

**Department of Chemistry /College of Science/ University of  
Baghdad**

**Subject: Research Methodology**

**Third stage**

**1<sup>st</sup> semester**

**Dr. Ashraf Saad Rsaheed**

**2023-2024**

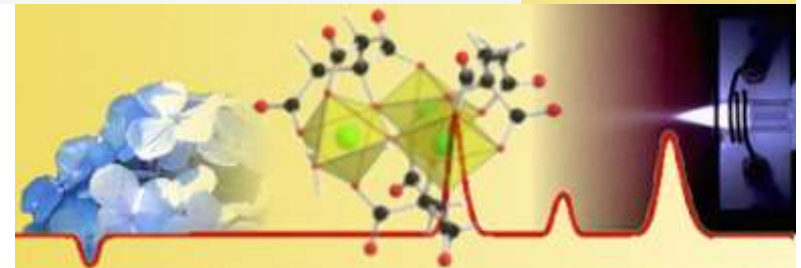
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**Lecture one and two**

# Research Methodology



**Research Methodology**  
*Third stage*

**Dr.Ashraf Saad Rasheed**  
**2023-2024**

**“Science is not belief,  
but the will to find out.”**

# Three LEAD Questions Before Starting Research



*Why?*

*What?*

*How?*



# COURSE OBJECTIVES

1. **Develop a basic understanding of research and its methodologies**
2. **Identify appropriate research topics**
3. **Select and define appropriate research problem**
4. **Prepare a project proposal**
5. **Organise and conduct research**
6. **Write a research report**

# Definitions of Research

The word **research** is derived from the Latin word meaning to **know**. It is a systematic and replicable process, which identifies and defines problems, within specified boundaries. It employs a well-designed method to collect the data and analyses the results. It disseminates the findings to contribute to generalizable knowledge.

**Definitions:** Various social and behavioural scientists have defined the word research in different ways. Some of the most popular definitions are:

1. “Endeavour to discover facts by scientific study, course of critical investigation”, by Pocket Oxford Dictionary.
2. “Systematic investigation to establish facts or collect information on the subject”, by Collins Concise Dictionary.

3. “Research is systematized effort to gain new knowledge”, by Redman and Mory.

4. “Research is the manipulation of things, concepts or symbols for the purpose of generalizing to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art”, by Encyclopedia of Social Sciences.

**Thus, we can say that research is a systematic and objective attempt to study a business problem for the purpose of deriving general principles. In other words, research is a systematic, controlled, empirical and critical investigation of hypothetical propositions about the presumed relations among phenomena.**

# Why do research?

- Desire to get a research degree along with its consequential benefits
- Desire to face the challenge in solving the unsolved problems
- Desire to get intellectual joy of doing some creative work
- Desire to be of service to society
- Desire to get respectability
- Directives of government, employment conditions etc.



# Why do research?...

1. Validate intuition
2. Improve methods
3. Demands of the Job
4. For publication/patent

# Choose a subject

- Based on an idea
- Based on your experience
- Based on your reading
- Originality

# Objectives of Research

- The main goal of research is to improve the quality and level of living in society. The purpose of a research study is to find out the hidden facts about a **scientific** phenomenon. The obvious function of research is to add new knowledge to the existing **science**. It serves the government and **scientific** organizations in forming their future policies.
- The objectives of a research study are listed below:

1. To gain familiarity with or gain new insights into a phenomenon.
2. To accurately portray the characteristics of a particular individual, situation or group.
3. To determine the frequency with which something occurs or is associated with something else.
4. To test a hypothesis of a causal relationship between variables.

### **Objectives of Research**

1. Understanding a business or science problem
2. Identifying the cause-and-effect relationship
3. To innovate new ideas
4. To improve the Quality

# Motivation in Research

What makes people undertake research? This is a question of fundamental importance. The possible motives for doing research may be either one or more of the following:

1. Desire to get a research degree along with its consequential benefits.
2. Desire to face the challenge in solving unsolved problems, i.e., concern over practical problems.
3. Desire to get intellectual joy from doing some creative work;
4. Desire to be of service to society.
5. Desire to get respectability.

# Motivation in Research

- However, this is not an exhaustive list of factors motivating people to undertake research studies. Many more factors, such as government directives, employment conditions, curiosity about new things, desire to understand causal relationships, social thinking and awakening, and the like, may motivate people to perform research operations.

# General Characteristics of Research

1. **Systematic-** All steps must be inter related- one to another
  2. **Logical-** Agreeing with the principles of logic
  3. **Empirical-**Conclusions should be based on evidences/observations
  4. **Objectivity-** It must answer the research questions
  5. **Replicable-** reproducible  
Transmittable
  6. **Quality control-** Accurate measurements
- All well designed and conducted research has potential application

# Types of Research

Types of research can be classified in many different ways. Some significant ways of classifying research include the following.

1-Descriptive versus Analytical Research

2-Applied versus Fundamental Research

3-Qualitative versus Quantitative Research

4-Conceptual versus Empirical Research



# Types of Research

## 1-Descriptive versus Analytical Research

**Descriptive research** concentrates on finding facts to ascertain the nature of something as it exists. **In contrast, analytical research** is concerned with determining the validity of a hypothesis based on the analysis of facts collected.

## 2- Applied versus Fundamental Research

**Applied research** is carried out to find answers to practical problems to be solved and as an aid in decision-making in different areas including product design, process design and policy making. **Fundamental research** is carried out as more to satisfy intellectual curiosity, than with the intention of using the research findings for any immediate practical application.

# Types of Research

## 3-Qualitative versus Quantitative Research

**Qualitative research** studies such aspects of the research subject which are not quantifiable, and hence not subject to measurement and quantitative analysis. **In contrast, quantitative research** makes substantial use of measurements and quantitative analysis techniques.

## 4-Conceptual versus Empirical Research

**Conceptual research** involves investigating thoughts and ideas and developing new ideas or interpretations of old ones based on logical reasoning. **In contrast empirical research** is based on firm verifiable data collected by either observation of facts under natural condition or obtained through experimentation.

