

**University of Gondar**  
**College of Social Sciences and Humanities**  
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*Course Title: Introduction to Research Methods in Geography  
and Environmental Studies*

*Category: 2<sup>nd</sup> year BA (undergraduate) students*

*Lecture note*

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## CHAPTER -1: THE NATURE OF RESEARCH

### 1.1. *What is Research?*

- **Research** is an organized inquiry carried out to provide information for the solution of a problem.
- **Research** is an organized and systematic way of finding answers to questions.
- An **organized, systematic, data based on critical, objective, scientific** enquiry or investigation into a specific problem, undertaken with the purpose of finding answers or solutions to it.
- **The role and salient characteristics** of marketing research may be described by the *Acronym RESEARCH*.
  - **R**: recognition of information needs
  - **E**: effective decision making
  - **S**:systematic and objective
  - **E**:exude or disseminate information
  - **A**: analysis of information
  - **R**:recommendations for action
  - **C**:collection of information
  - **H**: helpful to managers.

### **Qn: is research a means to an end or an end by it-Self?**

- **Information** is often required to solve a specific problem to minimize risk and uncertainty which makes research a means to end (**applied research**).
- Research can also be used to increase knowledge or understanding. This makes research an end in itself (**Basic research**).

### 1.2. **What are the basic Features of Scientific Research?**

- Scientific research is concerned with observed facts systematically classified, and includes trustworthy methods to discover truths.
- This method of inquiry is a very important aspect of science.
- Observation, hypothesis & verification are the three important components of scientific enquiry.

### ***1.3. Characteristics of Scientific Methods***

Two general traits characterize the scientific method:

**1. Validity:** is the characteristic used to describe research **that measures what it claims to measure** For example, to measure TV-viewing audiences people meter–mechanical device is put on TV sets to determine when they are turned on.

**2. Reliability:** is the characteristic of a research methodology that allows it to be **repeated again and again by any researcher**–always with the same results.

- Scientists working in their laboratories control all aspects of their experiments and report them in detail so that other scientists can attempt the same study and confirm the results.

### ***1.4. Types/Classification /Categories of Researches***

There are different categories of research:

#### **1. Descriptive vs. Analytical:**

- **Descriptive research** includes surveys and fact-finding enquiries of different kinds. The major purpose of descriptive research is description of the state of affairs as it exists at present.

- **Analytical research**, on the other hand, the researcher has to use facts or information already available, and analyze these to make a critical evaluation of the material.

## 2. **Basic Research/Pure Research/Fundamental Research vs applied research**

- **Basic research:** The investigation of problems to further and develop existing Knowledge.
- It is mainly concerned with generalization and formulations of theories.
- Gathering information and acquiring knowledge for knowledge's sake is termed basic research.
- **Applied Research:** Research done with the intention of applying the results of the findings to solve specific problems currently being experienced in the organization.
- Has a practical problem solving emphasis, although the problem solving is not always generated by negative circumstances.
- Problem solving based as it is conducted to reveal answers to specific questions related to action, performance, or policy needs.
- Undertaken to solve a specific problem.
- Attempts to solve specific management problems.

## 3. **Quantitative vs. Qualitative Research**

- **Quantitative Research:** Based on the measurement of quantity or amount.
- Applicable to phenomenon that can be expressed in terms of quantity.

- Is important in behavioral sciences where the aim is to discover the underlying motives, interests, personality and attitudes of human beings.
- **The qualitative research** serves as the foundation for the quantitative phase of the research project because it provides the researcher with first-hand knowledge of the research problem.
- Armed with this knowledge, the researcher's design and execution of the quantitative phase is invariably superior to what it might have been without the qualitative phase.
- In some cases, a qualitative phase is applied after a Quantitative study to help the researcher understand findings in the quantitative phase.

#### **4. Conceptual Vs. Empirical Research**

##### ***Conceptual Research***

- Related to some abstract idea or theory.
- Philosopher's thinkers generally use it to develop new concepts or to interpret existing ones.

##### ***Empirical Research***

- Data based, coming up with conclusions that are capable of being verified, by observation or by experiment.
- The researcher should collect enough that to prove or disprove his hypothesis.

##### ***1.5. A good research should have the following qualities:***

- The purpose of the research is clearly defined.
- The research process is presented in detail.

- The research design thoroughly planned.
  - High ethical standards should be applied
  - Limitations should be frankly revealed.
  - Adequate analysis should be made for decision makers' needs.
  - Findings should be presented unambiguously.
  - The Conclusions should be justified.
- ✓ Generally qualities of a good research
1. Good research is **systematic**
  2. Good research is **logical**
  3. Good research is **empirical**
  4. Good research is **replicable**

## CHAPTER-2: THE RESEARCH PROPOSAL

- *A research proposal* is an activity that incorporates decisions made during early research-project planning phase of the study including management –research questions hierarchy and exploration.
- *A research proposal* is a work plan, outline, prospectus, statement of intent, draft plan.
- *A proposal* is an individual's or a company's offer to produce a product or render a service to a potential buyer or sponsor.

### 2.1. Purpose of Research Proposal

- The purpose of a research proposal is to:
- Present the management question to be researched and its importance.
- Discuss the research efforts of others who have worked on related management questions.
- Suggest the data necessary for solving the management questions and how the data will be gathered, treated, and interpreted.

### 2.2. Types of Research Proposals

Proposals can be **internal or external**.

#### ✓ *Internal Proposals*

- Internal proposals are more succinct than external ones.
- An internal proposal is done for the corporation by staff specialist or by the research department of the firm.
- It is a memo from the researcher to management outlining the problem statement, study objectives, research design, and schedule enough to start an exploratory study.

#### ✓ *External Proposals*

- An external proposal is either solicited or unsolicited.
- The proposal is likely competing against others for a contract or grant.
- An unsolicited proposal has the advantage of not competing against others but the disadvantage of having to speculate on the ramifications of a problem facing the firm's management.
- The writer of the unsolicited proposal must decide to whom the document should be sent.
- The external summary of an external proposal may be included within about project management and the facilities and special resources.
- **Complexity Level of a Proposal**

There are two general levels complexity.

- Management proposal (Internal and external )
- Student proposals (Term Paper, Master's Thesis & Doctoral dissertation )

## **2.3. Structure of Internal & External Proposals**

### **i. Executive Summary**

- Allows a busy manager or sponsor to understand quickly the thrust of the proposal.
- It is essentially an informative abstract, giving executives the chance to grasp the essentials of the proposal without having to read the details.
- The goal of the summary is to secure a positive evaluation by the executive who will pass the proposal on to the staff for a full evaluation.



## **ii. Problem Statement**

- It should convince the sponsor to continue reading the proposal.
- It should capture the reader's attention by stating the management dilemma, its background and consequences, and the question starts the research task.
- It should include any restrictions or areas of the management question that won't be addressed.

## **iii. Research Objective**

- Lays out exactly what is being planned by the proposed research.
- In a descriptive study, the objectives can be stated as the research question.
- The research questions can be further broken down into investigative questions.
- If the proposal is for a descriptive or causal study, then the objectives can be restated as a hypothesis.
- The objective naturally flows from the problem statement, giving the sponsor specific, concrete, achievable goals.

## ***iv. Literature Review***

- Examines recent research studies, company data, or industry reports that acts as a basis for the proposed study.
- Discussion of literature should move from a comprehensive perspective to more specific studies that are associated with your problem.
- If the problem has a historical background, begin with the earliest references.

- Avoid the extraneous details of the literature, do a brief review of the information, not a comprehensive report.
- Emphasize the important results and conclusions of other studies, the relevant data and trends from previous research, and particular methods or design that could be duplicated or should be avoided.
- Discuss how the literature applies to the study you are proposing, show the weaknesses or faults in the design , discussing how you would avoid similar problems.
- If your proposal deals solely with secondary data, discuss the relevance of the data and the bias or lack of bias inherent in it.

#### **V. Importance / Benefits of the Study**

- Allows describing explicit benefits that will accrue from your study.
- The importance of “doing the study now” should be emphasized.
- If you find it difficult to write, then you will have probably not understood the problem adequately.
- Return to the analysis of the problem and ensure , through additional discussions with your research team or
- By the reexamination of the literature, that you have captured the essence of the problem.
- It requires you to understand what is most troubling to your sponsor.
- It is more important to the unsolicited external proposal.

#### **Vi. Research Design**

- The design module describes what you are going to do in technical terms.
- It should include so many subsections as needed to show the phases of the project.

