



**Presentation on  
RESEARCH METHODOLOGIES  
(ECE)**

**IV- B.TECH VII- Semester  
(AUTONOMOUS-R16)**



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# UNIT 1

## INTRODUCTION TO RESEARCH METHODOLOGIES

# Research Definition

## Meaning

Research is an endeavour to discover answers to intellectual and practical problems through the application of scientific method.

“Research is a systematized effort to gain new knowledge”.

**-Redman and Mory.**

Research is the systematic process of collecting and analyzing information (data) in order to increase our understanding of the phenomenon about which we are concerned or interested.

# Objectives

The purpose of research is to discover answers through the application of scientific procedures.

The objectives are:

- To gain familiarity with a phenomenon or to achieve new insights into it – Exploratory or Formulative Research.
- To portray accurately the characteristics of a particular individual, situation or a group – Descriptive Research.
- To determine the frequency with which something occurs or with which it is associated with something else – Diagnostic Research.
- To test a hypothesis of a causal relationship between variables – Hypothesis-Testing Research.

# Characteristics of Research

- Research is directed towards the solution of a problem.
- Research is based upon observable experience or empirical evidence.
- Research demands accurate observation and description.
- Research involves gathering new data from primary sources or using existing data for a new purpose.
- Research activities are characterized by carefully designed procedures.
- Research requires expertise i.e., skill necessary to carryout investigation, search the related literature and to understand and analyze the data gathered.
- Research is objective and logical – applying every possible test to validate the data collected and conclusions reached.
- Research involves the quest for answers to unsolved problems.
- Research requires courage.
- Research is characterized by patient and unhurried activity.
- Research is carefully recorded and reported.

# SCIENTIFIC METHOD

‘Science’ refers to the body of systematic and organized knowledge which makes use of scientific method to acquire knowledge in a particular field of enquiry.

Scientific method is the systematic collection of data (facts) and their theoretical treatment through proper observation, experimentation and interpretation.

Scientific method attempts to achieve a systematic interrelation of facts by experimentation, observation, and logical arguments from accepted postulates and a combination of these three in varying proportions.

## **BASIC POSTULATES IN SCIENTIFIC METHOD**

- It relies on empirical evidence.
- It utilizes relevant concepts.
- It is committed to only objective considerations.
- It presupposes ethical neutrality.
- It results into probabilistic predictions.
- The methodology is made known.
- Aims at formulating scientific theories.

# CRITERIA OF A GOOD RESEARCH

- Purpose clearly defined.
- Research process detailed.
- Research design thoroughly planned.
- High ethical standards applied.
- Limitations frankly revealed.
- Adequate analysis for decision maker's needs.
- Findings presented unambiguously.
- Conclusions justified.
- Researcher's experience reflected.



# Research Cont.....

## **QUALITIES OF A GOOD RESEARCH**

- Systematic
- Logical
- Empirical
- Replicable
- Creative
- Use of multiple methods

## **NEED FOR RESEARCH**

- Exploration
- Describe
- Diagnose
- Hypothesis
- Inductions and Deductions

# SCOPE / SIGNIFICANCE OF RESEARCH

## RESEARCH FOR DECISION MAKING

- Throws light on risks and uncertainty
- Identify alternative courses of action
- Helps in economic use of resources
- Helps in project identification
- Solves investment problems
- Solves pricing problems
- Solves allocation problems
- Solves decision making issues in HR
- Solves various operational and planning
- problems of business and industry

# SCOPE / SIGNIFICANCE OF RESEARCH

- Provides the basis for all government policies in our economic system.
- Helps social scientists in studying social relationships and in seeking answers to various social problems.
- For students, research means a careerism or a way to attain a high position in the social structure.
- For professionals in research, it may mean a source of livelihood.
- For philosophers and thinkers, research means the outlet for new ideas and insights.
- For literary men and women, research means development of new styles and creative work.
- For analysts and intellectuals, research means generalizations of new theories.

# PROBLEMS IN RESEARCH

- Not similar to science
- Uncontrollable variables
- Human tendencies
- Time and money
- Lack of computerization
- Lack of scientific training in the methodology of Research
- Insufficient interaction between university research departments and business establishments
- Lack of confidence on the part of business units to give information
- Lack of code of conduct
- Difficulty of adequate and timely secretarial assistance
- Poor library management and functioning
- Difficulty of timely availability of published data.
- Ignorance
- Research for the sake of research-limited practical utility though they may use high sounding business jargon.

# ROLE OF RESEARCH IN DECISION-MAKING

Decision-making is the process of selecting the best alternative from the available set of alternatives.

Management is chiefly concerned with decision making and its implementation. These decisions should be based on appropriate studies, evaluations and observations.

Research provides us with knowledge and skills needed to solve the problems and to meet the challenges of a fast paced decision-making environment.

# DECISION-MAKING cont....

According to **Herbert A Simon**, decision making involves three activities:

1. Intelligence Activity - scanning the environment for identifying conditions necessary for the decision.
2. Designing Activity - identifying, developing and analyzing the alternative courses of action.
3. Choice Activity - choosing the best course of action from among the alternatives.

# FACTORS THAT AFFECT MANAGERIAL DECISIONS



**INTERNAL FACTORS** – factors present inside an organization such as resources, technology, trade unions, cash flow, manpower etc.

**EXTERNAL FACTORS** – factors present outside the organization such as government policies, political factors, socio-economic factors, legal framework, geographic and cultural factors etc.

**QUANTITATIVE FACTORS** – factors that can be measured in quantities such as time, resources, cost factors etc.

**QUALITATIVE FACTORS** – factors that cannot be measured in quantities such as organizational cohesiveness, sense of belonging of employees, risk of technological change etc.

**UNCERTAINTY FACTORS** – factors which cannot be predicted.

# TYPES OF RESEARCH

## **Descriptive vs Analytical Research**

**Descriptive Research** is a fact finding investigation which is aimed at describing the characteristics of individual, situation or a group (or) describing the state of affairs as it exists at present.

**Analytical Research** is primarily concerned with testing hypothesis and specifying and interpreting relationships, by analyzing the facts or information already available.

## **Applied vs Fundamental Research**

**Applied Research or Action Research** is carried out to find solution to a real life problem requiring an action or policy decision.

**Fundamental Research** which is also known as basic or pure research is undertaken for the sake of knowledge without any intention to apply it in practice.

- It is undertaken out of intellectual curiosity and is not necessarily problem-oriented.



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# Types of Research cont.....

## Quantitative vs Qualitative

**Quantitative Research** is employed for measuring the quantity or amount of a particular phenomena by the use of statistical analysis.

**Qualitative Research** is a non-quantitative type of analysis which is aimed at finding out the quality of a particular phenomenon.

## Conceptual vs Empirical Research

**Conceptual Research** is generally used by philosophers and thinkers to develop new concepts or to reinterpret existing ones.

**Empirical Research** is a data based research which depends on experience or observation alone. It is aimed at coming up with conclusions without due regard for system and theory.

# Types of Research cont.....

## Some other types of research..

**One-time Research** – Research confined to a single time period.

**Longitudinal Research** – Research carried on over several time periods.

**Diagnostic Research** – It is also called clinical research which aims at identifying the causes of a problem, frequency with which it occurs and the possible solutions for it.