Home work

# Research Proposal

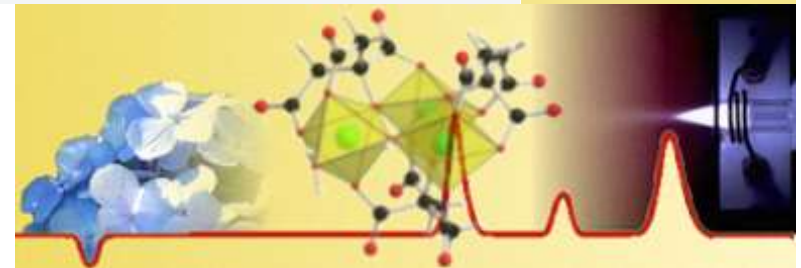
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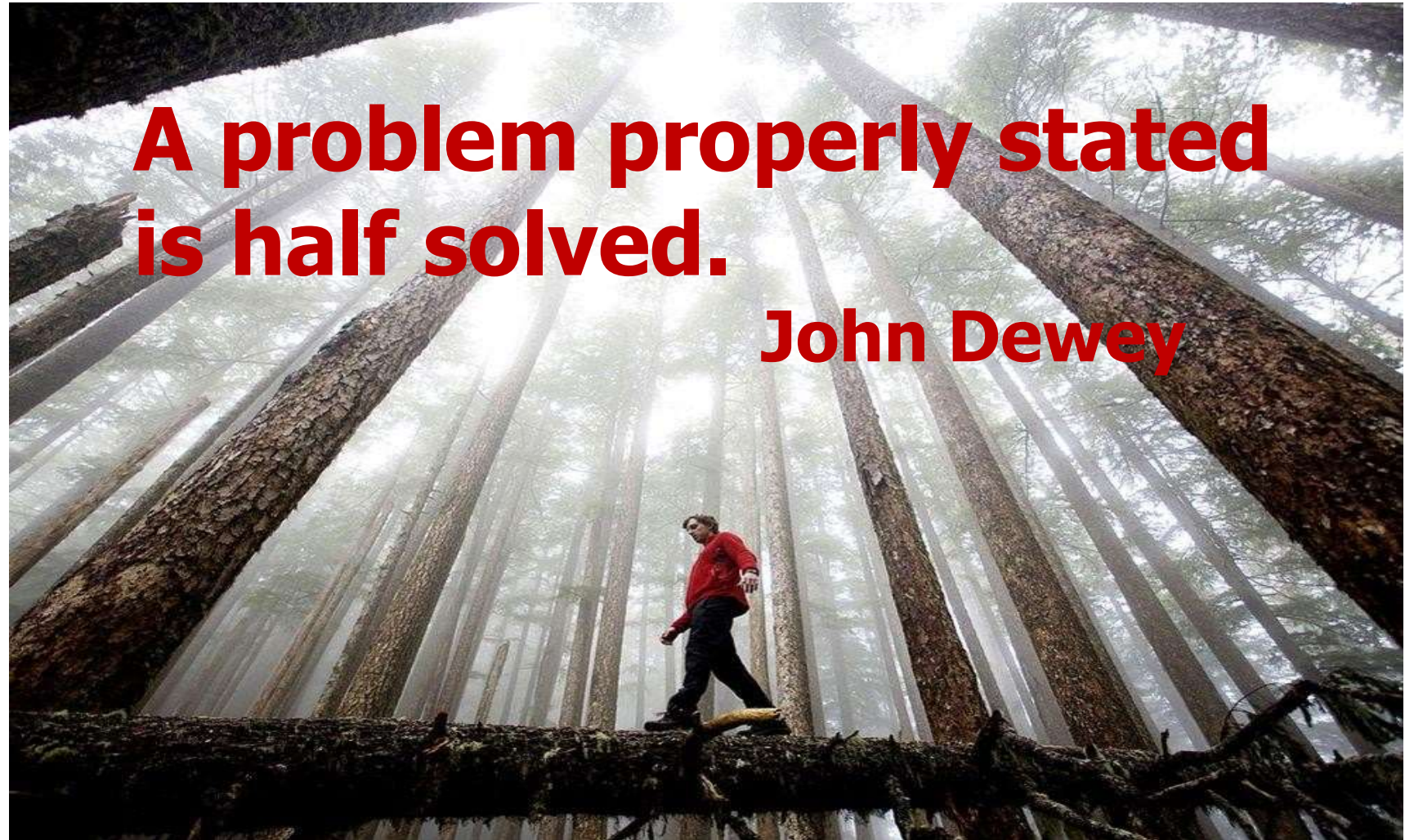
**Lecture three and four**

# Research Methodology



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**A problem properly stated  
is half solved.**

**John Dewey**



# What is a Research Problem



Problem: How can we design a more user-friendly vending machine?

**A Research problem is a question that a researcher wants to answer or a problem that are searcher wants to solve.**

**A research problem is an issues or a concern that an investigator/ researcher presents and justifies in a research study**

# HOW TO SELECT A RESEARCH PROBLEM

An 'angle' for your research can come from insights stemming from:

- Personal experience
- Theory
- Observations
- Contemporary issues
- Engagement with the literature

# Considerations in Selecting Research Problem

	Consideration Factor	Description
1.	<b>Interest</b>	<ul style="list-style-type: none"> <li>• The most important criterion in selecting a research problem.</li> <li>• The whole research process is normally time consuming and a lot of hard work is needed. If you choose a topic which does not greatly interest you, it would become difficult to keep up the motivation to write.</li> </ul>
2.	<b>Expertise</b>	<ul style="list-style-type: none"> <li>• Before selecting a research problem, you need to ensure that you met certain level of expertise in the area you are proposing.</li> <li>• Make use of the facts you learned during the study and of course your research supervisors will lend a hand as well.</li> </ul> <p><i>*** Remember, you need to do most of the work yourself.</i></p>
3.	<b>Data availability</b>	<ul style="list-style-type: none"> <li>• If your research title needs collection of information (journal, reports, proceedings) before finalising the title, you need to make sure you have these materials available and in the relevant format.</li> </ul>



## Considerations in Selecting Research Problem

4.	Relevance	<ul style="list-style-type: none"><li>• Always choose a topic that suits your interest and profession. Ensure that your study adds to the existing body of knowledge. Of course, this will help you to sustain interest throughout the research period.</li></ul>
5.	Ethics	<ul style="list-style-type: none"><li>• In formulating the research problem, you should consider some ethical issues as well.</li><li>• Sometimes, during the research period, the study population might be adversely affected by some questions.</li><li>• In ICT, some scenarios might occur especially research related information security, which might concern certain authorities. Therefore, it is always good for you to identify ethics related issues during the research problem formulation itself.</li></ul>

## Considerations in selecting a good research problem

- 1. Interest:** a research endeavour (attempt) is usually time-consuming and involves hard work and possibly unforeseen problems. One should select a topic of great interest to sustain the required motivation.
- 2. Magnitude (manageability):** It is essential to select a topic that you can manage within the time and resources at your disposal. Narrow the issue down to something manageable, specific and clear.
- 3. Measurement of concepts:** Make sure that you are clear about the indicators and measurement of concepts (if used) in your study. Do not use in your research problem concepts that you are not sure how to measure.

# Considerations in selecting a good research **problem**

- 4. Level of expertise:** Make sure that you have an adequate level of expertise (know-how/knowledge) for the task you are proposing since you need to do the work yourself.
- 5. Relevance:** Ensure that your study adds to the existing body of knowledge, bridges current gaps and is useful in policy formulation. This will help you to sustain interest in the study.
- 6. Availability of data:** Before finalizing the topic, make sure that data are available.
- 7. Ethical issues:** How ethical issues can affect the study population and how ethical problems can be overcome should be thoroughly examined at the problem-formulating stage.

## LEARNING OUTCOMES

By the end of this topic, you should be able to:

1. Define what is a research problem;
2. Identify five factors to consider in selecting research problems;



# What is a research **problem**?!

- ❖ A research problem generally refers to some difficulty that a researcher experiences in a theoretical or practical situation and want to obtain a solution.
- ❖ The research problem undertaken for the study must be carefully selected. The task is a difficult one, although it may not appear to be so. Help may be taken from a research guide in this connection.
- ❖ Nevertheless, every researcher must find salvation, for research problems cannot be borrowed.

# Why are research questions important?

❖ “Well-crafted questions guide the systematic planning of research. Formulating your questions precisely enables you to design a study with a good chance of answering them.”

-- Light, Singer, Willett, By Design (1990)

# STATEMENT OF PROBLEM

- A concise wording of the problem to be tackled.
- Your research problem statement is the foundation and focus of your research report.
- It is a clear, stand-alone statement that clarifies what you are aiming to discover or establish. **A good problem statement is specific.**
- Many researchers have difficulty formulating a concise problem statement.
- The statement of the problem is sometimes written as a separate chapter and sometimes located at the very end of the review literature.



