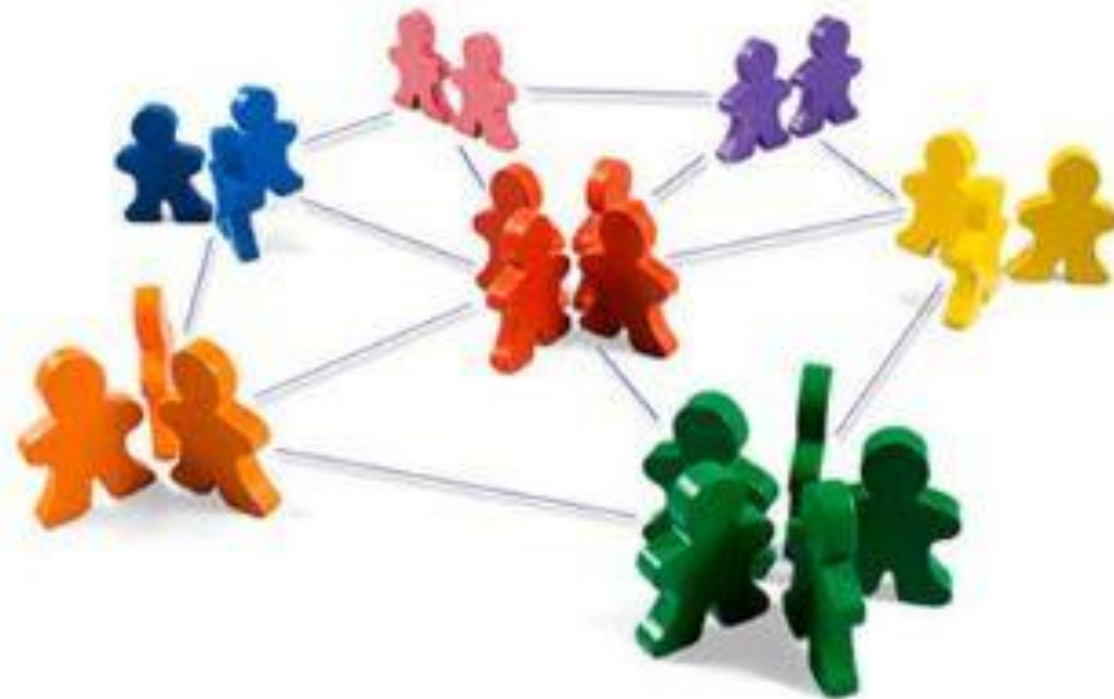
In case of hypothesis-testing research studies

- hypothesis-testing research studies known as experimental studies are those researcher tests the hypothesis of casual relationship between variables.

Explanatory Research or Analytical Research



Analytical Research is primarily concerned with testing hypothesis and specifying and interpreting relationships, by analyzing the facts or information already available. (Cause-Effect).



It aims at explaining social relations and events.



To build, test or revise a theory.