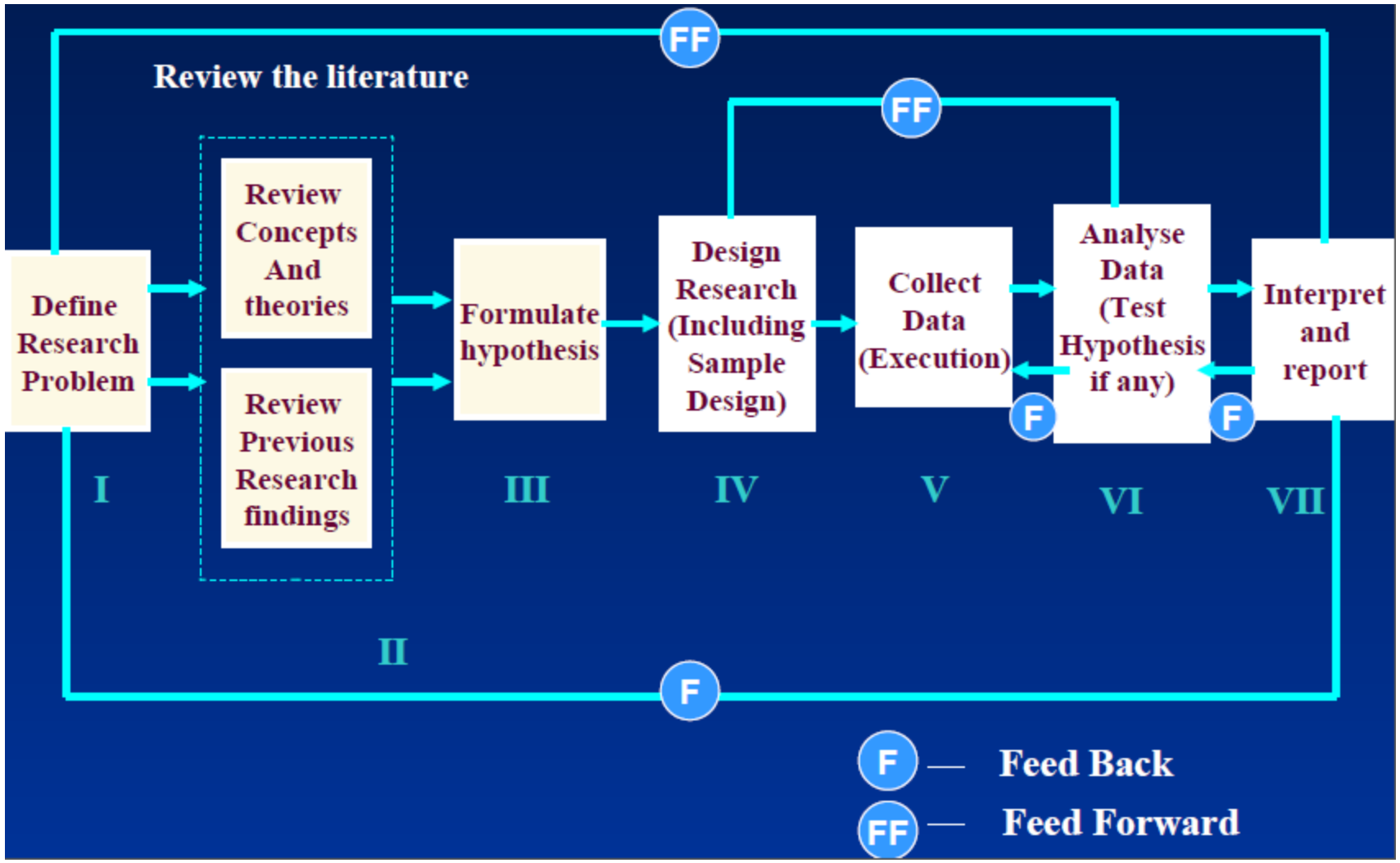
**Exploratory Research** – It is the preliminary study of an unfamiliar problem, about which the researcher has little or no knowledge. It is aimed to gain familiarity with the problem, to generate new ideas or to make a precise formulation of the problem. Hence it is also known as formulative research.

# Types of Research cont.....

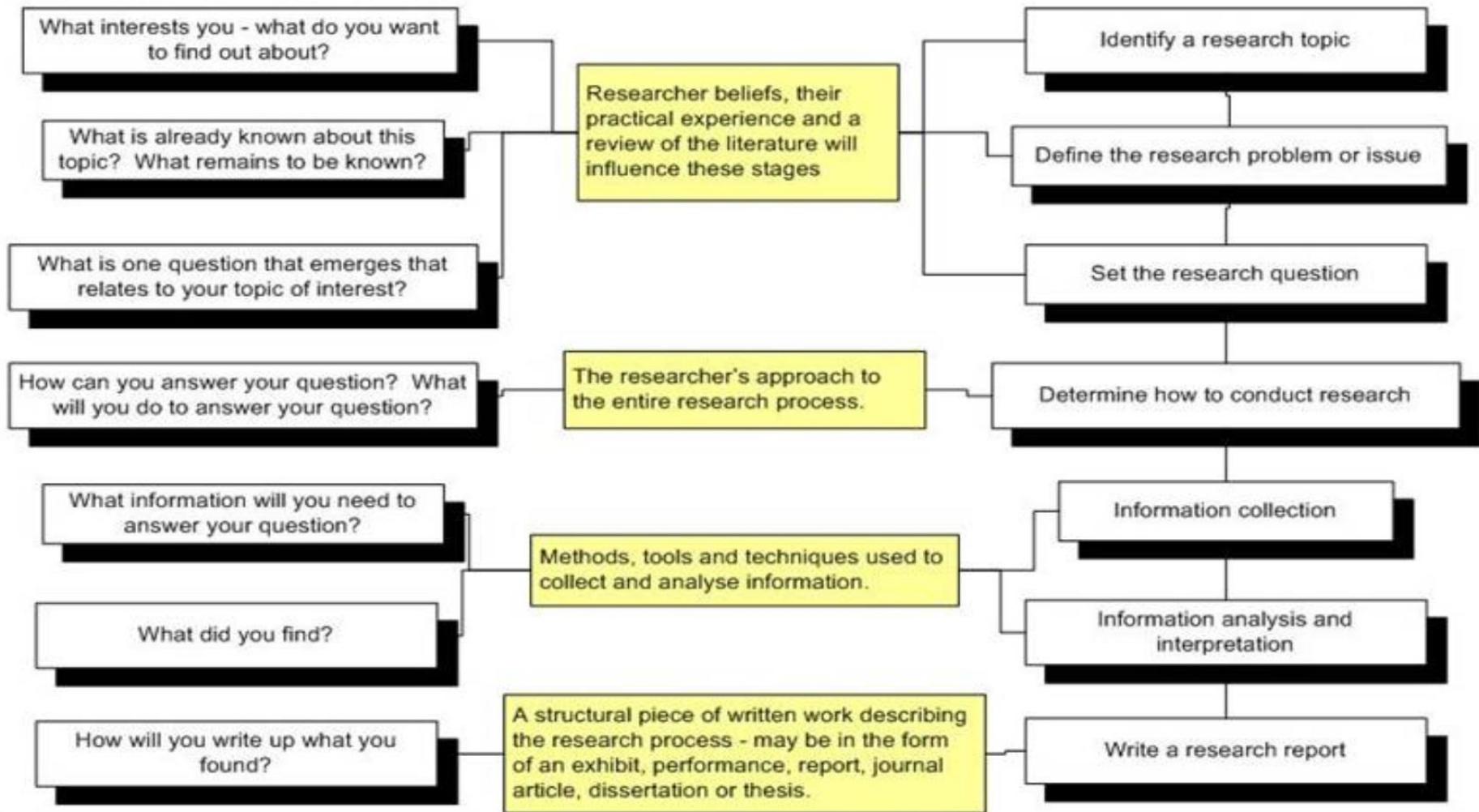
**Experimental Research** – It is designed to assess the effect of one particular variable on a phenomenon by keeping the other variables constant or controlled.

**Historical Research** – It is the study of past records and other information sources, with a view to find the origin and development of a phenomenon and to discover the trends in the past, in order to understand the present and to anticipate the future.

# Overview of the Research Process



## The Research Process - an Overview



# UNIT 2

## A Research problems and Hypotheses

# RESEARCH PROBLEM

What is a research problem?

- The term 'problem' means a question or issue to be examined.
- Research Problem refers to some difficulty /need which a researcher experiences in the context of either theoretical or practical situation and wants to obtain a solution for the same.



# 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.

The first step in the research process – definition of the problem involves two activities:

- Identification / Selection of the Problem
- Formulation of the Problem

# IDENTIFICATION / SELECTION OF THE RESEARCH PROBLEM



This step involves identification of a few problems and selection of one out of them, after evaluating the alternatives against certain selection criteria.