- Provide information on your proposed design for tasks such as sample selection and size, data collection method, instrumentation, procedures, and ethical requirements.
- When more than one way exists to approach the design discuss the methods you rejected and why your selected approach is superior.

### **Vii. Data Analysis**

- With smaller projects, the proposed data analysis would be included within the research design section.
- For large-scale contract research projects and doctoral thesis a separate brief section of data analysis is appropriate.
- Describe your proposed treatment and the theoretical basis for using the selected techniques.
- Assure the sponsor that you are following correct assumptions and using theoretically sound data analysis procedures.

### **Viii. Nature & Form of Results**

- The sponsor should be able to go back to the problem statement and research objectives and discover that each of the goals of the study has been covered.
- One should also specify the types of data to be obtained and the interpretations that will be made in the analysis.
- If the data are to be turned over to the sponsor for proprietary reasons, make sure that this is reflected.
- Alternatively, if the report will go to more than one sponsor, that should be noted.
- It also contains the contractual agreement telling the sponsor exactly what types of information will be received.

- Statistical conclusions, applied findings, recommendations, action plans, models strategic plans, and so forth are .....forms of results.

### **ix. Qualification of Researchers**

- It should begin with the principal investigator.
- It is also customary to begin qualifications with the highest academic degree held.
- Experience in carrying out previous research is important, especially in the corporate market place, so a concise description of similar projects should be included.
- Complete curriculum vitae information is often placed in an appendix for review by interested sponsors.

### **X. Budget**

- The budget should be presented in the form the sponsor requests.
- The budget should be no more than 1-2 pages.
- The budget statement in an internal research proposal is based on employee and over head costs.
- The budget presented by an external research organization is not just the wages or salaries of their employees.
- The budget section of an external proposal states the total fee payable for the assignment.

### **xi. Schedule**

- schedule should include the major phase of the project, their time tables, and the milestones that signify completion of a phase.
- Major phase may be:
  - Exploratory interviews

- Final research proposal
- Questionnaire revision
- Field interviews
- Editing & coding
- Data analysis , and
- Report generation
- You can use Gant chart.

## **Xii. Facilities & Special Resources**

- Often projects will require facilities or resources that should be described in detail.
- A contract exploratory study may need specialized facilities for focus group sessions.
- Computer assisted telephone or other interviewing facilities may be required.
- Alternatively , your proposed data analysis may require sophisticated computer algorithms , and therefore, you need access to an adequate system .
- The proposal should carefully list the relevant facilities and resources that will be used.

## **Xiii. Project Management**

- This section shows the sponsor that the research team is organized in a way to do the project efficiently.
- A master plan is required for complex projects to show how the phase will be brought together.
- Tables and charts are most helpful in presenting the master plan.
- The type and frequency of progress reports should be recorded

#### **XiV. Bibliography**

- For all projects that require literature review, a bibliography is necessary.
- Use the bibliographic format required by the sponsor.

#### **Appendices glossary**

- A glossary of terms should be included whichever there are many words unique to the research topic and not understood by the general management community.
- This is a simple section consisting of terms and definitions.
- Also, define any acronyms that you use, even if they are defined within the text.

## **CHAPTER-3: THE RESEARCH PROCESS: PROBLEM DEFINITION**

The research process includes a number of practical steps which may include the following.

- Define The Research Problem,
- Establish The Research Objectives,
- Develop Hypothesis And Research Questions,
- Identify Information Types And Sources
- Determine Research Design,
- Prepare and Present The Final Research Report
- Determine Sample Plan And Size
- Qualitative methods
- Quantitative methods
- Development of measurement scales
- Development of data collection designs (Questionnaire)
- Collecting Data
- Analyze Data

### **3.1. Defining the Problem and Determining Research Objectives**

#### **✓ *The Need For Research***

- To establish the need for research, all organizations should monitor their surrounding environments on a continuous basis using a monitoring system.
- The primary objective of a monitoring system is to bring operating information to management. Such information allows management:

- To evaluate whether their current operating information results in meeting performance objectives.
- If proposed legislation has an impact on consumer spending or other industry interests,
- Whether changes in consumer values and lifestyles are occurring, or if new strategies are being implemented by competitors

### **3.2. Differences between Managers & Researchers**

- Organization Position (line vs. Staff)
- Responsibility(to make profit Vs to generate profit)
- Training(General Decision Making Vs. Technique Application)
- Disposition Toward Knowledge (Wants Answers to questions Vs. Wants To Ask Question)
- Involvement (Pragmatic Vs. Scholarly)
- Use of Research (Highly Involved , Emotional Vs. Detached , Unemotional)
- Research Motivation (Political Vs. Nonpolitical )
- Research Motivation (To Make Symptoms Disappear Vs. To Find The Truth )

### **3.3. Research Problem:**

- It is defined as providing relevant, accurate, and unbiased information that managers can use to solve their Management problems.

Defining a problem involves:

- Specifying the symptoms
- Itemizing the possible causes of the symptoms, and



- Listing the reasonable alternative courses of action that the manager can undertake to solve the problem.

There are two types problems with which a research must contend:

- The Management Problem and
  - The Research Problem
- Poor problem definition can expose research to a range of undesirable consequences, including incorrect research designs and inappropriate or needlessly expensive and collection, assembly of incorrect or irrelevant data, and poor choice of the sample selection.
  - It is critical that the management problem be defined accurately and fully.

There are eight assessment areas that help the researcher properly define the Management problem.

- Assess the background of the company, Product, and Market
- Understand the decision maker's circumstances, objectives, and resources
- Specify actions that may alleviate the problem
- Identify the manager's assumptions about the consequences
- Assess the adequacy of information on Hand

### **3.4. Specify Research Objectives**

- A good way of setting research objectives is to ask, "what information is needed in order to solve the problem?"
- A key aspect of the research objectives step is the specification of the specific types of information useful to the managers as they look for a solution to the management problem at hand.

- Research objectives address information gaps that must be closed in order for the manager to go about resolving the current problem.
- Generally, the researcher prepares an itemized listing of the information objectives agreed upon by the manager as essential for this purpose.
- Each research objectives must be precise, detailed, clear and operational.
- For example:
  - ***The research objective:*** “compare the demographic profiles of Hilton Hotel customers to Non-Hilton Hotel customers using age, sex, education, and annual family income.”
  - ***To be precise:*** means that the terminology is understandable to the commercial manager and that it accurately captures the essence of each construct to be researched.
    - ***Detail*** is provided by including the four demographic measures of age, sex, education, and annual family income.
    - ***Clear objective:*** there is no doubt as to what will be researched and how the information will be presented to the manager.
    - ***Operational:*** it implies specific measurement scales and statistical analysis.

### 3.5. Hypothesis

1. **Null hypothesis** is a statement in which no difference or effects are expected. If the null hypothesis is not rejected, no changes will be made.

- The null hypothesis is a proposition that states a definitive, exact relationship between two variables.
- It states that the population correlation between two variables is equal to zero or that the difference in the means of two groups in the populations is equal to zero or the difference in the means of two groups in the population is equal to zero (or some definite number).
- In general, the null statements are expressed as no (significant) relationship between two variables or no (significant) difference between two groups.

**2. *Alternative Hypothesis*:** is a statement that some difference or effect is expected. Accepting the alternative hypothesis will lead to changes in opinions or actions.

### **3.5.1. Directional and Non-Directional Hypothesis**

- ***Directional Hypothesis (DP)***
  - DH is refers to those hypothesis that deals with relationships between two variables or comparing two groups.
  - In stating such hypothesis terms such as ***positive, negative, more than, less than,*** and the like are used.
- ***Non directional Hypothesis (NDH)***NDH are those that do not postulate a relationship or difference, but offer no indication of the direction of these relationships or differences.
- In other words, though it may be conjectured that there would be a significant relationship between two variables, we may not be able to say the relationship would be positive or negative.

- **Parametric tests:** hypothesis –testing procedures that assume that the variables of interest are measured on at least an interval scale.
- **Nonparametric test:** hypothesis testing procedures that assume that the variables are measured on a nominal or ordinal scale.

***The following steps are involved in hypothesis testing:***

- Formulate the null hypothesis  $H_0$  and the alternative hypothesis  $H_A$ .
- Select an appropriate statistical technique and the corresponding test statistic.
- Choose the level of significance,  $\alpha$ .
- Determine the sample size and collect the data .Calculate the value of the test statistics.
- Determine the probability associated with the test statistics under the null hypothesis using the sampling distribution of the test statistics. Alternatively, determine the critical values associated with the test statistics that divide the rejection and non-rejection regions.
- Compare the probability associated with the test statistics with the level of significance specified. Alternatively, determine whether the test statistics has fallen into the rejection or the non-rejection region.