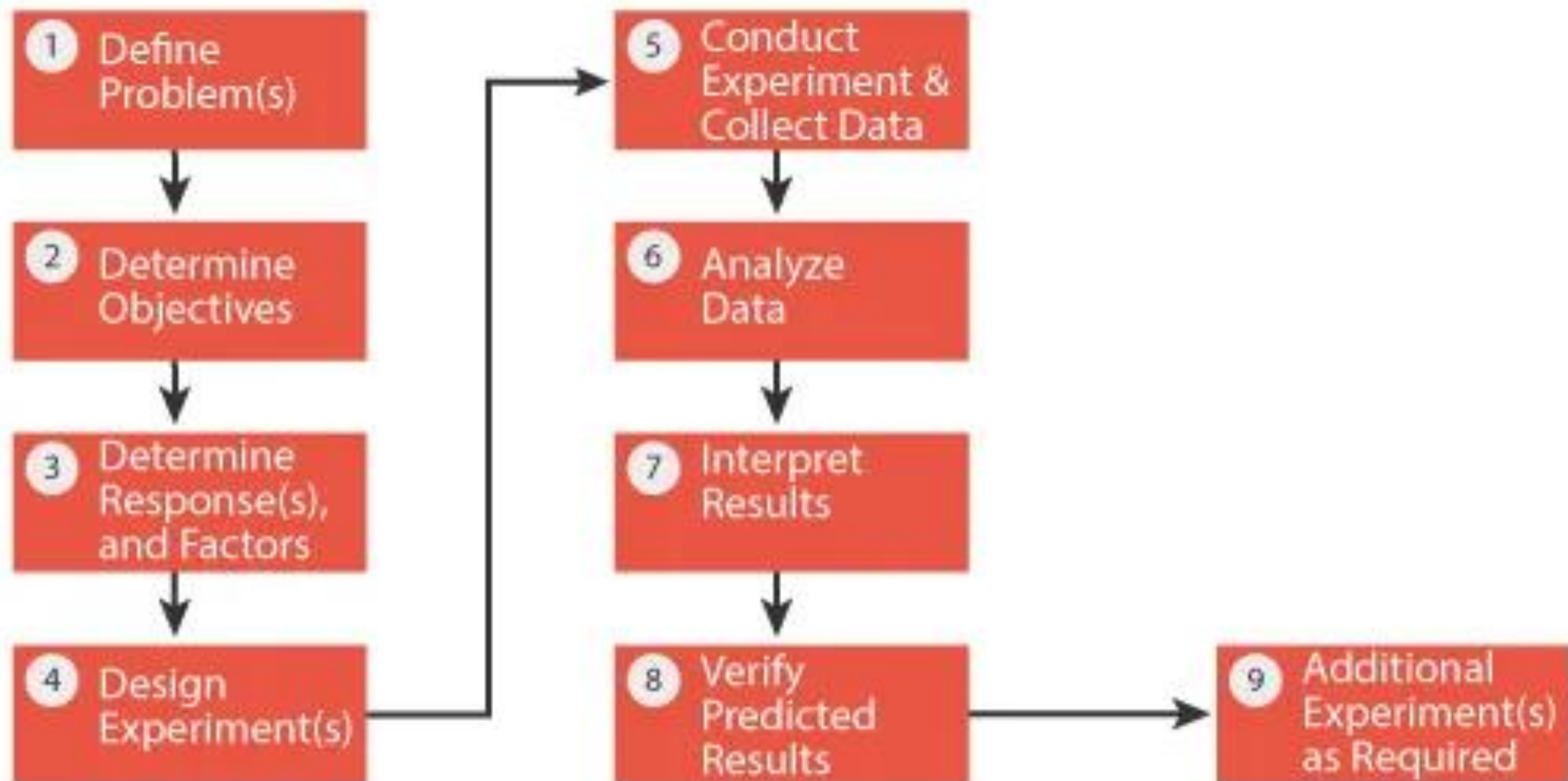
Definition of Exp.design :- The choice of treatment, the method assigning treatments to experimental units and arrangement of experimental units in various pattern to suit the requirements of particular problems are commonly known as design of experiment.

Or

Experimental design is the process of planning and study to meet a specific objectives.

Experimental design was developed by :- *Prof. R. A. Fisher* in 1920

Experimental Design Process



Principles of Experimental Design

There are three basic principles :

- **Replication:-** Repetition of the treatment under investigation Or To provide an estimate of experimental error.
- **Randomization:-** The allocation of the treatment to the different experimental units by a random process is known as randomization.
- **Local control:-** The principal of making use of greater homogeneity in groups of experimental units for reducing experimental error.

Advantages and Disadvantages of Design of Experiments

| Advantages | Disadvantages |
|--|---|
| Gain insight into methods of instruction | Subject to human error |
| Intuitive practice shaped by research | Personal bias of researcher may intrude |
| Teachers have bias but can be reflective | Sample may not be representative |
| Researcher can have control over variables | Can produce artificial results |
| Humans perform experiments anyway | Results may only apply to one situation and may be difficult to replicate |
| Can be combined with other research methods for rigor | Groups may not be comparable |
| use to determine what is best for population | Human response can be difficult to measure |
| provides for greater transferability than anecdotal research | Political pressure may skew results |

THANK YOU!