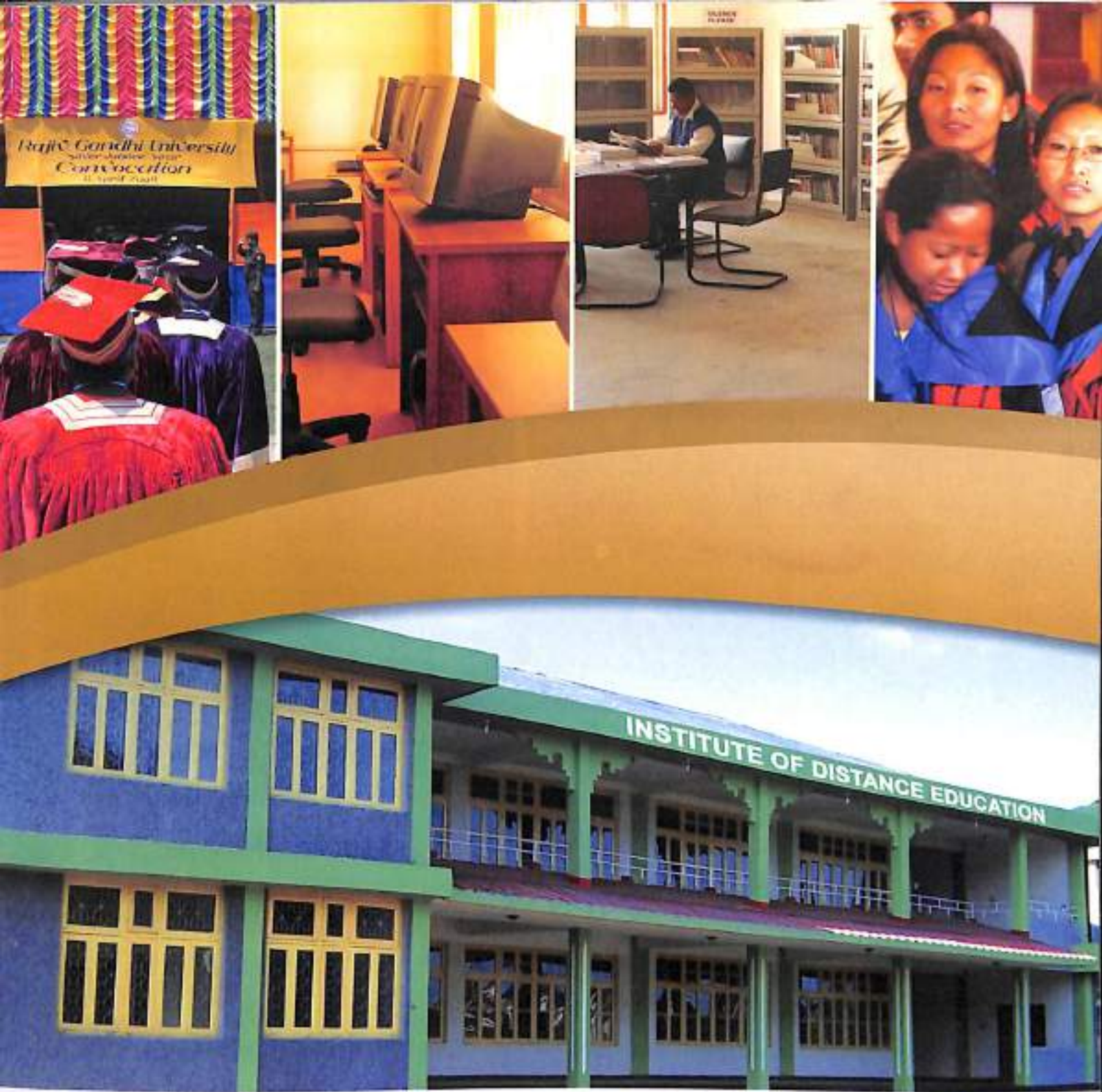

MA (Sociology)

FIRST SEMESTER

MASOC 403

INSTITUTE OF DISTANCE EDUCATION
Rajiv Gandhi University

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METHODOLOGY OF SOCIAL RESEARCH

METHODOLOGY OF SOCIAL RESEARCH

MA [Sociology]

First Semester

MASOC-403

RAJIV GANDHI UNIVERSITY
Arunachal Pradesh, INDIA - 791 112

About the University

Rajiv Gandhi University (formerly Arunachal University) is a premier institution for higher education in the state of Arunachal Pradesh and has completed twenty-five years of its existence. Late Smt. Indira Gandhi, the then Prime Minister of India, laid the foundation stone of the university on 4th February, 1984 at Rono Hills, where the present campus is located.