## CHAPTER-4: RESEARCH DESIGN

### 4.1. Research Design

It is a framework for conducting the marketing research project. It specifies the details of the procedures necessary for obtaining the information needed to structure and /or solve marketing research problems.

A Research design is the specification of procedures for collecting and analyzing the data necessary to help identify or react to a problem or opportunity, such that the difference between the cost of obtaining various levels of accuracy and the expected value of the information associated with each level of accuracy is maximized.

- ***A Research Design*** is the detailed blueprint used to guide a research study toward its objectives.
- ***Research design requires the specification of procedures.*** These procedures involve decisions on what information to generate, the data collection method, the measurement approach, the object to be measured, and the way in which the data are to be analyzed.
- ***The data are to be collected to help identify or react to a problem or opportunity.*** All data collected should eventually relate to decisions faced by management.
- ***The information has value.*** Information acquires values as it helps improve decisions.
- ***The varying levels of accuracy of information can be generated in response to the same problem.*** Information accuracy is affected by the occurrence of a number of potential errors.

- **The goal of applied research design is not to generate the most accurate information possible.**
- **Research Design Can Be Classified Into Two:**
  - Exploratory Research And
  - Conclusive Research
  - **Exploratory research** is one type of research design, which has as its primary objective the provision of insights into and comprehension of the problem situation confronting the researcher.
  - Exploratory research could be used for any of the following purposes of gain background information.
    - Exploratory Research is most commonly unstructured, informal research that is undertaken to gain background information about the general nature of the research problem.
    - By unstructured we mean that exploratory research does not have a formalized set of objectives, sample plan, or questionnaire.
    - Exploratory research is aimed at gaining additional information about a topic and generating possible hypothesis to test.
  - Exploratory research is systematic, but it is very flexible in that it allows the researcher to investigate whatever sources he or she desires and to the extent he or she feels is necessary in order to gain a good feel for the problem at hand.
  - **Exploratory research is the initial step *in the overall research design framework.***

- It should, in most instances, be followed by descriptive or causal research.
- For example, hypothesis developed via exploratory research should be statistically tested using descriptive or causal research.
- Exploratory research in the form of secondary data analysis and focus groups was conducted to identify the social causes that Ethiopian businesses should be concerned about.
- Then a descriptive cross-sectional survey was undertaken to quantify the relative salience of these causes.
- ***It is not necessary to begin the survey research design with exploratory research.***
- It depends upon the precision with which the problem has been defined and the researcher's degree of certainty about the approach to the problem.
- A research design could well begin with descriptive or causal research.
- ***Although exploratory research is generally the initial step, it need not be.***
- Exploratory research may follow descriptive or causal research.
- Exploratory research may provide more insights to help understand these findings.

#### **4.2. Methods of Conducting Exploratory Research**

A variety of methods are available to conduct exploratory research. These include:

##### ***a) Secondary Data Analysis***

- Secondary data analysis refers to the process of searching for and interpreting existing information relevant to the research problem.
- Data that have been collected for some other purposes.
- Libraries and internet are full of secondary data, which includes information found in books, journals, magazines, special reports, bulletins, newsletters, and so on.
- An analysis of secondary data is often the “core” of exploratory research.

***b) Experience surveys***

- Experience survey refers to gathering information from those thought to be knowledgeable on the issues relevant to the research problem.

**c) Case analysis**

Case analysis refers to a review of available information about a former situation (s) that has some similarities to the present research problem.

- There are few research problems that do not have some similarities to some situation in the past

***d) Focus groups***

- Focus groups are groups of people brought and guided by a moderator through an unstructured, spontaneous discussion for the purpose of gaining information relevant to the research problem.
- The moderator should ensure the discussion is “focused “on some general area of interest.

***e) Projective Techniques.***



- Projective techniques seek to explore hidden consumer motives for buying goods and services by asking participants to project themselves into a situation and then to respond to specific questions regarding the situation.
- **Conclusive Research:** Research designed to assist the decision maker in determining, evaluating, and selecting the best course of action to take in a given situation.
  - it is typically more formal and structured than exploratory research.
  - It is based on large, representative samples, and the data obtained are subjected to quantitative analysis.
  - The findings from the research are considered to be conclusive in nature in that they are used as input into managerial decision-making.
  - Conclusive research can be either **descriptive or causal**.
  - *A Descriptive Research* is a type of conclusive research that has as its major objective the description of something-usually market characteristics or functions.
  - Provides answers to questions such as who, what, where, when and how, as they are related to the research problem.
  - Typically, answers to these questions, are found in secondary data or by conducting surveys.

#### **4.3. Descriptive research is conducted for the following reasons:**

- To describe the characteristics' of relevant groups, such as consumers, salespeople, organizations, or market areas.
- To estimate the percentage of units in a specified population exhibiting a certain behavior.
- To determine the perceptions of product characteristics'.

- To determine the degree to which marketing variables are associated.
- To make specific predictions.
- Descriptive Research can be further classified into cross-sectional and longitudinal research.

***a) Cross-Sectional Designs***

- A type of research design involving the collection of information from any given sample of population elements only once.

***i. Single cross-sectional design***

- A type of research design involving the collection of information from any given sample of population elements only once.
- In this type of design only one sample of respondents is drawn from the target population, and information is obtained from this sample only once.

***ii. Multiple-cross-sectional design:***

- A cross sectional design in which there are two or more samples of respondents, and information from each samples is obtained only once.
- Often, information from different samples is obtained at different times over long intervals.
- It allows comparisons at the aggregate level but not at the individual respondent's level.
- Because a different sample is taken each time a survey is conducted, there is no way to compare the measures on individual respondents across surveys. For example cohort analysis.

- **A cohort analysis:** is a multiple cross-sectional design consisting of a series of surveys conducted at appropriate time intervals.
- The cohort refers to the group of respondents who experience the same event within the same time interval.
- The term cohort analysis refers to any study in which there are measures of some characteristics’ of one or more cohorts at two or more points in time.
- Cohort analysis is also used to predict changes in voter opinions during political campaigns.

**b) Longitudinal Designs**

- A type of research design involving a fixed sample of population elements that is measured repeatedly on the same variables.
- The sample remains the same over time, thus providing a series of pictures which, when viewed together, portray a vivid illustration of the situation and the changes that are taking place over time.
- Longitudinal data are used for tracking markets.

**4.4. Relative advantages and disadvantages of longitudinal and cross-sectional design**

S/N	<i>Evaluation Criteria</i>	<i>Cross-Sectional Design</i>	<i>Longitudinal Design</i>
1	Detecting change	-	+
2	large amount of data collection	-	+
3	Accuracy	-	+
4	representative sampling	+	-
	response bias	+	-

*Note: A + indicates a relative advantage over the other design, whereas a – indicates a relative disadvantage.*

#### 4.5. Causal Research

- A type of research where the major objective is to obtain evidence regarding cause –and effect (causal) relationships.
- Causality may be thought of as understanding a phenomenon in terms of conditional statements in the form of “if X, then Y.”
- These,” if-then” statements become our way of manipulating variables of interest.
- **Causal Research is Appropriate for the Following Purposes:**
- To understand which variables is the cause (independent variables) and which variables are the effect (dependent variables) of a phenomenon.
- To determine the nature of the relationship between the causal variables and the effect to be predicted.