# STATEMENT OF PROBLEM

- At a minimum, a problem statement should include :
  - **What** is the problem or defect ?
  - **Magnitude** of the problem ?
  - **Where** is the problem ?
  - **Why** is it important to work on this problem ?

# STATEMENT OF PROBLEM

- *Even though plastic is a useful and versatile material with a wide range of applications, the disposal of plastic waste is problematic since they are durable and persist in the environment.*
- *The monitoring of plastic waste and research into its impacts are still in their infancy, but so far the implications are worrying. Besides, the problem of plastics in developing countries is tripled since there is no proper waste management to effectively either recycle or to recovery energy from plastic waste.*

# STATEMENT OF PROBLEM

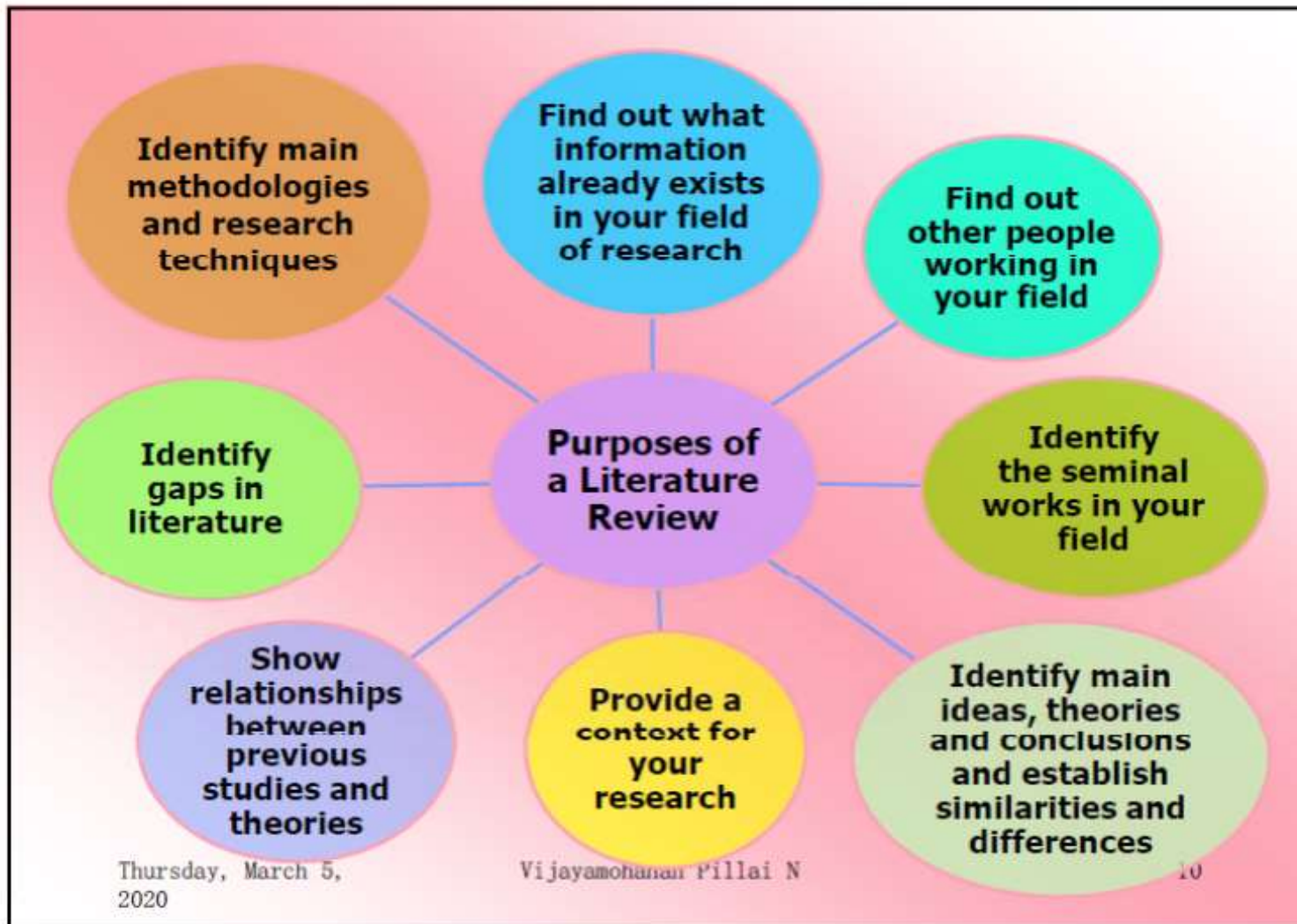
- Thus, recovery energy from plastic waste by producing liquid fuels will be a great *benefits by solving the energy problems in developing, reducing their environmental impacts and generating incomes.* Thus, in this work a novel Waste-to-liquid fuels technology is designed, manufactured and tested to be ready for the society. The technology is intended to be a low cost machine and serve the whole population of IRAQ.

# SOURCES OF RESEARCH PROBLEM

1. Reading
2. Academic Experience
3. Daily Experience
4. Exposure to field situations
5. Consultations
6. Brainstorming
7. Research
8. Intuition

# EVALUATION OF THE RESEARCH PROBLEM

- Will the research results have social, educational or scientific value?
- Will it be possible to apply the results in practice?
- Will the research opt new problems and lead to further research?
- Is there enough reach gap left within the area of research ?
- Will it be possible for another researcher to repeat the research?
- Are you motivated to undertake the research?



# What is a Literature review?

- **Systematic review of available resources**
- **Theoretical and conceptual concepts**
- **Identification of independent and dependent variables**
- **Measurement and operational definitions**
- **Selection of appropriate research technique**
- **Sampling strategy**
- **Statistical technique**
- **Findings and conclusions of similar studies studied**

# The Review of Literature

## The literature review is important because:

1. It describes how the proposed research is related to prior research.
2. It shows the originality and relevance of your research problem. Specifically, your research is different from other researchers.
3. It justifies your proposed methodology.
4. It demonstrates your preparedness to complete the research.



## What is a literature review and why is it necessary?

1. discover what knowledge exists related to your research topic
2. increase your statistical knowledge in your research area
3. find gaps (and possibly errors) in published research
4. generate new original ideas
5. avoid duplicating results of other researchers
6. justify the relevance of your proposed research

# Where do I find Sources of Information for my Literature Review?

- Books
- Journals
- Internet
- Data bases
- Archives
- Interviews
- Observations
- Reports
- Records

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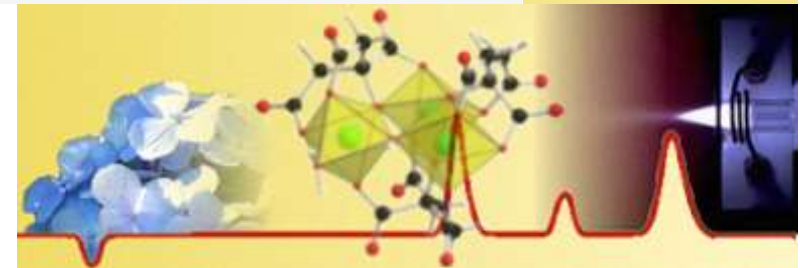