## SOURCES OF PROBLEMS

- Reading
- Academic Experience
- Daily Experience
- Exposure to Field Situations
- Consultations
- Brainstorming
- Research
- Intuition

# CRITERIA OF SELECTION

The selection of one appropriate researchable problem out of the identified problems requires evaluation of those alternatives against certain criteria. They are:

**Internal/ Personal criteria** – Researcher’s Interest, Researcher’s Competence, Researcher’s own Resource: finance and time.

**External Criteria or Factors** – Researchability of the problem, Importance and Urgency, Novelty of the Problem, Feasibility, Facilities, Usefulness and Social Relevance, Research Personnel.

# DEFINITION / FORMULATION OF THE RESEARCH PROBLEM



Formulation is the process of refining the research ideas into research questions and objectives.

Formulation means translating and transforming the selected research problem/topic/idea into a scientifically researchable question.

It is concerned with specifying exactly what the research problem is.

# Problem definition or Problem statement

Problem definition or statement is a clear, precise and succinct statement of the question or issue that is to be investigated with the goal of finding an answer or solution.

There are two ways of stating a problem:

- 1) Posting question / questions
- 2) Making declarative statement / statements

# PROCESS INVOLVED IN DEFINING THE PROBLEM



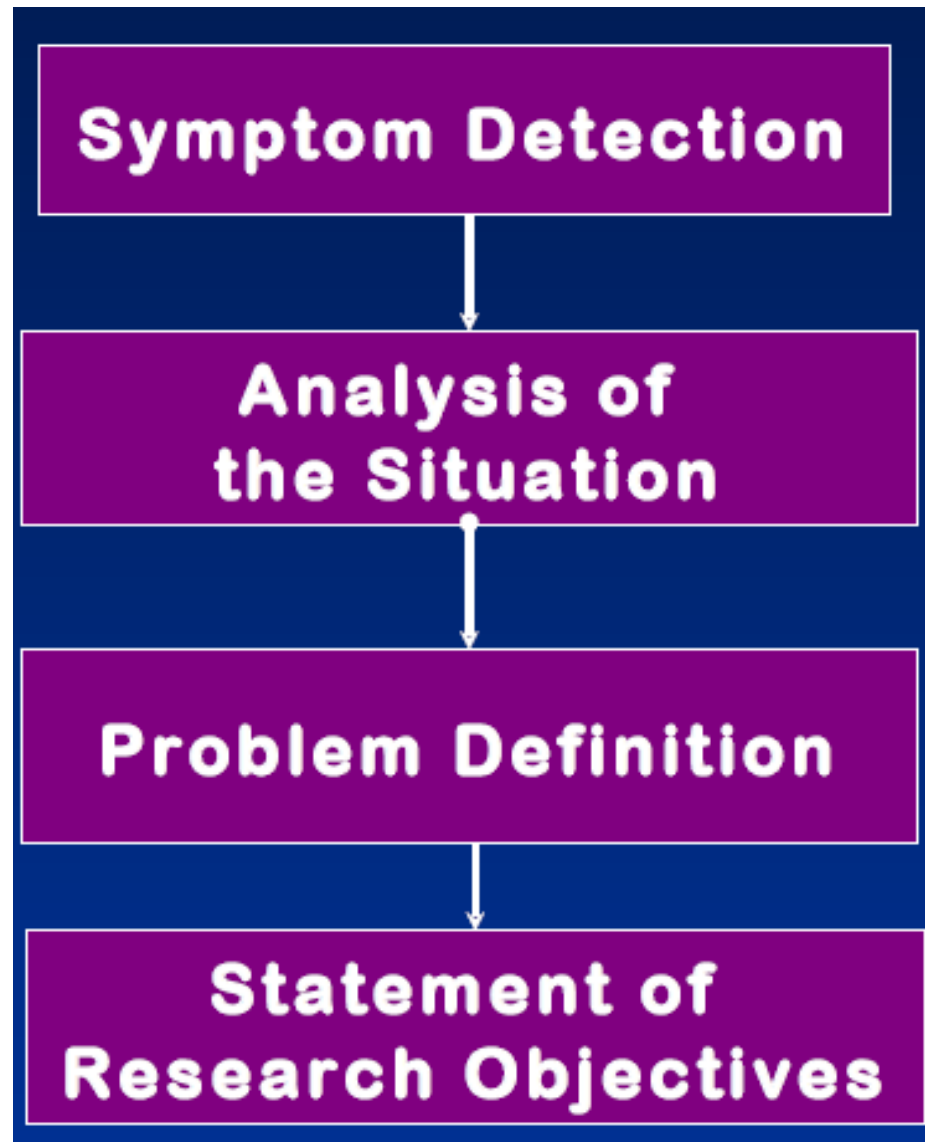
- STATEMENT OF THE PROBLEM IN A GENERAL WAY.
- UNDERSTANDING THE NATURE OF PROBLEM.
- SURVEYING THE AVAILABLE LITERATURE.
- DEVELOPING IDEAS THROUGH DISCUSSIONS.
- REPHRASING THE RESEARCH PROBLEM.

# CRITERIA OF A GOOD RESEARCH PROBLEM



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

# Defining Problem, Results in clear cut research objectives





- Research Objectives are the specific components of the research problem, that you'll be working to answer or complete, in order to answer the overall research problem. - Churchill, 2001.
- The objectives refers to the questions to be answered through the study. They indicate what we are trying to get from the study or the expected results / outcome of the study.

# HYPOTHESIS

- A hypothesis is an assumption about relations between variables.
- Hypothesis can be defined as a logically conjectured relationship between two or more variables expressed in the form of a testable statement.
- Relationships are conjectured on the basis of the network of associations established in the theoretical framework formulated for the research study.

- Anything that can vary can be considered as a variable.
- A variable is anything that can take on differing or varying values.
- For example; Age, Production units, Absenteeism, Sex, Motivation, Income, Height, Weight etc.
- Note: The values can differ at various times for the same object or person (or) at the same time for different objects or persons.

# Variable / Attribute

- A variable is a characteristic that takes on two or more values whereas, an attribute is a specific value on a variable (qualitative).
- For example; The variable SEX/GENDER has 2 attributes - Male and Female.
- The variable AGREEMENT has 5 attributes – Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree.

# Types of Variables

## **Explanatory vs Extraneous Variable**

The variables selected for analysis are called explanatory variables and all other variables that are not related to the purpose of the study but may affect the dependant variable are extraneous.

## **Dependant vs Independent Variable**

The variable that changes in relationship to changes in another variable(s) is called dependant variable.

The variable whose change results in the change in another variable is called an independent variable.

OR

An independent variable is the one that influences the dependant variable in either a positive or negative way.

# HYPOTHESIS

Research Hypothesis is a predictive statement that relates an independent variable to a dependant variable.

Hypothesis must contain atleast one independent variable and one dependant variable.

# HYPOTHESIS cont.....

- Hypothesis are tentative, intelligent guesses as to the solution of the problem.
- Hypothesis is a specific statement of prediction. It describes in concrete terms what you expect to happen in the study.
- Hypothesis is an assumption about the population of the study.
- It delimits the area of research and keeps the researcher on the right track.

# PROBLEM (VS) HYPOTHESIS

- Hypothesis is an assumption, that can be tested and can be proved to be right or wrong.
- A problem is a broad question which cannot be directly tested.
- A problem can be scientifically investigated after converting it into a form of hypothesis.



# CHARACTERISTICS OF HYPOTHESIS

- Conceptual Clarity - It should be clear and precise.
- Specificity - It should be specific and limited in scope.
- Consistency - It should be consistent with the objectives of research.
- Testability - It should be capable of being tested.
- Expectancy - It should state the expected relationships between variables.

# CHARACTERISTICS OF HYPOTHESIS cont...

- Simplicity - It should be stated as far as possible in simple terms.
- Objectivity - It should not include value judgments, relative terms or any moral preaching.
- Theoretical Relevance - It should be consistent with a substantial body of established or known facts or existing theory.
- Availability of Techniques – Statistical methods should be available for testing the proposed hypothesis.