#### 4.6. Differences between Exploratory and Causal Research

S.N	Factors	Exploratory	Causal
1	Objective	✓ to provide insights and understanding	✓ to test specific hypothesis and examine relationship
2	Characteristics	<ul style="list-style-type: none"> <li>✓ Information needed is defined only loosely.</li> <li>✓ Research process is flexible and unstructured.</li> <li>✓ Sample is small and non-representative.</li> <li>✓ analysis of primary data is qualitative</li> </ul>	<ul style="list-style-type: none"> <li>✓ Information needed is clearly defined.</li> <li>✓ Research process is formal and structured.</li> <li>✓ sample is large and representative</li> <li>✓ Data analysis is quantitative.</li> </ul>
3	Findings/Results	Tentative	Conclusive
4	Objective	to provide insights and understanding	to test specific hypothesis and examine relationship

#### 4.6. A Comparison of Basic Research Design

<i>S/N</i>	<i>Factors</i>	<i>Exploratory</i>	<i>Descriptive</i>	<i>Causal</i>
1	<b>Objective</b>	<ul style="list-style-type: none"> <li>✓ discover ideas and insights</li> </ul>	<ul style="list-style-type: none"> <li>✓ describe market characteristics or functions</li> </ul>	<ul style="list-style-type: none"> <li>✓ determine cause and effect relationships</li> </ul>
2	<b>Characteristics</b>	<ul style="list-style-type: none"> <li>✓ Flexible</li> <li>✓ Versatile</li> <li>✓ often the front end of total research design</li> </ul>	<ul style="list-style-type: none"> <li>✓ Marked by the prior formation of specific hypothesis.</li> <li>✓ preplanned and structured design</li> </ul>	<ul style="list-style-type: none"> <li>✓ Manipulating of one or more independent variables.</li> <li>✓ control of other mediating variables</li> </ul>
3	<b>Methods</b>	<ul style="list-style-type: none"> <li>✓ expert surveys</li> <li>✓ pilot surveys</li> <li>✓ secondary data (analyzed quantitatively)</li> <li>✓ qualitative research</li> </ul>	<ul style="list-style-type: none"> <li>✓ secondary data (analyzed quantitatively)</li> <li>✓ surveys</li> <li>✓ panels</li> <li>✓ observational and other data</li> </ul>	<ul style="list-style-type: none"> <li>✓ experiments</li> </ul>
4	<b>Objective</b>	<ul style="list-style-type: none"> <li>✓ discover ideas and insights</li> </ul>	<ul style="list-style-type: none"> <li>✓ describe market characteristics or functions</li> </ul>	<ul style="list-style-type: none"> <li>✓ determine cause and effect relationships</li> </ul>
5	<b>Characteristics</b>	<ul style="list-style-type: none"> <li>✓ Flexible</li> <li>✓ Versatile</li> <li>✓ often the front end of total research design</li> </ul>	<ul style="list-style-type: none"> <li>✓ Marked by the prior formation of specific hypothesis.</li> <li>✓ preplanned and structured design</li> </ul>	<ul style="list-style-type: none"> <li>✓ Manipulating of one or more independent variables.</li> <li>✓ control of other mediating variables</li> </ul>

## CHAPTER 5- SAMPLING

- **Sampling** is the process of using a small or parts of a larger population to make conclusions about the whole population.
- Sampling is one of the components of research design.

### **Sampling design involves several basic questions:**

- Should a sample be taken?
- If so, what process should be followed?
- What kind of sample should be taken?
- How large it should be?
- What can be done to control and adjust for non-response errors?

### **4.1. Types of Sampling**

**Sampling technique** can be broadly classified into **two broad categories:**  
Probability and Non-probability sampling.

**A) Probability sampling** techniques vary in terms of sampling efficiency.

- Sampling efficiency is a concept that reflects a trade-off between sampling cost and precision. Precision refers to the level of uncertainty about the characteristics being measured.
- Precision is inversely related to sampling errors but positively related to cost.
- The greater the precision the greater the cost and most studies require a trade –off.

➤ **Probability sampling techniques includes the following:**

#### **1. Simple Random Sampling (SRS)**

- SRS is a probability sampling technique in which each element in the population has a known and equal probability of selection. Every element is selected independently of every other element and the sample is drawn by a random procedure from a sampling frame.
- To draw a simple sample, the researcher first compiles a sampling frame in which each element is assigned a unique identification number.
- Probability of selection =  $\frac{\text{sample size}}{\text{Population Size}}$

✓ ***Advantages of SRS***

- It embodies the requirements necessary to obtain a probability sample and there for to derive unbiased estimates of the population's characteristics.
- It guarantees that every member of the population has a known and **equal chance** of being selected in to the sample; the resulting sample, no matter what the size, will be a valid representation of the population.

***2. Systematic Sampling (SS)***

- SS is a probabilistic sampling technique in which the sample is chosen by selecting a random starting point and then picking every point and then picking every <sup>th</sup>  $i$  elements in succession from the sampling frame.
- A ss involves selecting every  $n^{\text{th}}$  unit after a random start.
- To use systematic sampling the researcher decides on a “skip interval”, which is calculated by dividing the number of names on the list by sample size.

$$\text{Skip interval ( I )} = \frac{\text{Population list size}}{\text{Sample size}}$$

- For example, there are 100,000 elements in the population and a sample of 1000 is desired.
- In this case, the sampling interval, I, is 100. Random number between 1 and 100 is selected.
- If, for example, this number is 23, the sample consists of elements 23,123, 233, 423, 523, and so on.

✓ ***Prerequisites of Systematic Sampling***

- A prerequisite for applying systematic sampling is that the units in the population can be ordered in some way:
- **Some examples are presented below:**
- Records that are ordered in a file.
- Names that are ordered alphabetically in a telephone directory.
- Houses that are ordered along a road.
- Customers who walk one by one through an entrance, and so on.

✓ ***Advantages***

- It has “**economic efficiency**” (*can be applied with less difficulty.*)
- The method is simple, but probably the most important advantage is that a frame is not always needed.
- The method can therefore be used, for instance, to interview a sample of persons passing by a corner during a particular day.
- The units in the sample will be spread evenly over the ordered population.
- It can be accomplished in a shorter time period than can simple random sampling.



- It has the potential to create a sample that is almost identical in quality to samples created from simple random sampling.

### **3. *Stratified Sampling(SrS)***

- SrS is a probability sampling technique that uses a two-step process to partition the population into sub populations, or strata. Elements are selected from each stratum by random procedures.
- The strata should be mutually exclusive and collectively exhaustive in that every population elements should be omitted.
- Next, elements are selected from each stratum by random procedures, usually SRS.
- Technically, only SRS should be employed in selecting the elements from each stratum.
- In practice , sometimes systematic sampling and other probability sampling procedures are employed
- Stratified sampling differs from quota sampling in that sample elements are selected probabilistically rather than based on convenience or judgment.
- A major objective of stratified sampling is to increase precisions without increasing cost.
- Stratified sampling can be further divided into two:

#### **a) Proportionate**

- In proportionate stratified sampling the size of the sample drawn from each stratum is proportionate to the relative size of that stadium in the total population.

#### **b) Disproportionate:**

- in disproportionate stratified sampling, the size of the sample from each stratum is proportionate to the relative size of the stratum and to the standard deviation of the distribution of the characteristics of interest among all the elements in that stratum.
- ***Advantages***
- Stratified random sampling can give higher precision with the same sample size, alternatively, the same precision with a smaller sample.
- Stratified sampling can also give separate results for each stratum.
- Stratified sampling can also simplify data collection.

#### ***Disadvantages***

- A complete frame is needed.
- Depending on the allocation principle applied, additional information, such as knowledge of standard deviations and costs, may be needed for each stratum.

#### ***4. Cluster Sampling***

- It is a probability sampling in which the population is divided into sub-groups, each of which represents the entire population.
- In cluster sampling,
  - First, the target population is divided into mutually exclusive and collectively exhaustive subpopulations called clusters.
  - Then, a random sample of clusters is selected based on a probability sampling technique such as simple random sampling.

- For each selected cluster, either all the elements are included in the sample or a sample of elements is drawn probabilistically.
- There are three types of cluster sampling:
  - **One -stage sampling**
  - **Two -stage sampling**
  - **Multistage sampling**
- **Area sampling** is a common form of cluster sampling in which the clusters consist of geographic area such as **counties, housing tracts, blocks, or other area descriptions.**
- **In one–stage area sampling,** the researcher samples blocks and then all the households within the selected blocks are included in the sample.
- **Two or multi-stage are sampling,** the researcher samples blocks, and then samples households within the selected blocks.

### **Advantages**

- cluster sampling is that we do not need a complete frame of the secondary sampling units. (We do not need a frame of the clusters, however.)
- in many kinds of cluster sampling such as area sampling is the geographical concentration of the units to be interviewed.

### **5. Sequential Sampling**

- A probability sampling technique in which the population elements are sampled sequentially, data collection and analysis are done at each stage, and a decision is made as to whether additional elements should be sampled.

- Data collection and analysis are done at each stage, and decision is made as to whether additional population elements should be sampled.
- At each stage, this rule indicates whether sampling should be continued or whether enough information has been obtained.
- Sequential sampling has been used to determine preferences for two competing alternatives.

### ***6. Double Sampling***

- A sampling technique in which certain population elements are **sampled twice**.
- In the first phase, a sample is selected and some information is collected from all the elements in the sample.
- In the second phase, a subsample is drawn from the original sample and additional information is obtained from the elements in the subsample.
- The process may be extended to three or more phases, and the different phase may take place simultaneously or at different times.
- Double sampling can be useful when no sampling frame is readily available for selecting final sampling units but when the elements of the frame are known to be contained within a broader sampling frame.
- ***Non-Probability Sampling Techniques***
- The critical difference between probability and non-probability sampling methods is the mechanics used in the sample design.
- With non-probability sampling method, selection is not based on probability.