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## Lecture five and six

# Methods of Data Collection



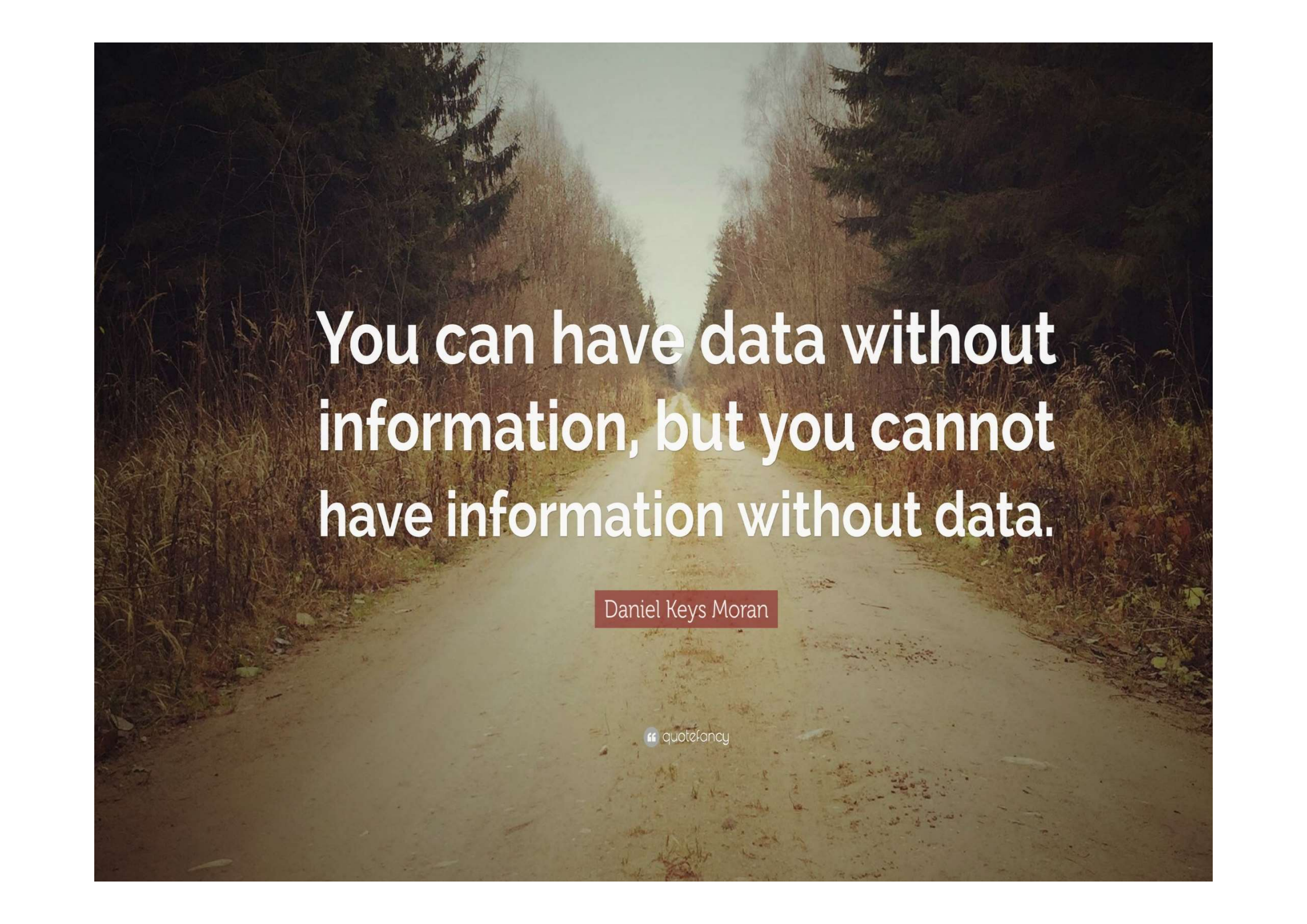
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# What is DATA?????

- Data are the set of values of qualitative or quantitative variables about one or more persons or objects.
- ❖ Data are simply units of information.
- ❖ Data are **measured, collected, reported, analyzed**, and used to create data **visualizations** such as graphs, tables or Images.





**You can have data without  
information, but you cannot  
have information without data.**

Daniel Keys Moran

 quotez fancy

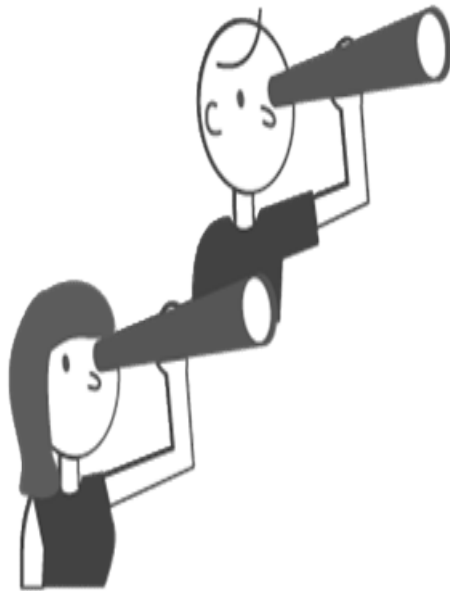
# What is Data Collection?

- ❖ It is the process by which the researcher **collects the information needed to answer the research problem.**
- ❖ The task of data collection begins after a research problem has been defined.



## In collecting the data, the researcher must decide:

- ❖ Which data is to collect?
- ❖ How to collect the Data?
- ❖ Who will collect the Data?
- ❖ When to collect the Data?





# The 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





# Methods of Data Collection

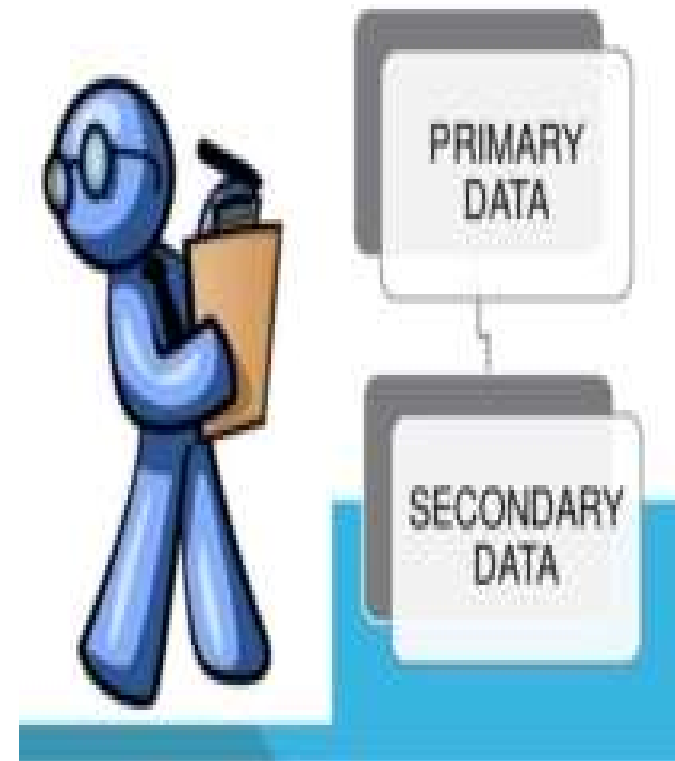
- Essentially Two Types:

- **PRIMARY DATA**

Primary data are those which are collected for the first time and are original in character.

- **SECONDARY DATA**

Secondary data are those which have already been collected-by someone else.