# SOURCES OF HYPOTHESIS

- Discussions with colleagues and experts about the problem, its origin and objectives in seeking a solution.
- Examination of data and records for possible trends, peculiarities.
- Review of similar studies.
- Exploratory personal investigation / Observation.
- Logical deduction from the existing theory.
- Continuity of research.
- Intuition and personal experience.

# TYPES OF HYPOTHESES

## **Descriptive Hypotheses**

These are assumptions that describe the characteristics (such as size, form or distribution) of a variable.

The variable may be an object, person, organisation, situation or event.

Examples:

“Public enterprises are more amenable for centralized planning”.

# TYPES OF HYPOTHESES cont.....

## **Relational Hypothesis [Explanatory Hypothesis]**

These are assumptions that describe the relationship between two variables. The relationship suggested may be positive, negative or causal relationship.

Examples:

“Families with higher incomes spend more for recreation”.

**Causal Hypothesis** state that the existence of or change in one variable causes or leads to an effect on another variable.

The first variable is called the independent variable and the latter is the dependant variable.

# TYPES OF HYPOTHESES cont.....

## Null Hypothesis

When a hypothesis is stated negatively, it is called null hypothesis. It is a 'no difference', 'no relationship' hypothesis. ie., It states that, no difference exists between the parameter and statistic being compared to or no relationship exists between the variables being compared.

It is usually represented as  $H_0$  or  $H_0$  .

### Example:

$H_0$ : There is no relationship between a family's income and expenditure on recreation.

# TYPES OF HYPOTHESES cont.....

## Alternate Hypothesis

It is the hypothesis that describes the researcher's prediction that, there exist a relationship between two variables or it is the opposite of null hypothesis. It is represented as  $H_A$  or  $H_1$ .

Example:

$H_A$ : There is a definite relationship between family's income and expenditure on recreation.

# Forms of Relationships

## NON-DIRECTIONAL

- There IS a relationship between
- X & Y
- X....linked....Y

## Vs DIRECTIONAL

- If X goes up, Y ....
- or
- As X increases, Y...
- X = Independent variable
- Y = Dependent variable



## DIRECTIONAL HYPOTHESES- “X” causes “Y” to change

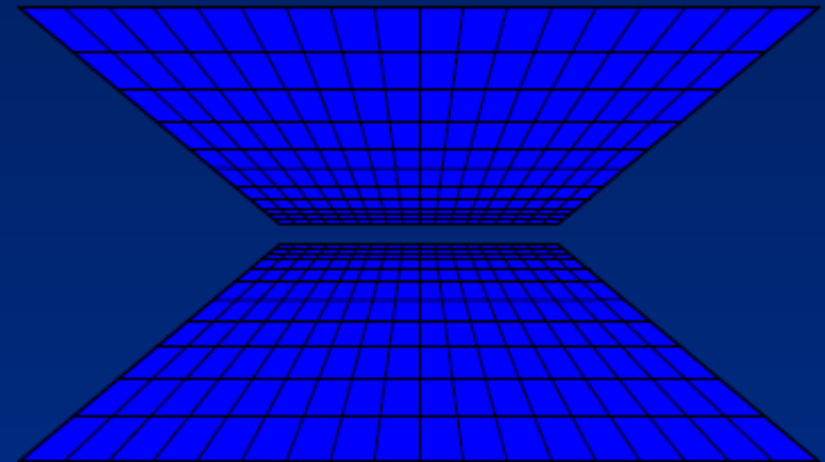
- If X changes
  - (increases
  - decreases)
- then
  - Y will \_\_\_\_\_
  - (increase or
  - decrease)
- a causal link

## DIRECTION OF RELATIONSHIP

- If X increases, Y increases
  - A **POSITIVE** relationship
- If X increase, Y decreases
  - A **NEGATIVE** or **INVERSE** relationship
- As X changes, Y does NOT change...>
- No Change...>**NO RELATIONSHIP**

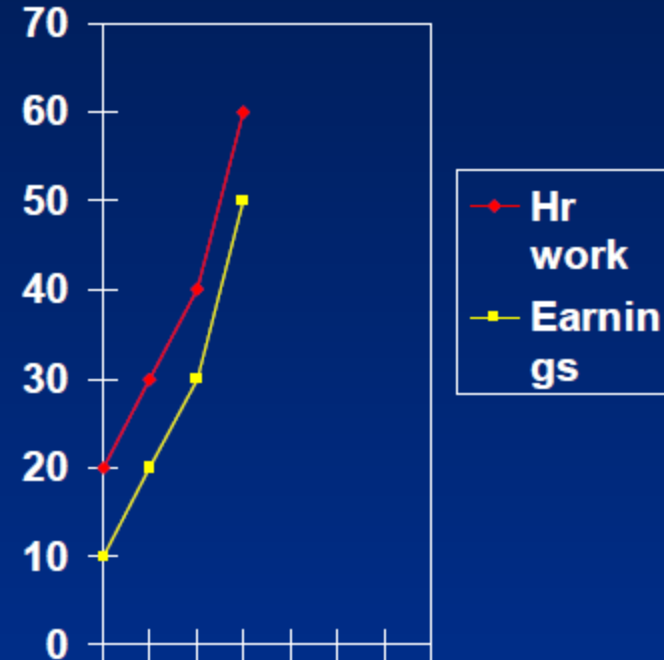
# Non- Directional Hypotheses

- There Is
- a relationship
- between  $X$  &  $Y$ 
  - non-causal
  - correlational statement
  - $X \dots Y$



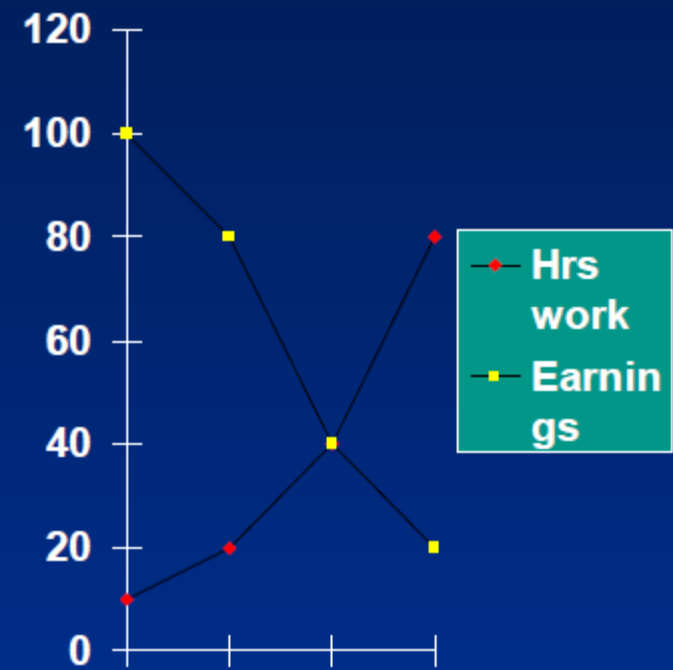
# CORRELATIONAL RELATIONSHIP- POSITIVE CORRELATION

- When the values of
- TWO variables
- “go together”
- or
- values on X & Y
- change in SAME
- DIRECTION



# NEGATIVE CORRELATION

- When the values of two variables
- CO-VARY
- in Opposite direction
- (as one goes up,
- the other goes down)



# FUNCTIONS OR ROLE OF HYPOTHESIS



- It gives a definite point to the investigation and provides direction to the study.
- It determines the data needs.
- It specifies the sources of data.
- It suggests which type of research is likely to be more appropriate.
- It determines the most appropriate technique of analysis.
- It contributes to the development of theory.

# UNIT 3

## RESEARCH DESIGN AND DATA COLLECTION

# Research Design: Introduction

- Research approach & research design are two terms that are frequently used interchangeably; however research design is a broader plan to conduct a study, & research approach is an important element of the research design, which governs it.
- A research design is the framework or guide used for the planning, implementation, & analysis of a study.
- It is a systematic plan of what is to be done, how it will be done, & how the data will be analysed.