Ever since its inception, the university has been trying to achieve excellence and fulfill the objectives as envisaged in the University Act. The university received academic recognition under Section 2(f) from the University Grants Commission on 28th March, 1985 and started functioning from 1st April, 1985. It got financial recognition under section 12-B of the UGC on 25th March, 1994. Since then Rajiv Gandhi University, (then Arunachal University) has carved a niche for itself in the educational scenario of the country following its selection as a University with potential for excellence by a high-level expert committee of the University Grants Commission from among universities in India.

The University was converted into a Central University with effect from 9th April, 2007 as per notification of the Ministry of Human Resource Development, Government of India.

The University is located atop Rono Hills on a picturesque tableland of 302 acres overlooking the river Dikrong. It is 6.5 km from the National Highway 52-A and 25 km from Itanagar, the State capital. The campus is linked with the National Highway by the Dikrong bridge.

The teaching and research programmes of the University are designed with a view to play a positive role in the socio-economic and cultural development of the State. The University offers Undergraduate, Post-graduate, M.Phil and Ph.D. programmes. The Department of Education also offers the B.Ed. programme.

There are fifteen colleges affiliated to the University. The University has been extending educational facilities to students from the neighbouring states, particularly Assam. The strength of students in different departments of the University and in affiliated colleges has been steadily increasing.

The faculty members have been actively engaged in research activities with financial support from UGC and other funding agencies. Since inception, a number of proposals on research projects have been sanctioned by various funding agencies to the University. Various departments have organized numerous seminars, workshops and conferences. Many faculty members have participated in national and international conferences and seminars held within the country and abroad. Eminent scholars and distinguished personalities have visited the University and delivered lectures on various disciplines.

The academic year 2000-2001 was a year of consolidation for the University. The switch over from the annual to the semester system took off smoothly and the performance of the students registered a marked improvement. Various syllabi designed by Boards of Post-graduate Studies (BPGS) have been implemented. VSAT facility installed by the ERNET India, New Delhi under the UGC-Infonet program, provides Internet access.

In spite of infrastructural constraints, the University has been maintaining its academic excellence. The University has strictly adhered to the academic calendar, conducted the examinations and declared the results on time. The students from the University have found placements not only in State and Central Government Services, but also in various institutions, industries and organizations. Many students have emerged successful in the National Eligibility Test (NET).

Since inception, the University has made significant progress in teaching, research, innovations in curriculum development and developing infrastructure.

SYLLABI-BOOK MAPPING TABLE

Methodology of Social Research

Syllabi	Mapping in Book
Unit I **Scientific Research: Characteristics, Types and Method:-** Meaning, Characteristics and Objective of Scientific Research, Aims of Social Research, Types of Social Research, Major Steps in Social Research, Hypothesis.	**Unit 1:** Scientific and Social Research **(Pages 3-34)**
Unit II **Concept, Theory and Fact:** Concept, Theory and Fact, Relationship between Theory and Fact, Inductive and Deductive Reasoning, Theory Building, Objectivity-Subjectivity Debate, Value Neutrality, Validity and Reliability.	**Unit 2:** Concept, Theory and Fact **(Pages 35-49)**
Unit III **Research Design and Sampling:** Research Design, Types of Research Design, Sampling: Type, Size and Sampling Error.	**Unit 3:** Research Design and Sampling **(Pages 51-89)**
Unit IV **Methods of Data Collection:** Questionnaire, Schedule, Case Study, Observation, Interview Method and Content Analysis, Projective Techniques.	**Unit 4:** Methods of Data Collection **(Pages 91-131)**
Unit V **Scales and Scaling Techniques:** Scaling and its Importance, Nominal Scale, Ordinal Scale, Interval Scale, Ratio Scales, Bogardus Scale and Likert Scale.	**Unit 5:** Scales and Scaling Techniques **(Pages 133-162)**

CONTENTS

INTRODUCTION

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Research is the search for knowledge or a systematic investigation in order to establish facts. The basic aim of research is to discover, interpret and develop methods and systems to advance human knowledge on diverse scientific matters. Social research refers to the conduction of research on various groups of a society by social scientists. Research methodology refers to the way research can be conducted. It is also known as the process of collecting data for various research projects.