# Primary Data v/s Secondary Data

## Primary data

- Real time
- Sure about the sources
- Can answer research question.
- Cost and time
- Can avoid bias
- More flexible

## Secondary data

- Past data
- Not sure about sources
- Refining the research problem
- Cheap and no time
- Bias can't be ruled out
- Less flexible

# Methods of Collecting Primary Data

Primary  
Data  
may be  
collected  
through:

- **Observation**
- **Surveys**
- **Interviews**
- **Questionnaires**
- **Schedules**



# 1. Observation Method

- Observation method is a method under which data from the field is collected with the help of observation by the observer or by personally going to the field.



# Steps For An Effective Observation

**Determine what needs to be observed**



**Select participants**

Random/Selected



**Conduct the observation**

(venue, duration, recording materials, take photographs )



**Compile data collected Analyze and interpret data collected**



# Types of OBSERVATION Methods

## 1– Structured Observation

When the observation is characterized by a careful definition of the units to be observed (predefined), the style of recording the observed information, standardized conditions of observation and the selection of related data of observation.

## 2– Unstructured Observation

When it takes place without the above characteristics.  
(Not predefined)

## 3– Participant Observation

When the observer is member of the group which he is observing then it is Participant Observation.

# Types of OBSERVATION Methods

## 4- Non-Participant Observation

When the **observer is not the member of the group** which he is observing then it is Non-Participant Observation.

observer is observing people without giving any information to them then it is Non-Participant Observation

## 5- Uncontrolled Observation

When the observation takes place in **natural condition** i.e., uncontrolled observation. It is done to get spontaneous picture of life and persons.

## 6- Controlled Observation

When **observation takes place according to pre-arranged plans**, with experimental procedure then it is controlled observation generally done in laboratory under controlled condition.

# Advantages of observation Method



Produces Large quantities of data.

All data obtained from observations are usable.

The observation technique can be stopped or begun at any time.

Relative Inexpensive



# Disadvantages of observation Method

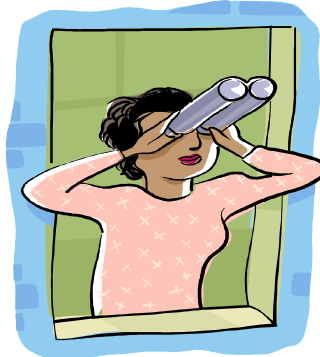
1. Interviewing selected subjects may provide more information, economically, than waiting for the spontaneous occurrence of the situation.
2. Extensive Training is needed.
3. Limited information

# How to collect Primary information through survey

- A researcher can collect information

either

by observation



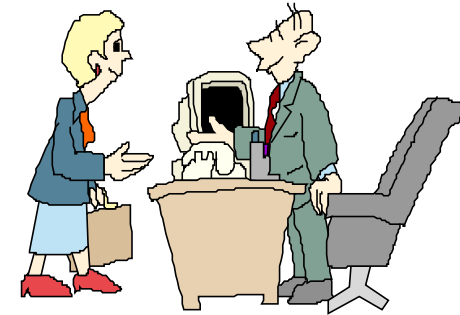
or

by asking.



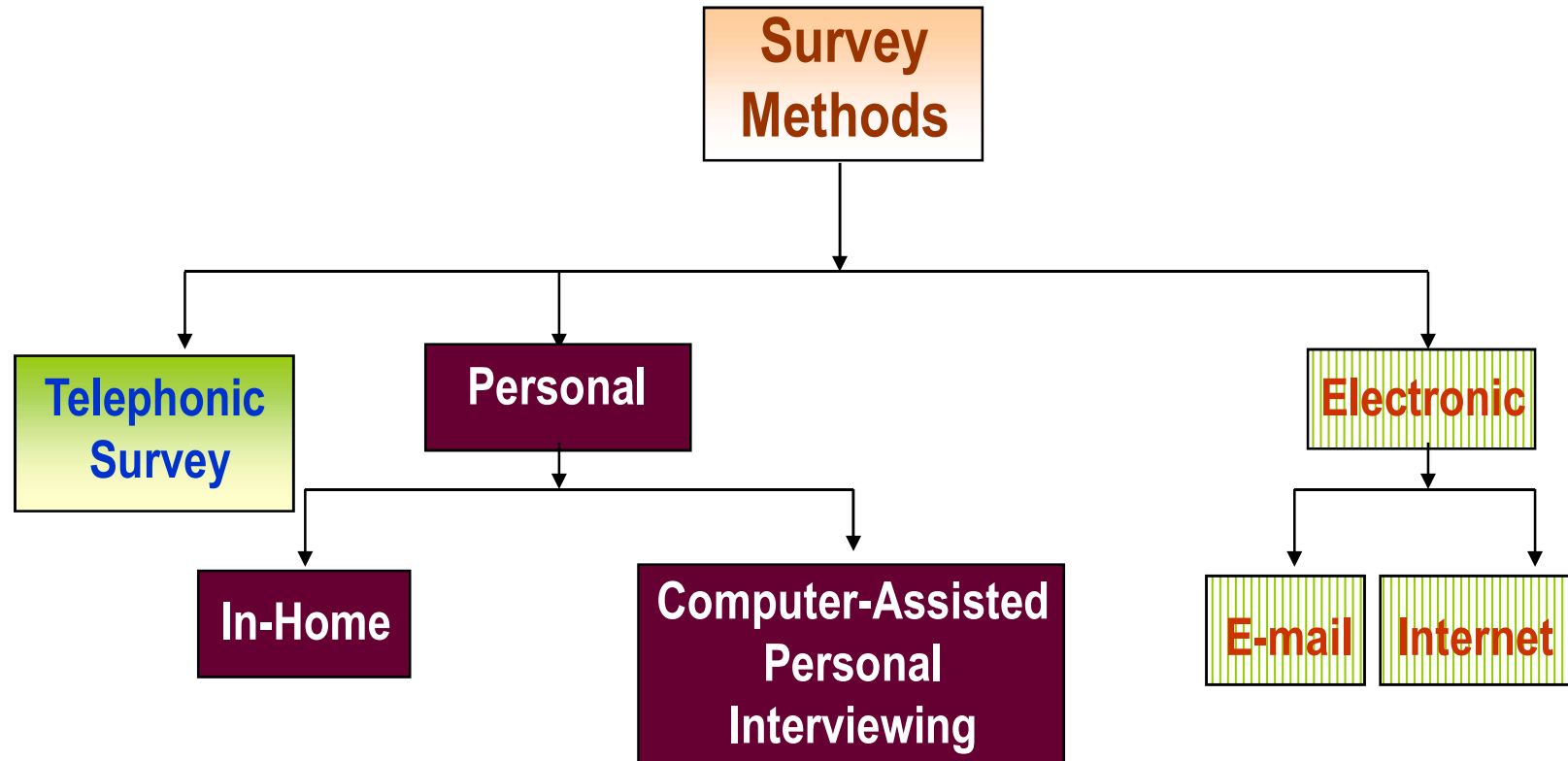
- **WHEN HE/SHE ASKS FOR INFORMATION, WE SAY THAT HE/SHE IS CONDUCTING A SURVEY.**

## 2. SURVEY Method



- A 'survey' is a technique of gathering information by questioning those individuals who are the object of the research belong to a representative sample, through standardized or questioning procedure, with the aim of studying the relationship among the variables and/or collecting information that probably describe the whole population.

There may be different ways to conduct surveys...