# Introduction Cont....

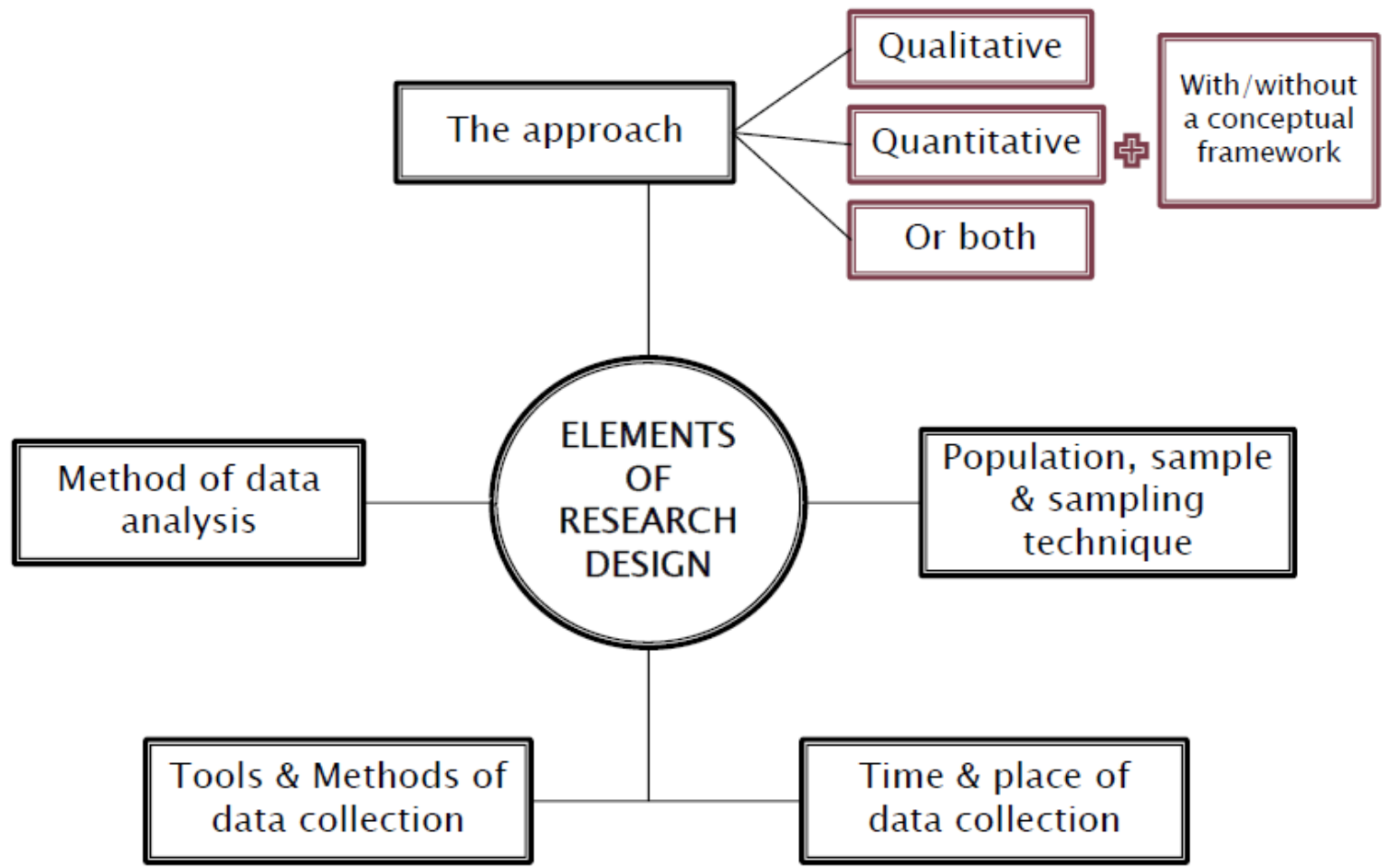
- Research design basically provides an outline of how the research will be carried out & the methods that will be used.
- It includes the descriptions of the research approaches, dependent & independent variables, sampling design, & planning format for data collection, analysis & presentation.



# Definitions

- The research design is the master plan specifying the methods & procedures for collecting & analyzing the needed information in a research study.
- Research design can be defined as a blue print to conduct a research study, which involves the description of research approach, study setting, sampling size, sampling technique, tools & method of data collection & analysis to answer a is specific research questions or for testing research hypothesis.
- Research design is a plan of how, when & where data are to be collected & analyzed.
- Research design is the researcher's overall plan for answering the research questions or testing the research hypothesis.

# Elements of Research Design



# The Approach Cont.....

- It involves the description of the plan to investigate the phenomenon under study in a structured (quantitative), unstructured (qualitative) or a combination of the two methods (quantitative qualitative integrated approach).
- Therefore, the approach helps to decide about the presence or absence as well as manipulation & control over variables.
- It also helps to identify the presence or absence of & comparison between groups.
- The approach of research study depends on several factors, but primarily on the nature of phenomenon under study.
- At this stage of the research study, conceptual framework may or may not be incorporated.

# Population, Sample and sampling Technique

- Research design also provides the researcher with directions about population, sample & sampling technique, which will be used for the research study.
- For example, in an ethnographic qualitative research design, a researcher gets the directive that the population will be a specific cultural group & the study will include a small sample selected through a nonprobability sampling technique.

# Time, Place and Sources of Data collection

- Time (specifying days, months, & years of study), location (study setting) & the sources of the requisite data are the other important constituents essential to ensure effective planning to conduct a research study.

## **Tools and methods of Data collection**

- This element of research design involves the description of different tools & methods of data collection,
- For example, questionnaires, interview, direct observation or any other methods that suit the particular approach of the research as well as nature of the phenomenon under study.

# Methods of Data analysis

- A research design must also include the description of the methods of data analysis - either quantitative or qualitative data analysis techniques – that helps the researcher to collect the relevant data, which later can be analysed as per the research design plan.
- Without a formal plan of data analysis researcher may collect irrelevant data, which can later become difficult to analyse.

# Selection Of Research Design

- Research designs are plans & the procedures for research that span the decisions from broad assumptions to detailed methods of data collection & analysis.
- In order to meet the aims & objectives of a study, researchers must select the most appropriate design.
- The selection of a research design largely depends on the nature of the research problem, the resources available (cost, time, expertise of the researcher), accessibility of subjects, & research ethics.

# Factors affecting selection of Research design



- **Nature of the research problem:** This is the most important factor, which helps the researcher to decide about the selection of a research design.
- Based on the nature of research problem or phenomenon, researchers decide whether it should be investigated through an experimental, quasi-experimental, or non-experimental approach.
- **Purpose of the study:** Study may be conducted for the purpose of prediction, description, exploration, or correlation of the research variable. Therefore, the purpose of the research study helps the researcher to choose a suitable research design.



# Cont.....

- **Researcher's knowledge & experience:** Selection of research design is largely influenced by the researcher's knowledge & experience, because they avoid using those designs wherein they lack confidence, relevant knowledge, or experience.
- **Researcher's interest & motivation:** Interest & motivation levels help researchers decide about the particular research design(s).
- Motivated researchers always analyse most aspects of research design before selecting one or a combination, while casual & callous researchers may choose research design(s) that may lead to failure.

# Cont.....

**Research ethics & principle:** The incorporation & application of ethical & legal principles in the research design are essential. This includes moral obligations such as respect for participants & their rights, informed consent, & protection from harm, including any adverse effects to educational progress, health & well-being.

- Selection of a research design is significantly influenced by the ethics of the research study.

- For example, a researcher may be willing to conduct a research study through a certain experimental approach, but problems of ethical approval may stop the researcher to do so & he or she may have to settle for another available possible research design.

## Cont.....

**Subjects/participants:** The number & availability of study subjects may influence the selection of research design. If only few subjects are involved, an in-depth qualitative researcher may opt for qualitative research design.

**Resources:** None of the researcher can conduct without resources such as money, equipments, facilities, & support from colleagues. However, some of the studies require more amounts of resources as compared to others. Therefore, the selection of a research design may be affected by the availability of resources for the research study.