- In other words you can't calculate the probability of any one person in the population being selected into the sample.
- Still each non-probability sampling method strives to draw a representative sample.

## ***B) Non -Probability Sampling Methods***

- The non-probability sampling methods include the following:

### **1. Convenience Sampling**

- A non-probability sampling technique that attempts to obtain a sample of convenient elements.
- The selection of sampling units is left primarily to the interviewer.
- Examples of convenience sampling includes:
  - Use of students , church groups , and members of social organizations
- Convenience samples are not recommended for descriptive or causal research , but they can be used in exploratory research for generating ideas, insights, or hypothesis
- Convenience samples can used for focus groups , pretesting questionnaires , or pilot studies.
- Even in these cases, caution should be exercised in interpreting the results.
- Nevertheless, this technique is sometimes used even in large surveys.

### **2. Judgment Sampling**

- A form of convenience sampling in which the population elements are purposely selected based on the judgment of the researcher.
- The researcher uses his or her judgment or that of some other knowledgeable person to identify who will be in the sample.

- Subjectivity enters in here, and certain members of the population will have a smaller chance of selection than will others.
- The researcher exercising common examples of judgment sampling include :
- judgment or expertise , chooses the elements to be included in the sample , because he or she believes that they are representative of the population of interest or are otherwise appropriate.

### **3. Referral Samples/Snowball Samples**

- Respondents are asked for the names or identities of others like themselves who might qualify to take part in the survey.
- A non-probability sampling technique in which an initial group of respondents is selected randomly.
- Subsequent respondents are selected based on the referrals or information provided by the initial respondents.
- This process may be carried out in waves by obtaining referrals from referrals.
- A major objective of snowball sampling is to estimate characteristics that are rare in the population.

#### **Advantages of snow ball sampling**

- It substantially increases the likelihood of locating the desired characteristics in the population.
- It also results in relatively low sampling variance and costs.

### **4. Quota Samples**

- A non-probability sampling technique that is a two-stage restricted judgmental sampling.

- The size of the quotas is determined by the researcher's belief for the relative size of each class of respondent.
- ***The first stage*** consists of developing control categories or quotas of population elements.
- In **the second stage**, sample elements are selected based on convenience sampling.
- To develop these quotas, the researcher lists relevant ***control characteristics which*** may include ***sex, age and race, are*** identified on the basis of judgment.
- A field worker is provided with screening criteria that will classify the potential respondent into a particular quota cell.
- ***In other words***, the quotas ensure that the composition of the sample is the same as the composition of the population with respect to the characteristics of interest.
- ***In the second-stage***, sample elements are selected based on convenience or judgment.
- Once the quotas have been assigned, there is considerable freedom in selecting the elements to be included in the sample.
- The only requirement is that the elements selected fit the control characteristics.
  
- Although this type of sample is not representative, it may nevertheless be very relevant.

### ***Advantages***

- QS Attempts to obtain representative samples at a relatively low cost.

- A quota system overcomes much of the non-representativeness danger inherent in convenience samples.
- It may guarantee that the researcher has sufficient sub-sample sizes for meaningful subgroup analysis.
- Under certain conditions, Qs obtain results close to those for conventional probability sampling.

### 4.3. Strengths and Weaknesses of probability Sampling Techniques

<b>S/N</b>	<b>Technique</b>	<b>Strengths</b>	<b>Weaknesses</b>
1	Simple random sampling (SRS)	Easily understood, result projectable	Difficult to construct sampling frame, expensive, lower precision, no assurance of representativeness
2	Systematic sampling	Can increase representativeness, easier to implement than SRS, sampling frame not necessary	Can decrease representativeness
3	Stratified sampling	Includes all important subpopulations, precision	Difficult to select relevant stratification variables, not feasible to stratify on many variables, expensive
4	Cluster sampling	Easy to implement cost effective	Imprecise, difficult to compute and interpret results.



#### 4.4. Strengths and Weaknesses of Non-probability Sampling Techniques

<b>S/N</b>	<b>Technique</b>	<b>Strengths</b>	<b>Weaknesses</b>
1	Convenience sampling	Least expensive , least time consuming, most convenient	Selection bias, sample not representative, not recommended for descriptive or causal research
2	Judgment sampling	Low cost, convenient, not time consuming	Does not allow generalization , subjective
3	Quota sampling	Sample can be controlled for certain characteristics	Selection bias , no assurance of representativeness
4	Snow ball sampling	Can estimate rare characteristics.	Time consuming

## CHAPTER 6: METHODS OF DATA COLLECTION

### 6.1. Types of data: viz., primary and secondary

- The primary data are those which are collected afresh and for the first time, and thus happen to be original in character.
- The secondary data, on the other hand, are those which have already been collected by someone else and which have already been passed through the statistical process.

### 6.2. Collection of Primary Data

- We collect primary data during the course of doing experiments in an experimental research and descriptive survey research.
- An experiment refers to an investigation in which a factor or variable under test is isolated and its effect(s) measured.
- Survey refers to the method of securing information concerning phenomena under study from all or a selected number of respondents of the concerned universe.
- There are several methods of collecting primary data, particularly in surveys and descriptive researches.

#### 1. Observation Method

- The observation method is the most commonly used method especially in studies relating to behavioral sciences.
- Observation becomes a scientific tool and the method of data collection for the researcher, when it serves a formulated research purpose, is systematically planned and recorded and is subjected to checks and controls on validity and reliability
- The **advantages:**

1. Subjective bias is eliminated, if observation is done accurately

2. The information obtained under this method relates to what is currently happening

3. Independent of respondents' willingness to respond

**Limitations:**

1. it is an expensive method
  2. information provided by this method is very limited
  3. sometimes unforeseen factors may interfere with the observational task
- In case the observation is characterized by a careful definition of the units to be observed, the style of recording the observed information, standardized conditions of observation and the selection of pertinent data of observation, then the observation is called as **structured observation**.
  - But when observation is to take place without these characteristics to be thought of in advance, the same is termed as **unstructured observation**.
  - Structured observation is considered appropriate in descriptive studies, whereas in an exploratory study the observational procedure is most likely to be relatively unstructured.
  - If the observer observes by making himself, more or less, a member of the group he is observing so that he can experience what the members of the group experience, the observation is called as the **participant observation**.
  - But when the observer observes as a detached emissary without any attempt on his part to experience through participation what others

feel, the observation of this type is often termed as **non-participant observation**.

When the observer is observing in such a manner that his presence may be unknown to the people he is observing, such an observation is described as **disguised observation**

- If the observation takes place in the natural setting, it may be termed as **uncontrolled observation**.
- but when observation takes place according to definite pre-arranged plans, involving experimental procedure, the same is then termed **controlled observation**.
- In non-controlled observation, no attempt is made to use precision instruments.
- The major aim of this type of observation is to get a spontaneous picture of life and persons.

## **2. Interview Method**

- It involves presentation of oral-verbal stimuli and reply in terms of oral-verbal responses. This method can be used through **personal interviews** and, if possible, through **telephone interviews**.

### **(a) Personal interviews**

- Personal interview method requires a person known as the **interviewer** asking questions generally in a face-to-face contact to the other person or persons.
- It is usually carried out in a **structured way**. Such interviews involve the use of a set of predetermined questions and of highly standardized techniques of recording.

- The analysis of **unstructured** responses becomes much more difficult and time-consuming.
- **Unstructured interviews** also demand deep knowledge and greater skill on the part of the interviewer. Unstructured interview, however, happens to be the central technique of collecting information in case of exploratory or formulative research studies.
- **Focused interview** is meant to focus attention on the given experience of the respondent and its effects.
- Under it the interviewer has the freedom to decide the manner and sequence in which the questions would be asked and has also the freedom to explore reasons and motives.
- **The clinical interview** is concerned with broad underlying feelings or motivations or with the course of individual's life experience.
- The interviewer often acts as a catalyst to a comprehensive expression of the respondents' feelings and beliefs and of the frame of reference within which such feelings and beliefs take on personal significance.