# 3. Interview Method

- The Interview Method of collecting data involves presentation of oral-verbal stimuli and reply in terms of oral- verbal responses.
- where the questions are asked personally directly to the respondent.
- Interviewer asks questions to respondent. (which are aimed to get information required for study)



# Steps For An Effective Interview



- 1. Prepare interview schedule**
- 2. Select subjects/ key Respondent**
- 3. Conduct the interview**
- 4. Analyze and interpret data collected from the interview**

# Types of Interview Methods

## 1- Structured Interviews :

In this case, a set of predecided questions are there.

## 2- Unstructured Interviews :

In this case, we don't follow a system of pre-determined questions.

### 3- Focused Group Interview

- Unstructured and Free flowing
- Focus Group has one Moderator
- Moderator maintains control and focuses discussion
- It involves 6 to 10 people
- Group interview start with broad topic and focus in on specific issues
- Relatively homogeneous
- Similar lifestyles and experiences
- Generate discussion and interaction
- Listens to what people have to say
- Everyone gets a chance to speak

A research method that brings together a small group of consumers to discuss the product or advertising, under the guidance of a trained interviewer.





#### 4- Clinical Interviews :

- Information is generated and utilized at every step this process including the activities of investigation, observation, monitoring, diagnosis, planning, treatment and review.
- They also record their plans, orders, procedures performed, observations, test results, opinions and discussions.

#### 5- Group Interviews :

It is done in a group of 6 to 8 individuals is interviewed.

## 6- Qualitative and quantitative Interviews :

It is divided on the basis of subject matter i.e., whether qualitative or quantitative.

## 7- Individual Interviews :

Interviewer meets a single person and interviews him.

## 8- Selection Interviews :

Done for selection of people for certain Jobs.

## Advantages of Interview Method

More information at greater depth can be obtained

Resistance may be overcome by a skilled interviewer

Personal information can be obtained

## Disadvantages of Interview Method

It is an expensive Method

Interviewer bias

Respondent bias

Time consuming

## 4.Questionnaires Method

- The term “questionnaire” refers to an instrument for the collection of data, usually in written form, consisting of open/closed questions and other enquiries requiring a response from subjects.
- A Questionnaire is sent ( by post or by mail ) to the persons concerned with a request to answer the questions and return the Questionnaire.
- A Questionnaire consists of a number of questions printed in a definite order on a form.



# Steps For An Effective Questionnaire

## Prepare questions

(Formulate & choose types of questions, order them, write instructions, make copies)



## Select your respondents

Random/Selected



## Administer the questionnaire

(date, venue, time )



## Tabulate data collected



## Analyze and interpret data collected



# Types of Questionnaire Methods

- **1- Open-ended questions**

- This gives the respondents the ability to respond in their own words.

- **2- Close-ended or fixed alternative questions**

- This allows the respondents to choose one of the given alternatives.
- Types:- Dichotomous questions and Multiple Questions.

# Essentials of Good Questionnaire

- Should be short and simple
- Follow a sequence of questions from easy to difficult one
- Technical terms should be avoided
- Should provide adequate space for answers in questionnaire
- Directions regarding filling of questionnaire should be given Physical Appearance – Quality of paper, Color
- Sequence must be clear





# Advantages of questionnaire Method

1. Low cost –even when the universe is large and is widespread
2. Free from interviewer bias
3. Respondents have adequate time to think through the answers.
4. Respondents who are not easily approachable, can also be reached conveniently.
5. Large samples can be used

# Disadvantages of questionnaire Method

1. Time consuming
2. The respondents need to be educated and cooperative
3. This method is slow
4. Possibility of unclear replies.

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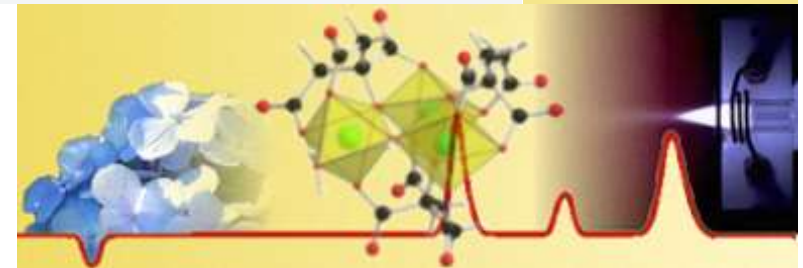


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**Lectures nine and ten**

# Sampling



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# Meaning and Definition of sampling

- **Sampling may be defined as the selection of some part of an aggregate or totality on the basis of which a judgement or inference about the aggregate or totality is made. In other words, it is the process of obtaining information about an entire population by examining only a part of it.**
- In most of the research work and surveys, the usual approach happens to be to make generalisations or to draw inferences based on samples about the parameters of population from which the samples are taken

# Need for Sampling

**Sampling is used in practice for a variety of reasons such as:**

1. Sampling can save time and money. A sample study is usually less expensive than a census study and produces results at a relatively faster speed.
2. Sampling may enable more accurate measurements for a sample study is generally conducted by trained and experienced investigators.
3. Sampling remains the only way when population contains infinitely many members.
4. Sampling remains the only choice when a test involves the destruction of the item under study.
5. Sampling usually enables to estimate the sampling errors and, thus, assists in obtaining information concerning some characteristic of the population

# Some fundamental definitions

**1- Universe/Population:** From a statistical point of view, the term 'Universe' refers to the total of the items or units in any field of inquiry, whereas the term 'population' refers to the total of items about which information is desired.

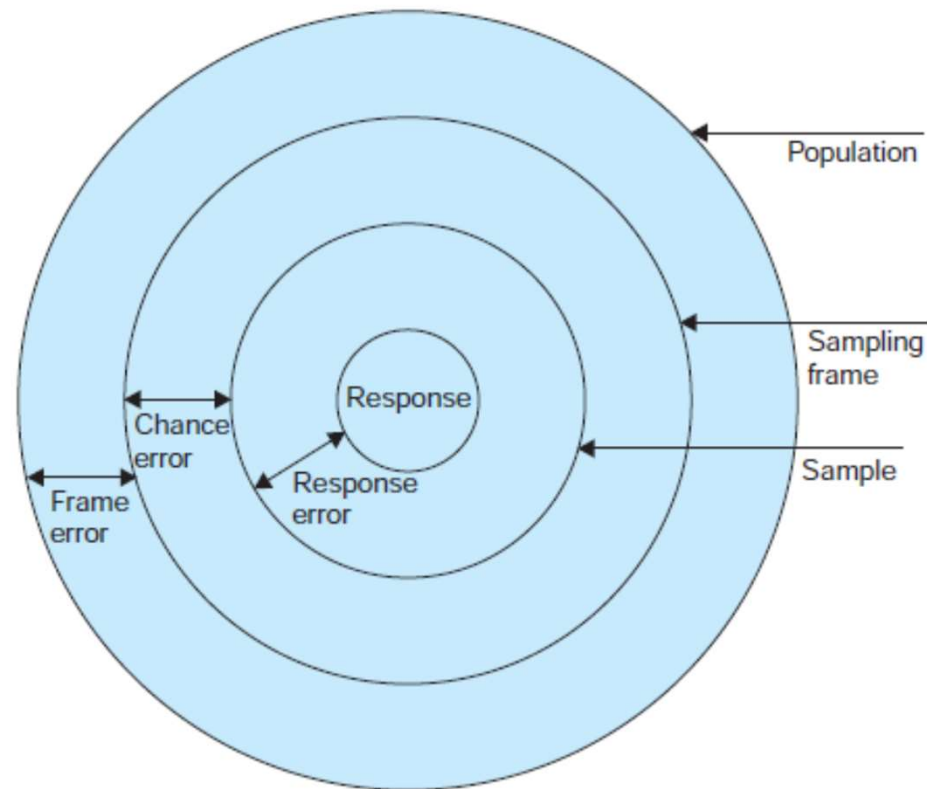
**A)** The population or universe can be ***finite or infinite***. The population is said to be finite if it consists of a fixed number of elements so that it is possible to enumerate it in its totality. For instance, the population of a city, the number of workers in a factory are examples of finite populations.