# Cont.....

**Time:** Time is also a major deciding factors for the selection of research design. For example, a researcher needs more time to conduct longitudinal studies, while cross-sectional studies may be conducted in shorter time. Therefore, time is also a significant contributing factor in selection of a research design.

**Users of the study findings:** A research design also various methods of data collection & data analysis. Therefore, while choosing a research design, researcher must ensure that research design is as appropriate for the users of the study findings as possible, so that maximum advantage of the results can be obtained.

# Cont.....

**Possible control on extraneous variables:** An efficient design can maximize result, decrease errors, & control pre-existing or impaired conditions that may affect the outcome of the study.

The maximized efforts of the researcher should maximize control.

Therefore, possible control over the extraneous variables may affect the selection of a research design.

For example, a researcher wants to conduct a study through true-experimental design but because of inability to control selected extraneous variables, other similar design has to be opted for, such as quasi-experimental or pre-experimental research design.

# Types of Research Design

Generally research designs are classified into two broad categories, & several subtypes,

1. Quantitative research design
  - A.) Experimental
  - B.) Non- experimental
  - C.) Others
  
2. Qualitative research design

# Quantitative Research Design

Broad Categories	Types of Research Design	Main Features
I. Experimental research design	<b>1. True experimental design</b> <ul style="list-style-type: none"> <li>- Post-test -only control design</li> <li>- Pre-test-posttest control group design</li> <li>- Solomon four-group design</li> <li>- Factorial design</li> <li>- Randomized block design</li> <li>- Crossover design</li> </ul>	Manipulation of independent variable, in the presence of control group, randomization
	<b>2. Quasi-experimental design</b> <ul style="list-style-type: none"> <li>- Nonrandomized control group design</li> <li>- Time-series design</li> </ul>	Manipulation of independent variable, but absence of either randomization or control group.
	<b>3. Pre-experimental design</b> <ul style="list-style-type: none"> <li>- One-shot case design</li> <li>- One-group pretest-post-test design</li> </ul>	Manipulation of independent variables, but limited control over extraneous variables, no randomization & control group.

# Quantitative Research Design cont..

Broad Categories	Types of Research Design	Main Features
II. Nonexperimental research design	<p>1. Descriptive design</p> <ul style="list-style-type: none"> <li>- Univariate descriptive design</li> <li>- Exploratory descriptive design</li> <li>- Comparative descriptive design</li> </ul>	<p>Accurate description of characteristics of individual, situation, or group, &amp; the frequency with which a certain phenomenon occurs in natural setting without imposing any control or manipulation</p> <p><i>Univariate descriptive:</i> Studies undertaken to describe the frequency of occurrence of a phenomenon rather than to study relationship</p> <p><i>Exploratory:</i> Investigating the phenomenon &amp; its related factors about which very little is known</p> <p><i>Comparative:</i> Comparing occurrences of a phenomenon in two or more groups</p>



# Quantitative Research Design cont..

Broad Categories	Types of Research Design	Main Features
	<p>2. Correlational/Ex post facto design</p> <ul style="list-style-type: none"> <li>- Prospective design</li> <li>- Retrospective design</li> </ul>	<p>Examining the relationship between two or more variables in a natural setting without manipulation or control (cause &amp; effect relationship)</p> <p><i>Prospective:</i> Examining relationship from cause to effect.</p> <p><i>Retrospective:</i> Examining relationship from effect to cause</p>
	<p>3. Developmental Research Design</p> <ul style="list-style-type: none"> <li>- Cross-sectional design</li> <li>- Longitudinal design</li> </ul>	<p>Examining the phenomenon in respect to the time</p> <p><i>Cross-sectional:</i> Examining the phenomenon only at one point in time</p> <p><i>Longitudinal:</i> Examining the phenomenon at more than one point in time.</p>
	<p>4. Epidemiological design</p> <ul style="list-style-type: none"> <li>-Case-control studies</li> <li>- cohort studies</li> </ul>	<p>The investigation of the distribution &amp; causes of disease in a population is known as epidemiology</p>

# Quantitative Research Design cont..

Broad Categories	Types of Research Design	Main Features
	5. Survey research design	Survey studies are investigation in which self-reported data are collected from sample with the purpose of describing population on some variables of interest.
III. Other additional research design	1. Methodological studies	Research conducted to develop, test, & evaluate the research instruments & method.
	2. Meta-analysis	Quantitatively combining & integrating the findings of the multiple research studies on a particular topic.
	3. Secondary data analysis	A research design in which the data collected in one research is reanalysed by another researcher, usually to test new hypotheses.

# Quantitative Research Design cont..

Broad Categories	Types of Research Design	Main Features
	<b>4. Outcome research</b>	Outcome research involves the evaluation of care practices & systems in place. It is used in nursing to develop evidence-based practice & improve nursing actions.
	<b>5. Evaluation studies</b>	It is research design which involves the judgment about success of a programmes, practices, procedures, or policies.
	<b>6. Operational research</b>	Operational research involves the study of complex human organizations & services to develop new knowledge about institutions, programmes, use of facilities, & personnel in order to improve working efficiency of an organization

# Qualitative Research Design

Types of research designs	Main features
Phenomenological research	Phenomenological research examines human experiences through the descriptions provided by people involved.
Ethnographic research	Ethnographic research involves the information collected from certain cultural groups, by living with people of those groups & from their key informants, who are believed to be most knowledgeable about the selected culture.
Grounded theory	Theory is developed inductively from a corpus of data acquired by a participant-observer
Case studies	Research on a phenomenon by studying in depth a single case example. The case can be an individual person , an event , a group, or an institution.
Historical research	Systematic collection & objective evaluation of data related to past occurrences in order to test hypotheses concerning causes, effects, or trends of these events that may help to explain present events & anticipate future events.
Action research	Action research seeks action to improve practices & study the effect of the action that was taken.

# INTRODUCTION TO DATA COLLECTION

- Data collection is a term used to describe a process of preparing and collecting data.
- Systematic gathering of data for a particular purpose from various sources, that has been systematically observed, recorded, organized.
- Data are the basic inputs to any decision making process in business

# PURPOSE OF DATA COLLECTION

## PURPOSE OF DATA COLLECTION

The purpose of data collection is-

- to obtain information
- to keep on record
- to make decisions about important issues
- to pass information on to others