**(b) Telephone interviews**

- It is not a very widely used method, but plays important part in industrial surveys, particularly in developed regions.
- The **chief merits of telephone interview**
  1. It is more flexible in comparison to mailing method
  2. It is faster than other methods i.e., a quick way of obtaining information
  3. It is cheaper than personal interviewing method
  4. No field staff is required

### 3. Questionnaire

- It is quite popular, particularly in case of big enquiries
- A Questionnaire is a structured technique for data collection that consists of a series of questions, written or verbal, that a respondent answers.
- A questionnaire consists of a number of questions printed or typed in a definite order on a form or set of forms.
- **Typically, a questionnaire is only one element of a data collection package that might also include:**

Fieldwork procedures, such as instructions for selecting, approaching, and questioning respondents.

#### ✓ **Main aspects of a questionnaire**

- Quite often questionnaire is considered as the heart of a survey operation.

#### 1. General form

- **Structured questionnaires** are those questionnaires in which there are definite, concrete and pre-determined questions.
- The form of the question may be either **closed** (i.e., of the type ‘yes’ or ‘no’) or **open** (i.e., inviting free response). Structured questionnaires may also have fixed alternative questions.
- Thus a highly structured questionnaire is one in which all questions and answers are specified and comments in the respondent’s own words are held to the minimum.
- Structured questionnaires are simple to administer and relatively inexpensive to analyze. The provision of alternative replies, at times, helps to understand the meaning of the question clearly.

- **unstructured questionnaire:** the interviewer is provided with a general guide on the type of information to be obtained, but the exact question formulation is largely his own responsibility and the replies are to be taken down in the respondent's own words to the extent possible; in some situations tape recorders may be used to achieve this goal.

## 2. Question sequence

- In order to make the questionnaire effective and to ensure quality to the replies received, a researcher should pay attention to the question-sequence in preparing the questionnaire.
- A proper sequence of questions reduces considerably the chances of individual questions being misunderstood.
- The question-sequence must be clear and smoothly-moving, meaning thereby that the relation of one question to another should be readily apparent to the respondent, with questions that are easiest to answer being put in the beginning.
- But in a structured questionnaire the best that can be done is to determine the question-sequence with the help of a **Pilot Survey** which is likely to produce good rapport with most respondents.
- In general, all questions should meet the following standards—
  - (a) should be easily understood;
  - (b) should be simple i.e., should convey only one thought at a time;
  - (c) should be concrete and should conform as much as possible to the respondent's way of thinking.

## 6.3. Collection of secondary data

- Secondary data may either be published data or unpublished data. Usually published data are available in:

- (a) various publications of the central, state and local governments;
- (b) various publications of foreign governments or of international bodies and their subsidiary organizations;
- (c) technical and trade journals
- (d) books, magazines and newspapers;
- (e) reports and publications of various associations connected with business and industry, banks, stock exchanges, etc.;
- (f) reports prepared by research scholars, universities, economists, etc. in different fields;
- (g) public records and statistics, historical documents, and other sources of published information.

- The sources of unpublished data are many; they may be found in diaries, letters, unpublished biographies and autobiographies and also may be available with scholars and research workers, trade associations, labor bureaus and other public/ private individuals and organizations.
- Researcher must be very careful in using secondary data.
- He/she must make a minute scrutiny because it is just possible that the secondary data may be unsuitable or may be inadequate in the context of the problem which the researcher wants to study.
- By way of caution, the researcher, before using secondary data, must see that they possess following characteristics:
  1. Reliability of data
  2. Suitability of data
  3. Adequacy of data



## Chapter 7: Data Processing, Analysis, Interpretation and Report Writing

- Technically speaking, **processing** implies editing, coding, classification and tabulation of collected data so that they are amenable to analysis.
- The term **analysis** refers to the computation of certain measures along with searching for patterns of relationship that exist among data-groups
- **Field editing** consists in the review of the reporting forms by the investigator for completing (translating or rewriting) what the latter has written in abbreviated and/or in illegible form at the time of recording the respondents' responses.
- This type of editing is necessary in view of the fact that individual writing styles often can be difficult for others to decipher.
- This sort of editing should be done as soon as possible after the interview, preferably on the very day or on the next day.
- While doing field editing, the investigator must restrain himself and must not correct errors of omission by simply guessing what the informant would have said if the question had been asked.
- **Central editing** should take place when all forms or schedules have been completed and returned to the office.
- This type of editing implies that all forms should get a thorough editing by a single editor in a small study and by a team of editors in case of a large inquiry.

- Editor(s) may correct the obvious errors such as an entry in the wrong place, entry recorded in months when it should have been recorded in weeks, and the like.

**2. Coding:** it refers to the process of assigning numerals or other symbols to answers so that responses can be put into a limited number of categories or classes.

- Such classes should be appropriate to the research problem under consideration.
- They must also possess the characteristic of exhaustiveness (i.e., there must be a class for every data item) and also that of mutual exclusivity which means that a specific answer can be placed in one and only one cell in a given category set.
- Coding is necessary for efficient analysis and through it the several replies may be reduced to a small number of classes which contain the critical information required for analysis.
- Coding decisions should usually be taken at the designing stage of the questionnaire.
- But in case of hand coding some standard method may be used.

**3. Classification:** Most research studies result in a large volume of raw data which must be reduced into homogeneous groups if we are to get meaningful relationships.

- This fact necessitates classification of data which happens to be the process of arranging data in groups or classes on the basis of common characteristics.

- Data having a common characteristic are placed in one class and in this way the entire data get divided into a number of groups or classes.
- Classification can be one of the following **two types**, depending upon the nature of the phenomenon involved:

**(a) Classification according to attributes:** Data are classified on the basis of common characteristics which can either be descriptive (such as literacy, sex, honesty, etc.) or numerical (such as weight, height, income, etc.). Descriptive characteristics refer to qualitative phenomenon which cannot be measured quantitatively; only their presence or absence in an individual item can be noticed.

- Data obtained this way on the basis of certain attributes are known as **statistics of attributes** and their classification is said to be classification according to attributes.
- Such classification can be simple classification or manifold classification.
- In simple classification we consider only one attribute and divide the universe into two classes-one class consisting of items possessing the given attribute and the other class consisting of items which do not possess the given attribute.
- But in manifold classification we consider two or more attributes simultaneously, and divide that data into a number of classes (total number of classes of final order is given by  $2^n$ , where  $n$  = number of attributes considered).

**(b) Classification according to class-intervals:** Data relating to income, production, age, weight, etc. are classified on the basis of class intervals. We may have classes with equal class magnitudes or with unequal class magnitudes.

- The number of items which fall in a given class is known as the frequency of the given class.
- All the classes or groups, with their respective frequencies taken together and put in the form of a table, are described as group frequency distribution or simply frequency distribution.
- Classification according to class intervals usually involves the following three main problems:

**(i) How many classes should be there? What should be their magnitudes?**

- There can be no specific answer with regard to the number of classes.
- The decision about this calls for skill and experience of the researcher.

**(ii) How to choose class limits?**

- While choosing class limits, the researcher must take into consideration the criterion that the mid-point (generally worked out first by taking the sum of the upper limit and lower limit of a class and then divide this sum by 2) of a class-interval and the actual average of items of that class interval should remain as close to each other as possible.
- Consistent with this, the class limits should be located at multiples of 2, 5, 10, 20, 100 and such other figures.
- Class limits may generally be stated in any of the following forms:

**1.Exclusive type class intervals:** the upper limit of a class interval is excluded and items with values less than the upper limit (but not less than the lower limit) are put in the given class interval.

**2. Inclusive type class intervals:** The upper limit of a class interval is also included in the concerning class interval.

- Class limits may generally be stated in any of the following forms:

**1.Exclusive type class intervals:** the upper limit of a class interval is excluded and items with values less than the upper limit (but not less than the lower limit) are put in the given class interval.

**2. Inclusive type class intervals:** The upper limit of a class interval is also included in the concerning class interval.

**(iii) How to determine the frequency of each class?**

- This can be done either by tally sheets or by mechanical aids.
- Under the technique of tally sheet, the class groups are written on a sheet of paper (commonly known as the tally sheet) and for each item a stroke (usually a small vertical line) is marked against the class group in which it falls.
- The general practice is that after every four small vertical lines in a class group, the fifth line for the item falling in the same group, is indicated as horizontal line through the said four lines and the resulting flower (IIII) represents five items.