Social research pertains to research carried out by social scientists on various facets of society. Research plays a very significant role in the field of social science. In order to study the importance and relationship between social science and research, social research is conducted or undertaken. The research that attempts to measure, describe, explain and predict the social and economic phenomena or social behaviour of human beings is known as 'social research'.

Methodology of social research is the science of studying how research is conducted scientifically. It helps to understand both the products as well as the process of scientific enquiry. A research process involves selection and formulation of a research problem, research design, sample strategy or sample design, as well as the interpretation and preparation of research report. Research can be undertaken in the form of descriptive/ survey research, applied or fundamental research, quantitative or qualitative research, conceptual or empirical research, and other types of research.

A few important factors in research methodology include the validity and reliability of research data and the level of ethics. A job is considered half done if the data analysis is conducted properly. Formulation of appropriate research questions and sampling probable or non-probable factors are followed by measurement using survey and scaling techniques. This is followed by research design that may be experimental. This book deals with scientific and social research; concept, theory and fact; research design and sampling; methods of data collection; and scales and scaling techniques.

This book, *Methodology of Social Research*, is written in a self-instructional format and is divided into five units. Each unit begins with an Introduction to the topic followed by an outline of the Unit Objectives. The content is then presented in a simple and easy-to-understand manner, and is interspersed with Check Your Progress questions to test the reader's understanding of the topic. A list of Questions and Exercises is also provided at the end of each unit, and includes short-answer as well as long-answer questions. The Summary and Key Terms section are useful tools for students and are meant for effective recapitulation of the text.

UNIT 1 SCIENTIFIC AND SOCIAL RESEARCH

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Structure

1.0 INTRODUCTION

Simply defined, research is a search for knowledge. One can also define research as a scientific and systematic pursuit of information on a specific topic. Scientifically, research can also be termed as scientific investigation. Thus, research and scientific enquiry can be considered synonymous. The only difference between the two is that while it is possible to employ scientific method without research, it is not possible to conduct any research without employing scientific methods. Thus, research is a more specialized form of scientific enquiry which in turn is the result of gathering of data, information and facts for the specific purpose.

Social research pertains to research carried out by social scientists on various facets of society. Research plays a very significant role in the field of social science. In order to study the importance and relationship between social science and research,

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social research is conducted or undertaken. The research that attempts to measure, describe, explain and predict the social and economic phenomena or social behaviour of human beings is known as 'social research'. In this unit, you will get acquainted with the meaning, characteristics and objective of scientific research, aims and types of social research, steps in social research, and the concept of hypothesis.

1.1 UNIT OBJECTIVES

After going through this unit, you will be able to:

- Explain the meaning of the term research
- Discuss the concept of scientific research and the relationship between social science and research
- Analyse the aims of social research
- Assess the types of social research
- Describe the major steps involved in social research
- Assess the need for hypotheses formulation

1.2 MEANING OF RESEARCH

Research in common parlance refers to the search for knowledge. One can also define research as a scientific and systematic search for pertinent information on a specific topic. In fact, research is an art of scientific investigation. According to the *Advanced Learner's Dictionary of Current English*, 'Research is a careful investigation or enquiry, especially a thorough search for new facts in any branch of knowledge.' Redman and Mory (1923), author of *The Romance of Research*, defined research as 'A systematized effort to gain new knowledge'. Some people consider research as a voyage of discovery that involves movement from the known to the unknown.

Research in a technical sense is an academic activity. Clifford Woody, a professor of Education, defined research as an activity that comprises defining and redefining problems, formulating a hypothesis; collecting, organizing and evaluating data; making deductions and reaching conclusions; and carefully testing the conclusions to determine if they support the formulated hypothesis. D. Slesinger and M. Stephenson, in the *Encyclopaedia of Social Sciences*, defined research as 'the manipulation of things, concepts or symbols for the purpose of generalizing, extending, correcting or verifying the knowledge, whether that knowledge aids in the construction of theory or in the practice of an art.' Research is thus an original contribution to the existing stock of knowledge making for its advancement.

1.2.1 Definitions of Research

Grinnell (1993:4) writes 'A research is a structured inquiry that utilizes acceptable scientific methodology to solve problems and creates new knowledge that is generally applicable.'