### CLASSIFICATION OF DATA TYPES

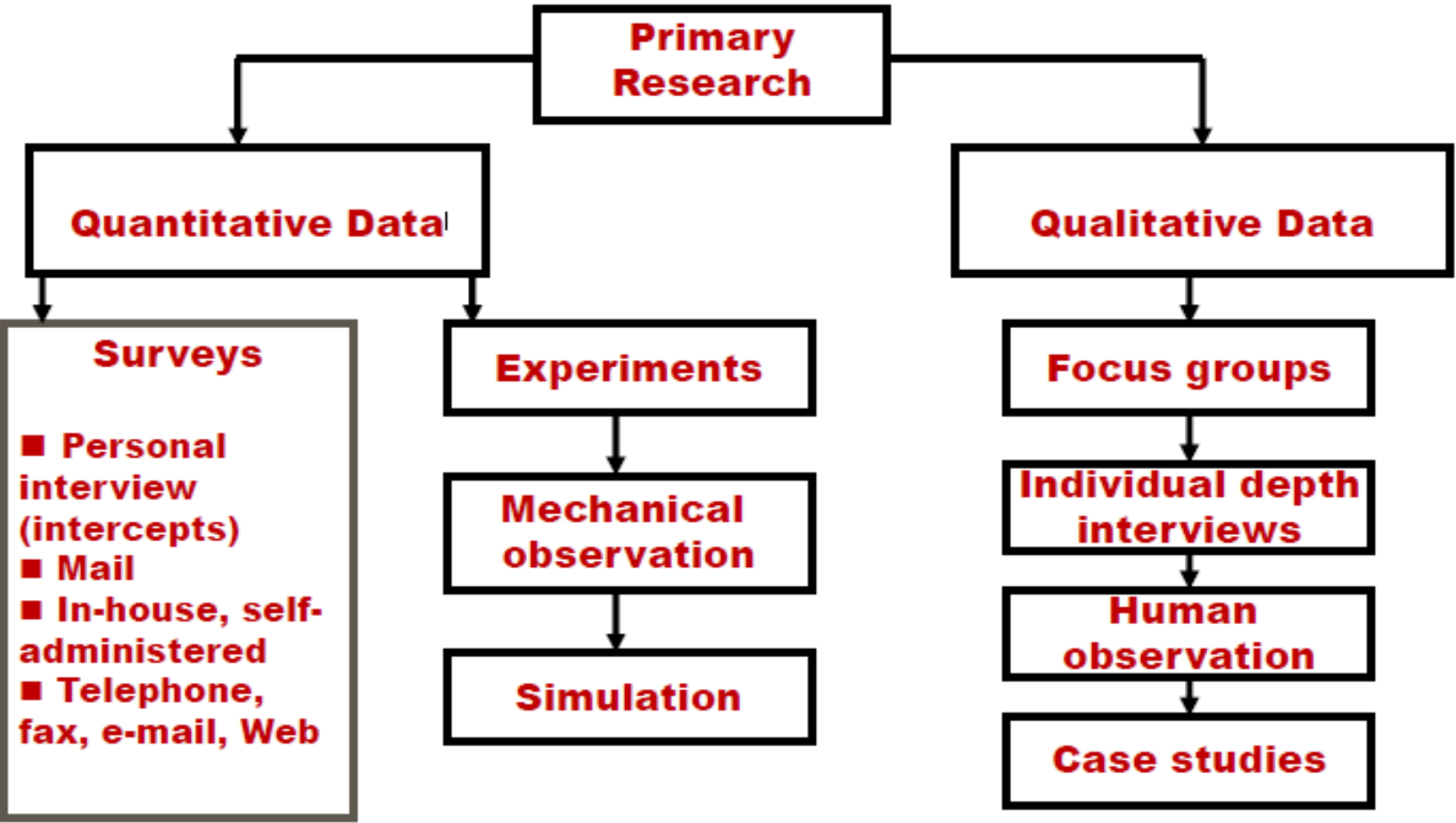
1.) PRIMARY DATA

2.) SECONDARY DATA

# Primary Data

- The data which are collected from the field under the control and supervision of an investigator Primary data means original data that has been collected specially for the purpose in mind.
- This type of data are generally afresh and collected for the first time.
- It is useful for current studies as well as for future studies.
- For example: **your own questionnaire.**

# Primary Research Methods & Techniques





# Quantitative and Qualitative Information:

**Quantitative – based on numbers** – 56% of 18 year olds drink alcohol at least four times a week - doesn't tell you why, when, how.

**Qualitative** – more detail – tells you why, when and how!

## Quantitative Research

- Numerical
- Statistically reliable
- Projectable to a broader population

## Sampling Methods:

**Random Samples** – equal chance of anyone being picked

May select those not in the target group – indiscriminate

Sample sizes may need to be Large to be representative

Can be very expensive

# Quantitative Research cont....

## **Stratified or Segment Random Sampling**

- Samples on the basis of a representative strata or segment
- Still random but more focussed.
- May give more relevant information.
- May be more cost effective.

## **Quota Sampling**

- Again – by segment
- Not randomly selected
- Specific number on each segment are interviewed, etc.
- May not be fully representative
- Cheaper method

# Qualitative Research

## Qualitative Research

- In-depth, insight generating
- Non-numerical
- ‘Directional’

## Common Techniques

- Personal interviews (depth, one-on-one)
- Focus groups (8-12) and mini-groups (3-6)

# Qualitative Research Methods

## **OBSERVATION METHOD**

- Through personal
- observation

## **PERSONAL INTERVIEW**

- Through Questionnaire

## **TELEPHONE INTERVIEW**

- Through Call outcomes,
- Call timings

## **MAIL SURVEY**

- Through Mailed
- Questionnaire

# Advantages and Disadvantages Of Primary Data

## Advantages

- Targeted Issues are addressed
- Data interpretation is better
- Efficient Spending for Information
- Decency of Data
- Proprietary Issues
- Addresses Specific Research Issues
- Greater Control

## Disadvantages

- High Cost
- Time Consuming
- Inaccurate Feed-backs
- More number of resources is required

# Secondary Data

- Data gathered and recorded by someone else prior to and for a purpose other than the current project
- Secondary data is data that has been collected for another purpose.
- It involves less cost, time and effort
- Secondary data is data that is being reused. Usually in a different context.
- For example: data from a book.

## EXTERNAL SOURCES

- External sources of secondary data are usually for Financial application-
- Journals
- Books
- Magazines
- Newspaper
- Libraries
- The Internet

# Sources cont.....

## EXTERNAL SOURCES

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# Advantages and Disadvantages of Secondary Data

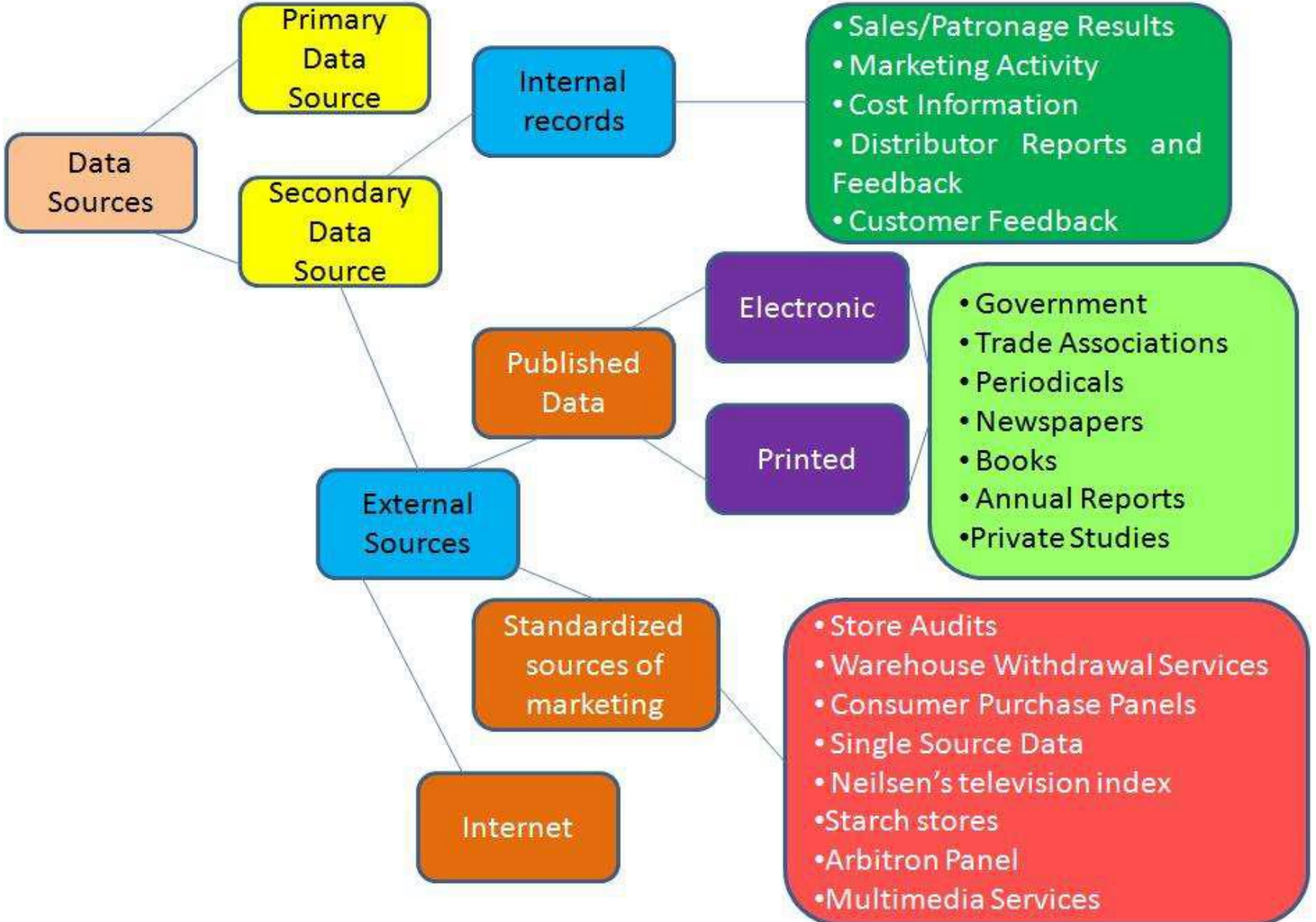
## Advantages

- Ease of Access
- Low Cost to Acquire
- Clarification of Research Question
- May Answer Research Question