**B)** Thus, in an **infinite** population the number of items is infinite i.e., we cannot have any idea about the total number of items. The number of stars in a sky, possible rolls of a pair of dice are examples of infinite population.

**2. Sampling frame:** The elementary units or the group or cluster of such units may form the basis of sampling process in which case they are called as sampling units. A list containing all such sampling units is known as sampling frame.

- 3. Sampling design:** A sample design is a definite plan for obtaining a sample from the sampling frame. It refers to the technique or the procedure the researcher would adopt in selecting some sampling units from which inferences about the population is drawn.
- 4. Statistic(s) and parameter(s):** A statistic is a characteristic of a sample, whereas a parameter is a characteristic of a population. Thus, when we work out certain measures such as mean, median, mode or the like ones from samples, then they are called statistic(s) for they describe the characteristics of a sample.
- 5. Sampling error:** Sample surveys do imply the study of a small portion of the population and as such there would naturally be a certain amount of inaccuracy in the information collected. This inaccuracy may be termed as sampling error or error variance.
- 6. Sampling distribution:** We are often concerned with sampling distribution in sampling analysis. If we take certain number of samples and for each sample compute various statistical measures such as mean, standard deviation, etc., then we can find that each sample may give its own value for the statistic under consideration.

# Some fundamental definitions



Sampling error = Frame error  
+ chance error + response error.  
(If we add measurement error or the non-sampling error  
to sampling error, we get total error)

Fig. 8.1

$$\text{Sampling error} = \text{Frame error} + \text{Chance error} + \text{Response error}$$



# Sampling methods

There are two types of sampling methods which are:

## 1- Probability sampling methods:

Probability sampling means that every member of the population has a chance of being selected. It is mainly used in quantitative research. If you want to produce results that are representative of the whole population, probability sampling techniques are the most valid choice. There are four main types of probability sample.

### 1. Simple random sampling

In a simple random sample, every member of the population has an equal chance of being selected. Your sampling frame should include the whole population. To conduct this type of sampling, you can use tools like random number generators or other techniques that are based entirely on chance.

## Probability sampling methods

Example: Simple random sampling You want to select a simple random sample of 100 employees of Company X. You assign a number to every employee in the company database from 1 to 1000, and use a random number generator to select 100 numbers.

### 2. Systematic sampling

Systematic sampling is similar to simple random sampling, but it is usually slightly easier to conduct. Every member of the population is listed with a number, but instead of randomly generating numbers, individuals are chosen at regular intervals.

Example: Systematic sampling All employees of the company are listed in alphabetical order. From the first 10 numbers, you randomly select a starting point: number 6. From number 6 onwards, every 10th person on the list is selected (6, 16, 26, 36, and so on), and you end up with a sample of 100 people.

## Probability sampling methods

### 3. Stratified sampling

Stratified sampling involves dividing the population into subpopulations that may differ in important ways. It allows you draw more precise conclusions by ensuring that every subgroup is properly represented in the sample.

To use this sampling method, you divide the population into subgroups (called strata) based on the relevant characteristic (e.g. gender, age range, income bracket, job role).

Based on the overall proportions of the population, you calculate how many people should be sampled from each subgroup. Then you use random or systematic sampling to select a sample from each subgroup.

**Example:** Stratified sampling. The company has 800 female employees and 200 male employees. You want to ensure that the sample reflects the gender balance of the company, so you sort the population into two strata based on gender. Then you use random sampling on each group, selecting 80 women and 20 men, which gives you a representative sample of 100 people.

# Probability sampling methods

## 4. Cluster sampling

Cluster sampling also involves dividing the population into subgroups, but each subgroup should have similar characteristics to the whole sample. Instead of sampling individuals from each subgroup, you randomly select entire subgroups.

If it is practically possible, you might include every individual from each sampled cluster. If the clusters themselves are large, you can also sample individuals from within each cluster using one of the techniques above. This is called [multistage sampling](#).

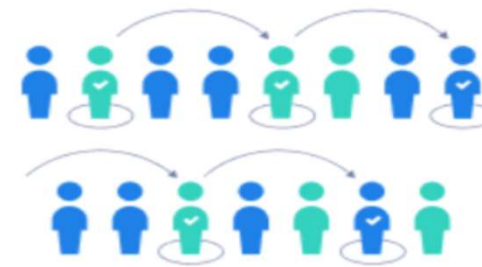
**Example:** Cluster sampling. The company has offices in 10 cities across the country (all with roughly the same number of employees in similar roles). You don't have the capacity to travel to every office to collect your data, so you use random sampling to select 3 offices – these are your clusters.

# Probability sampling methods

Simple random sample



Systematic sample



Stratified sample



Cluster sample



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# (Non-probability sampling methods)

## 2- Non-probability sampling methods

In a non-probability sample, individuals are selected based on non-random criteria, and not every individual has a chance of being included. This type of sample is easier and cheaper to access, but it has a higher risk of [sampling bias](#). There are four types of **Non-probability sampling methods**

### 1. [Convenience sampling](#)

A convenience sample simply includes the individuals who happen to be most accessible to the researcher.

This is an easy and inexpensive way to gather initial data, but there is no way to tell if the sample is representative of the population, so it can't produce [generalizable](#) results.

**Example:** Convenience sampling You are researching opinions about student support services in your university, so after each of your classes, you ask your fellow students to complete a [survey](#) on the topic. This is a convenient way to gather data, but as you only surveyed students taking the same classes as you at the same level, the sample is not representative of all the students at your university.

## (Non-probability sampling methods)

### 2. Voluntary response sampling

Similar to a convenience sample, a voluntary response sample is mainly based on ease of access. Instead of the researcher choosing participants and directly contacting them, people volunteer themselves (e.g. by responding to a public online survey).

Voluntary response samples are always at least somewhat biased, as some people will inherently be more likely to volunteer than others.

**Example:** Voluntary response sampling You send out the survey to all students at your university and a lot of students decide to complete it. This can certainly give you some insight into the topic, but the people who responded are more likely to be those who have strong opinions about the student support services, so you can't be sure that their opinions are representative of all students.

## (Non-probability sampling methods)

### 3. Purposive sampling

This type of sampling, also known as judgement sampling, involves the researcher using their expertise to select a sample that is most useful to the purposes of the research.

It is often used in qualitative research, where the researcher wants to gain detailed knowledge about a specific phenomenon rather than make statistical inferences, or where the population is very small and specific. An effective purposive sample must have clear criteria and rationale for inclusion. Always make sure to describe your inclusion and exclusion criteria.

**Example:** Purposive sampling You want to know more about the opinions and experiences of disabled students at your university, so you purposefully select a number of students with different support needs in order to gather a varied range of data on their experiences with student services.