**4. Tabulation:** When a mass of data has been assembled, it becomes necessary for the researcher to arrange the same in some kind of concise and logical order. This procedure is **referred to as tabulation.**

- Thus, tabulation is the process of summarizing raw data and displaying the same in compact form (i.e., in the form of statistical tables) for further analysis.
- In a broader sense, tabulation is an orderly arrangement of data in columns and rows.
- Tabulation is essential because of the following **reasons**.
  1. It conserves space and reduces explanatory and descriptive statement to a minimum.
  2. It facilitates the process of comparison.
  3. It facilitates the summation of items and the detection of errors and omissions.
  4. It provides a basis for various statistical computations.
    - Tabulation can be done by hand or by mechanical or electronic devices.
    - The choice depends on the size and type of study, cost considerations, time pressures and the availability of tabulating machines or computers.
    - In relatively large inquiries, we may use mechanical or computer tabulation if other factors are favorable and necessary facilities are available.
    - Hand tabulation is usually preferred in case of small inquiries where the number of questionnaires is small and they are of relatively short length. Hand tabulation may be done using the direct tally, the list and tally or the card sort and count methods.
    - When there are simple codes, it is feasible to tally directly from the questionnaire.

- Under this method, the codes are written on a sheet of paper, called tally sheet, and for each response a stroke is marked against the code in which it falls.
- Tabulation may also be classified as simple and complex tabulation.
- The former type of tabulation gives information about one or more groups of independent questions, whereas the latter type of tabulation shows the division of data in two or more categories and as such is designed to give information concerning one or more sets of inter-related questions.
- Simple tabulation generally results in one-way tables which supply answers to questions about one characteristic of data only.
- As against this, complex tabulation usually results in two-way tables (which give information about two inter-related characteristics of data), three-way tables (giving information about three interrelated characteristics of data) or still higher order tables, also known as manifold tables, which supply information about several interrelated characteristics of data.
- Two-way tables, three-way tables or manifold tables are all examples of what is sometimes described as cross tabulation.

## 7.2. Elements/Types of Analysis

- **Analysis**, particularly in case of survey or experimental data, involves estimating the values of unknown parameters of the population and testing of hypotheses for drawing inferences. Analysis may, therefore, be categorized as **descriptive analysis and inferential analysis** (statistical analysis).
- **Descriptive analysis** is largely the study of distributions of one variable.

- This study provides us with profiles of companies, work groups, persons and other subjects on any of a multiple of characteristics such as size, composition, efficiency, preferences, etc.
- This sort of analysis may be in respect of one variable (described as **uni-dimensional analysis**), or in respect of two variables (described as **bivariate analysis**) or in respect of more than two variables (described as multivariate analysis).
- In this context we work out various measures that show the size and shape of a distribution(s) along with the study of measuring relationships between two or more variables.
- **Correlation analysis** studies the joint variation of two or more variables for determining the amount of correlation between two or more variables.
- **Causal analysis** is concerned with the study of how one or more variables affect changes in another variable. It is thus a study of functional relationships existing between two or more variables. This analysis can be termed as **regression analysis**.
- Causal analysis is considered relatively more important in **experimental researches**, whereas in most social and business researches our interest lies in understanding and controlling relationships between variables then with determining causes per se and as such we consider correlation analysis as relatively more important.
- **Inferential analysis** is concerned with the various **tests of significance for testing hypotheses** in order to determine with what validity data can be said to indicate some conclusion or conclusions.
- It is also concerned with **the estimation of population values**.



- It is mainly on the basis of inferential analysis that the task of interpretation (i.e., the task of drawing inferences and conclusions) is performed.

### **7.3. Interpretation and Report Writing**

- After collecting and analyzing the data, the researcher has to accomplish the task of drawing inferences followed by report writing.
- It is only through interpretation that the researcher can expose relations and processes that underlie his findings.
- In case of hypotheses testing studies, if hypotheses are tested and upheld several times, the researcher may arrive at generalizations.
- But in case the researcher had no hypothesis to start with, he would try to explain his findings on the basis of some theory.
- This may at times result in new questions, leading to further researches.
- All this analytical information and consequential inference(s) may well be communicated, preferably through research report, to the consumers of research results.
- Interpretation refers to the task of drawing inferences from the collected facts after an analytical and/or experimental study.
- In fact, it is a search for broader meaning of research findings.
- The task of interpretation has two major aspects viz., (i) the effort to establish continuity in research through linking the results of a given study with those of another, and (ii) the establishment of some explanatory concepts.

- In one sense, interpretation is concerned with relationships within the collected data, partially overlapping analysis.
- Interpretation also extends beyond the data of the study to include the results of other research, theory and hypotheses.
- Thus, interpretation is the device through which the factors that seem to explain what has been observed by researcher in the course of the study can be better understood and it also provides a theoretical conception which can serve as a guide for further researches.

- **Why interpretation?**

- Interpretation is essential for the simple reason that the usefulness and utility of research findings lie in proper interpretation.
- It is being considered a basic component of research process because of the following reasons:
  - (i) It is through interpretation that the researcher can well understand the abstract principle that works beneath his findings.

(ii) Interpretation leads to the establishment of explanatory concepts that can serve as a guide for future research studies; it opens new avenues of intellectual adventure and stimulates the quest for more knowledge.

(iii) Researcher can better appreciate only through interpretation why his findings are what they are and can make others to understand the real significance of his research findings.

(iv) The interpretation of the findings of exploratory research study often results into hypotheses for experimental research and as such interpretation is involved in the transition from exploratory to experimental research.

- ✓ **Technique of Interpretation**

- The technique of interpretation often involves the **following steps**:

- (i) Researcher must give reasonable explanations of the relations which he has found and he must interpret the lines of relationship in terms of the underlying processes.
- ✓ This is the technique of how generalization should be done and concepts be formulated.
- (ii) Extraneous information, if collected during the study, must be considered while interpreting the final results of research study, for it may prove to be a key factor in understanding the problem under consideration.
- (iii) It is advisable, before embarking upon final interpretation, to consult someone having insight into the study and who is frank and honest and will not hesitate to point out omissions and errors in logical argumentation.
- (iv) Researchers must accomplish the task of interpretation only after considering all relevant factors affecting the problem to avoid false generalization.

- **Significance of Report Writing**

- Research report is considered a major component of the research study for the research task remains incomplete till the report has been presented and/or written.
- As a matter of fact even the most brilliant hypothesis, highly well designed and conducted research study, and the most striking generalizations and findings are of little value unless they are effectively communicated to others.
- The purpose of research is not well served unless the findings are made known to others. Research results must invariably enter the general store of knowledge.
- All this explains the significance of writing research report.

- Writing of report is the last step in a research study and requires a set of skills somewhat different from those called for in respect of the earlier stages of research.
- This task should be accomplished by the researcher with utmost care; he may seek the assistance and guidance of experts for the purpose.
- **Different Steps in Writing Report**
- Research reports are the product of slow, painstaking, accurate inductive work. The usual steps involved in writing report are:

### **1. Logical analysis of the subject matter:**

- There are two ways in which to develop a subject
  - (a) logically and
  - (b) chronologically.
- The logical development is made on the basis of mental connections and associations between the one thing and another by means of analysis.
- Logical treatment often consists in developing the material from the simple possible to the most complex structures.
- Chronological development is based on a connection or sequence in time or occurrence.
- The directions for doing or making something usually follow the chronological order.

### **2. Preparation of the final outline:**

- Outlines are the framework upon which long written works are constructed.
- They are an aid to the logical organization of the material and a reminder of the points to be stressed in the report.

### **3. Preparation of the rough draft:**

- This follows the logical analysis of the subject and the preparation of the final outline.

Such a step is of utmost importance for the researcher now sits to write down what he has done in the context of his research study

### **4. Rewriting and polishing of the rough draft:**

- This step happens to be most difficult part of all formal writing.
- Usually this step requires more time than the writing of the rough draft.
- The careful revision makes the difference between a mediocre and a good piece of writing.

While rewriting and polishing, one should check the report for weaknesses in logical development or presentation

### **5. Preparation of the final bibliography:**

- Next in order comes the task of the preparation of the final bibliography.
- The bibliography, which is generally appended to the research report, is a list of books in some way pertinent to the research which has been done.
- It should contain all those works which the researcher has consulted.

The bibliography should be arranged alphabetically and may be divided into **two parts**; the first part may contain the **names of books and pamphlets**, and the second part may contain the **names of magazine and newspaper articles**.

- Generally, this pattern of bibliography is considered convenient and satisfactory from the point of view of reader, though it is not the only way of presenting bibliography.

**6. Writing the final draft:** This constitutes the last step. The final draft should be written in a concise and objective style and in simple language, avoiding vague expressions.