## Disadvantages

- Quality of Research
- Not Specific to Researcher's Needs
- Incomplete Information
- Not Timely

# Data Collection Flow



## UNIT 4

# ATTITUDE MEASUREMENT, SCALING AND SAMPLING TECHNIQUES

# Measurement

- It is the process of assigning numbers or symbols to object, event or issue on the basis of certain rules.
- In social science research also measurement is done by assigning numbers to the qualitative phenomenon.
- According to S. Steven, "Measurement is the equipment of providing numbers to objects or events according to rule."
- According to Goode and Hatt, "Measurement is the method of turning the series of qualitative facts into a quantitative series."

# Scaling

- A scale is a continuum, consisting of the highest point in terms of some characteristic e.g. satisfaction level, preference, etc. and the lowest point along with several intermediate points between these two extreme points.
- Scaling is a process of preparing a continuum.
- Scaling is attempting to determine quantitative measures of subjective abstract concepts.
- Scaling provides mechanism for measuring abstract concepts

# Attitude Measurement

- Attitude is a reaction made by a person over any event, product or other thing.
- It is the judgement of any individual about any event or situation or object or person.
- Those scales used in social science which help measure a persons attitude are known as attitude measurement scales.
- Measurement helps to convert qualitative facts in quantitative figures

# Three Approaches to Constructing a Scale

- Select a scale that has been previously developed and tested by other researchers
- Develop a scale by either modifying an existing one or introducing a new set of items
- Develop a new scale that is valid.

## **Such construction of scale involves seven steps**

- Specify domain(area) of the construct
- Generate sample of items
- Collect data
- Purify measures
- Assess reliability
- Assess validity
- Develop norms

# Techniques for Developing Attitude Scale (Mechanisms for Measuring Attitude)

- Ranking
- Respondents are asked to rank the objects or characteristics
- Rating
- The respondents are asked to rate the characteristics or attribute. Maximum and minimum rating are specified.
- Sorting
- Several concepts are provided to the respondents and asked to arrange them in order on the basis of their priority/value. Such arrangements reflect the attitude of the respondents.
- Choice
- Respondents are offered a number of choices and asked to select any one.



# Construction of Scale

- Number or symbols are provided for the measurement of such qualitative subject.
- Various scales can be used for measurement of attitude of human beings.
  1. Arbitrary Scale
  2. Summated Rating Scale or Likert Scale
  3. Differential Scale or Thurstone Scale
  4. Cumulative or Guttman Scale

# Scales cont.....

## Arbitrary Scale

- Social phenomena change over time and new phenomenon exist
- To study such phenomenon need new and different scales
- An arbitrary scale is a new scale developed by the researcher for her research
- Mostly done if the area of research is new
- For such scale to be used, the researcher should ensure the reliability and validity first

## Likert Scale (Summated Rating Scale)

- Developed by Rensis Likert
- Most widely used scale in social science research
- Measures the degree of agreement or disagreement to a series of statements
- It can be 5, 7 or 9 point scale.
- After the responses are collected, an average of each questions is calculated and the inferences are made.

# Scales cont.....

## Differential Scale or Thurstone Scale

- Developed by L.L. Thurstone
- The scale items are selected by the a panel of judges
- Selection is made on the basis of relevance of items to the topic and the level of ambiguity in implication
- Judges are involved in ranking the statements from most favourable to least favourable of certain attitude

## Cumulative or Guttman Scale

- Also called Louis Guttman's Scalogram analysis
- It involves gathering of series of statements as in other scales
- In this scale, items are arranged in an order so that an individual who agrees with a particular item also agrees with items of lower rank-order.
- It eases analysis of data

# QUESTIONNAIRE

- A questionnaire is defined as a formalised schedule for collecting data from respondents. It may be called as a schedule, interview form or measuring instrument.
- Measurement error is a serious problem in questionnaire construction. The broad objective of a questionnaire include one without measurement errors.

Specifically, the objectives of a questionnaire are as follows:

- a) It must translate the information needed into a set of specific questions that the respondents can and will answer.
- b) The questions should measure what they are supposed to measure.
- c) It must stimulate the respondents to participate in the data collection process. The respondents should adequately motivated by the virtual construct of the questionnaire.
- d) It should not carry an ambiguous statements that confuses the respondents.

# Questionnaire Components

A questionnaire consists typically of five sections. They are:

- a) Identification data
- b) Request for cooperation
- c) Instruction
- d) Information sought
- e) Classification of data

# Validity and Reliability of Measurement

## Validity of Measurement

- Validity of an instrument is the degree to which it measures what it is supposed to measure.
- Validity refers to the question of whether our measurements are actually hitting on the construct
- According to Goode and Hatt, “ A scale processes its validity when it actually measures what it claims to measure.”

# Types of Validity

## Content Validity

- Also called face validity
- It ensures whether the measurement tools include an adequate and representative set of items that would tap the concept
- Methods: Judgmental, panel evaluation with content validity ratio, correlation

## Criterion-Related Validity

- It refers to the success of the measures to predict or estimate
- This validity is used when measures differentiate individual on a criterion it is expected to predict
- Helps to establish correlation between actual and standard work
- **Concurrent Validity: scale should differentiate individuals who are known to be different, they should score differently in the instrument**
- **Predictive Validity: differentiate individual with reference to future**
- E.g. one scoring lower in aptitude should be a lower performer than one scoring higher

# Criterion-Related Validity cont.....

A criterion should have some qualities as below

- Relevance:
- Freedom from biases
- Reliability
- Availability: information specified by the criterion should be available
- Method: Correlation

## Construct Validity

- It is internal validity
- It testifies how well the results obtained from the use of the measure fit the theories around which it is designed.
- It is assessed through.

## Convergent Validity

It is established when the scores obtained with two different instruments measuring the same concept are highly correlated



# Discriminant Validity

It is established when, based on theory, two variables are predicted to be uncorrelated, and the score obtained by measuring them are indeed empirically found to be so

Methods: individual judgement, correlation of proposed test with established one, convergent discriminant techniques, factor analysis.

# Reliability of Measurement

- Reliability refers to the consistency of the measurement
- Reliability refers to a measure's ability to capture an individual's true score, i.e. to distinguish accurately one person from another.
- While a reliable measure will be consistent, consistency can actually be seen as a by-product of reliability, and in a case where we had perfect consistency (everyone scores the same and gets the same score repeatedly).

# Features of reliability

- **Stability: stable and consistent result.**
- **Equivalence: equivalent results in different samples by the same researcher.**
- **Internal consistency: if the similar instruments are used and the responses are highly correlated then such measuring instruments are considered as internally consistent.**

# Methods of Measuring Reliability

## **Test-retest method:**

- Researcher measures any phenomena using the same instrument time and again and checks the correlation between the results.
- Checking the correlation between the results, if correlation is high, instrument is reliable and vice versa

## **Alternative or Parallel Form Method:**

- Researcher develops two measuring instruments(forms) under the same concept
- Measures the same phenomena using the two instruments.
- If the results are highly correlated, the instrument is reliable.

# Methods of Measuring Reliability

## Split-half Method

- Checks the correlation between two halves of an instrument.
- Instrument is divided into two equal halves.
- Two instruments are divided to two different group of samples.
- If the results from both samples is highly correlated, instrument is Reliable.

## Inter-rater Method

- Consistency of the judgement of several respondents or raters on the same issue or question is evaluated
- If several respondents rate in the similar way, then the instrument is reliable
- It is used for checking the reliability in case of observation, unstructured interview, etc.