## (Non-probability sampling methods)

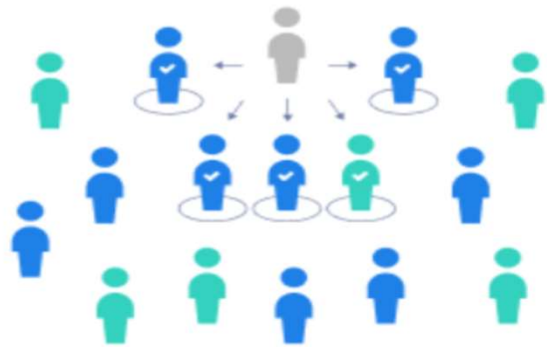
### 4. Snowball sampling

If the population is hard to access, snowball sampling can be used to recruit participants via other participants. The number of people you have access to “snowballs” as you get in contact with more people.

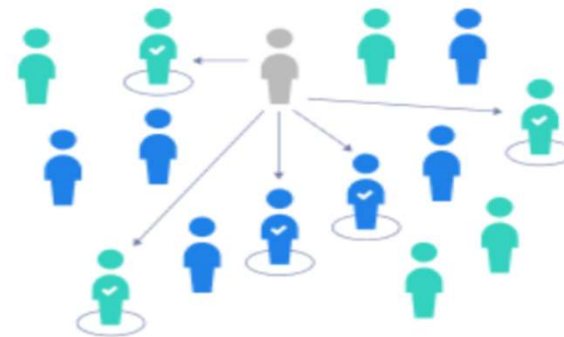
**Example:** Snowball sampling You are researching experiences of homelessness in your city. Since there is no list of all homeless people in the city, probability sampling isn't possible. You meet one person who agrees to participate in the research, and she puts you in contact with other homeless people that she knows in the area.

# (Non-probability sampling methods)

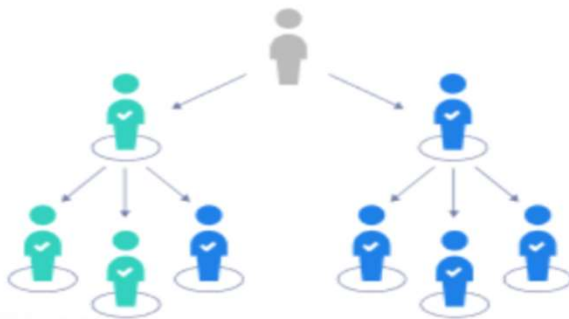
Convenience sample



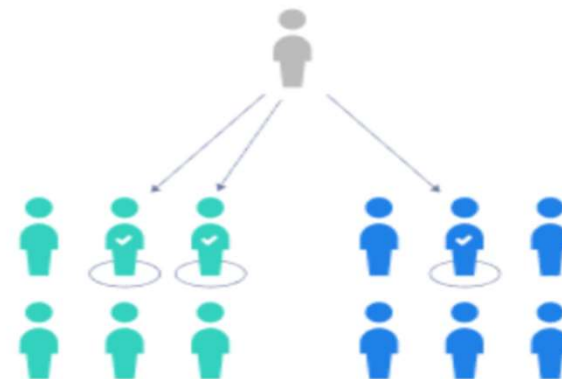
Purposive sample



Snowball sample



Quota sample



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College

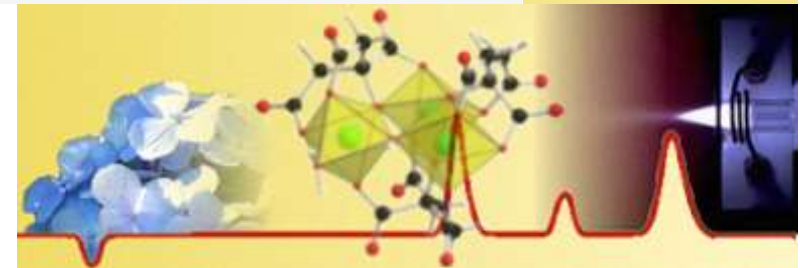


Science  
Baghdad



Lectures eleven and twelve

# Preparation of Research



Research Methodology  
*Third stage*

*Dr.Ashraf Saad Rasheed  
2023-2024*

# Characteristics of Good research

## A Title that Works: Characteristics and Tips

The title occupies an exclusive place in the text as it immediately captures the reader's attention and influences his/her decision to read the paper or not. It's a good idea to take advantage of this fact and create a concise, informative, and catchy title that will draw the reader in.

# Characteristics of Good research

In 2005, the scholars Hairson and Keene in their book *Successful Writing* came up with four goals that any good title accomplishes.

## 1. A good title predicts the content of the research

A good title informs the reader accurately about the contents of the article. The main responsibility of a title is to explain what the article is about without misleading or establishing wrong expectations. Make sure it doesn't include anything that your reader won't be able to find in the paper.

## 2. A good title should be interesting to the reader

To make the title interesting, attention-grabbing, and easy to read, use words that create a positive impression and stimulate the reader's interest. The example above is catchy enough to become a memorable title.

However, be careful if you want to include a catchy phrase. Even though stylistic devices make titles witty and more attractive, such titles may be not clear. When trying to add some zest, make sure your title conveys information in an unambiguous and precise manner, communicates the message clearly, and doesn't encourage multiple interpretations.

# Characteristics of a good research title

## 3. It reflects the tone of writing

It's very important to define the tone of your research in the title and keep it throughout the paper. If it's a serious and conventional academic study, avoid a casual or fun title containing ornate or conversational language.

## 4. It contains important keywords

Keywords are important words and concepts that are frequently used in your research paper. Using them in the title will let you introduce the topic, problem, or solution right away.

## 5. Concise and on point.

In 2012, Paiva's research showed that short-titled articles "had higher viewing and citation rates than those with longer titles. Articles with results-describing titles were cited more often than those with methods-describing titles".

APA recommends that your title be no more than 12 words in length. If it's too long, there may be too many unnecessary words.

# Characteristics of a good research title

- On the other hand, if a title is too short, it's a slippery slope towards making it too broad, non-specific, and the reader won't be able to grasp the gist. For example, a paper on philosophy of education with the title "Learning How" is so non-specific that it could be the title of a DIY manual.

## Tips for Writing an Effective Research Paper Title

- When writing a research title, you can use the four criteria listed above as a guide. Here are a few other tips you can use to make sure your title will be part of the recipe for an effective research paper:

1. Make sure your research title describes (a) the topic, (b) the method, (c) the sample, and (d) the results of your study. You can use the following formula:

- *[Result]: A [method] study of [topic] among [sample]*

- *Example: Meditation makes nurses perform better: a qualitative study of mindfulness meditation among German nursing students*



## Tips for Writing an Effective Research Paper Title

2. Avoid unnecessary words and jargons. Keep the title statement as concise as possible. You want a title that will be comprehensible even to people who are not experts in your field. Check our article for a detailed list of [things to avoid when writing an effective research title](#).
3. Make sure your title is between 5 and 15 words in length.
4. If you are writing a title for a university assignment or for a particular academic journal, verify that your title conforms to the standards and requirements for that outlet. For example, many journals require that titles fall under a character limit, including spaces. Many universities require that titles take a very specific form, limiting your creativity.

# Tips for Writing an Effective Research Paper Title

Use a descriptive phrase to convey the purpose of your research efficiently. Most importantly, use critical keywords in the title to increase the discoverability of your article.

Example of good titles

1- **Spectrophotometric determination of penicillins in pure and pharmaceutical formulations using Folin-Ciocalteu reagent**

Sensitive and selective spectrophotometric assay of doxycycline hyclate in pharmaceuticals using Folin-Ciocalteu reagent.

Novel spectrophotometric method for determination of some macrolide antibiotics in pharmaceutical formulations using 1,2-naphthoquinone-4-sulphonate.