➤ **Layout of the Research Report**

- A comprehensive layout of the research report should comprise:

**(A) Preliminary Pages**

- In its preliminary pages the report should carry a title and date, followed by acknowledgements in the form of ‘Preface’ or ‘Foreword’.
- Then there should be a table of contents followed by list of tables and illustrations so that the decision-maker or anybody interested in reading the report can easily locate the required information in the report.

**(B) Main Text**

- The main text provides the complete outline of the research report along with all details.
- Title of the research study is repeated at the top of the first page of the main text and then follows the other details on pages numbered consecutively, beginning with the second page.

**(i) Introduction:** The purpose of introduction is to introduce the research project to the readers.

- It should contain a clear statement of the objectives of research i.e., enough background should be given to make clear to the reader why the problem was considered worth investigating.

**(ii) Statement of findings and recommendations:**

- After introduction, the research report must contain a statement of findings and recommendations in non-technical language so that it can be easily understood by all concerned.
- If the findings happen to be extensive, at this point they should be put in the summarized form.

**(iii) Results:**

- A detailed presentation of the findings of the study, with supporting data in the form of tables and charts together with a validation of results, is the next step in writing the main text of the report.
- This generally comprises the main body of the report, extending over several chapters.
- The result section of the report should contain statistical summaries and reductions of the data rather than the raw data.
- All the results should be presented in logical sequence and splitted into readily identifiable sections.
- All relevant results must find a place in the report.

**(iv) Implications of the results:**

- Toward the end of the main text, the researcher should again put down the results of his research clearly and precisely.

**(v) Summary:**

- It has become customary to conclude the research report with a very brief summary, resting in brief the research problem, the

methodology, the major findings and the major conclusions drawn from the research results.

### **(C) End Matter**

- At the end of the report, appendices should be enlisted in respect of all technical data such as questionnaires, sample information, mathematical derivations and the like ones.
- Bibliography of sources consulted should also be given. Index (an alphabetical listing of names, places and topics along with the numbers of the pages in a book or report on which they are mentioned or discussed) should invariably be given at the end of the report.
- The value of index lies in the fact that it works as a guide to the reader for the contents in the report.
- **Types of reports**
- Research reports vary greatly in length and type.
- In each individual case, both the length and the form are largely dictated by the problems at hand.
- For instance, business firms prefer reports in the letter form, just one or two pages in length.
- Banks, insurance organizations and financial institutions are generally fond of the short balance-sheet type of tabulation for their annual reports to their customers and shareholders.
- Mathematicians prefer to write the results of their investigations in the form of algebraic notations.
- Chemists report their results in symbols and formulae.
- We give below a few details about the said two types of reports:

### **(A) Technical Report**



- In the technical report the main emphasis is on

(i) the methods employed,

(ii) assumptions made in the course of the study,

(iii) the detailed presentation of the findings including their limitations and supporting data

- A general outline of a technical report can be as follows:

**1. Summary of results:** A brief review of the main findings just in two or three pages.

**2. Nature of the study:** Description of the general objectives of study, formulation of the problem in operational terms, the working hypothesis, the type of analysis and data required, etc.

**3. Methods employed:** Specific methods used in the study and their limitations. For instance, in

- sampling studies we should give details of sample design viz., sample size, sample selection, etc.

**4. Data:**

- Discussion of data collected their sources, characteristics and limitations.
- If secondary data are used, their suitability to the problem at hand be fully assessed. In case of a survey, the manner in which data were collected should be fully described.

**5. Analysis of data and presentation of findings:**

- The analysis of data and presentation of the findings of the study with supporting data in the form of tables and charts be fully narrated. This, in fact, happens to be the main body of the report usually extending over several chapters.

## **6. Conclusions:**

- A detailed summary of the findings and the policy implications drawn from the results be explained.

**7. Bibliography:** Bibliography of various sources consulted be prepared and attached.

## **8. Technical appendices:**

- Appendices be given for all technical matters relating to questionnaire, mathematical derivations, elaboration on particular technique of analysis and the like ones.

## **9. Index:**

- Index must be prepared and be given invariably in the report at the end.

## **(B) Popular Report**

- The popular report is one which gives emphasis on simplicity and attractiveness.
- The simplification should be sought through clear writing, minimization of technical, particularly mathematical, details and liberal use of charts and diagrams.
- We give below a general outline of a popular report.

1. The findings and their implications:

2. Recommendations for action:

3. Objective of the study:

4. Methods employed:

5. Results:

## 6. Technical appendices:

### ➤ **Precautions for Writing Research Reports**

- Research report is a channel of communicating the research findings to the readers of the report.
- A good research report is one which does this task efficiently and effectively.
- As such it must be prepared keeping the following precautions in view:

1. While determining the length of the report (since research reports vary greatly in length), one should keep in view the fact that it should be long enough to cover the subject but short enough to maintain interest.

- In fact, report-writing should not be a means to learning more and more about less and less.

2. A research report should not, if this can be avoided, be dull; it should be such as to sustain reader's interest.

3. Abstract terminology and technical jargon should be avoided in a research report.

- The report should be able to convey the matter as simply as possible.
- This, in other words, means that report should be written in an objective style in simple language, avoiding expressions such as “it seems,” “there may be” and the like.

4. Readers are often interested in acquiring a quick knowledge of the main findings and as such the report must provide a ready availability of the findings.

- For this purpose, charts, graphs and the statistical tables may be used for the various results in the main report in addition to the summary of important findings.
5. The layout of the report should be well thought out and must be appropriate and in accordance with the objective of the research problem.
  6. The reports should be free from grammatical mistakes and must be prepared strictly in accordance with the techniques of composition of report-writing such as the use of quotations, footnotes, documentation, proper punctuation and use of abbreviations in footnotes and the like.
  7. The report must present the logical analysis of the subject matter.
    - It must reflect a structure wherein the different pieces of analysis relating to the research problem fit well.
  8. A research report should show originality and should necessarily be an attempt to solve some intellectual problem.
    - It must contribute to the solution of a problem and must add to the store of knowledge.
  9. Towards the end, the report must also state the policy implications relating to the problem under consideration.
  10. It is usually considered desirable if the report makes a forecast of the probable future of the subject concerned and indicates the kinds of research still needs to be done in that particular field.
  11. Bibliography of sources consulted is a must for a good report and must necessarily be given.
  12. Index is also considered an essential part of a good report and as such must be prepared and appended at the end.

13. Report must be attractive in appearance, neat and clean, whether typed or printed.

14. Calculated confidence limits must be mentioned and the various constraints experienced in conducting the research study may also be stated in the report.

15. Objective of the study, the nature of the problem, the methods employed and the analysis techniques adopted must all be clearly stated in the beginning of the report in the form of introduction.

## **References**

- Bryman, A. (2016). *Social research methods*. Oxford university press.
- Clifford, N., Cope, M., Gillespie, T., & French, S. (Eds.). (2016). *Key methods in geography*. Sage.
- Creswel, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*. Los angeles: University of Nebraska–Lincoln.
- Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- Dawson, C. (2019). *Introduction to Research Methods 5th Edition: A Practical Guide for Anyone Undertaking a Research Project*. Robinson.
- Denscombe, M. (2012). *Research proposals: A practical guide: A practical guide*. McGraw-Hill Education (UK).
- Flowerdew, R., & Martin, D. (Eds.). (2005). *Methods in human geography: a guide for students doing a research project*. Pearson Education.
- Gomez, B., & Jones III, J. P. (Eds.). (2010). *Research methods in geography: A critical introduction* (Vol. 6). John Wiley & Sons.
- Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.
- Kumar, R. (2019). *Research methodology: A step-by-step guide for beginners*. Sage Publications Limited.

- Leavy, P. (2017). *Research design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches*. Guilford Publications.
- Locharoenrat, K. (2017). *Research Methodologies for Beginners*. CRC Press.
- Montello, D., & Sutton, P. (2012). *An introduction to scientific research methods in geography and environmental studies*. Sage.
- Neuman, L. W. (2007). *Social research methods, 6/E*. Pearson Education India.
- Somekh, B., & Lewin, C. (Eds.). (2005). *Research methods in the social sciences*. Sage.
- Spronken-Smith, R. (2005). Implementing a problem-based learning approach for teaching research methods in geography. *Journal of Geography in Higher Education*, 29(2), 203-221.
- Taylor, S. J., Bogdan, R., & DeVault, M. (2015). *Introduction to qualitative research methods: A guidebook and resource*. John Wiley & Sons.
- Vanderstoep, S. W., & Johnson, D. D. (2008). *Research methods for everyday life: Blending qualitative and quantitative approaches* (Vol. 32). John Wiley & Sons.