Burns (1994:2) defines research as 'A systematic investigation to find answers to a problem.'

According to Kerlinger (1986:10), 'Scientific research is a systematic, controlled empirical and critical investigation of propositions about the presumed relationship about various phenomena.'

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Bulmer (1977:5) states 'Sociological research is primarily committed to establishing systematic, reliable and valid knowledge about the social world.'

Ranjit Kumar (1999:7) holds that a research should have the following characteristics. It should be:

- **Controlled:** The concept of control implies that in exploring causal relationship among variables, the study is set in such a way that extraneous factors affect the relationship minimally.
- **Rigorous:** The research must be carried out rigorously and scrupulously and it should be ensured that the procedures followed are relevant, appropriate and justified.
- **Systematic:** This refers to the logical sequence that is undertaken in an investigation.
- **Valid and verifiable:** The conclusions drawn on the basis of findings should bear the imprint of validity and should be verifiable by others.
- **Empirical:** Conclusions reached during research are based on evidences gathered from real-life experiences and observations.
- **Critical:** The methods employed and procedures used are critically scrutinized. The processes and methods of investigation adopted should be very lucidly stated and explained and should withstand critical scrutiny.

1.2.2 Principles of Research

The basic principles of research include a systematic process to identify a question or problem, set forth a plan of action to answer the question or resolve the problem, and meticulously collect and analyse data. In conducting any research, it is crucial to choose the right method and design for a specific researchable problem. All research is different. However, the following factors are common to all good pieces of research:

- It is based on empirical data.
- It involves precise observations and measurements.
- It is aimed at developing theories, principles and generalizations.
- There are systematic, logical procedures involved.
- It is replicable.
- The findings of the research need to be reported.

1.3 SCIENTIFIC RESEARCH

Science refers to organized knowledge, but this knowledge and these facts are seldom conclusive. New experiences and additional information constantly alter the previous findings and replace them with generalizations that confirm the latest findings.

The same is the case with social sciences. The scientific method can also be applied to subjects in social sciences.

Steps in Scientific Method

The steps involved in the scientific method are as follows:

- Collection of data as per the problem in hand, according to some adequate plan and their systematic observation.

Check Your Progress

1. What is research?
2. What are the basic principles of research?

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- Observations are made with a well-defined purpose and they are recorded in definite terms.
- Classification and organization of data on the basis of similarities, variations, activities, causes and results.
- Generalization of data for the purpose of formulating principles and theories. The principles and theories must be specifically defined so that it can solve the problems in the related field.
- Verification of generalizations through controlled experiments by tested prediction of results and by repetition of experiments. Correlation coefficient of original as well as verification of results is also calculated and probable errors are estimated. It is also determined whether the error lies in procedure or apparatus.
- Assumptions and limitations are noted down on the basis of verification of results.
- Reporting the research in detail.
- Announcement of the results before the general public for practical use.

Steps in Scientific Process

The steps involved in a scientific process are as follows:

(i) **Purposeful observation:** Observation should be accurate and extensive, and it must be done under various controlled conditions.

(ii) **Analysis-synthesis:** This includes the following:

- The essential elements in a problematic situation must be selected by analysis.
- Similarities as well as dissimilarities must be isolated.
- Exceptions are to be given special attention.

(iii) **Selective recall:** A wide range of experiences is essential.

(iv) **Hypothesis:** It is nothing but a tentative solution to the problem. There may be more than one solution depending on the nature of the problem.

(v) **Verification by inference and experiment:** Here, only one variable is manipulated and judgment is made on the adequacy and accuracy of data.

1.3.1 Social Science and Research

Research plays a very significant role in the field of social science. In order to study the importance and relationship between social science and research, social research is conducted or undertaken. Research that attempts to measure, describe, explain and predict the social and economic phenomena or social behaviour of human beings is known as 'social research'.

One of the main objectives of conducting social research is to find information about the behaviour of an individual and solutions to the problems related to human relations. The outcome of social research provides the following benefits:

- It helps professionals in earning their livelihood.
- It helps students in knowing how to write a report for various findings.
- It helps philosophers to think on wider new perspectives.
- It helps in developing new styles for creative work.

In order to conduct social research and examine the social life of human beings, social scientists use different methods. Quantitative and qualitative research are the two

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methods of research that are generally used by social scientists to conduct a research. In quantitative method, numerical data is collected and then analysed in order to measure the social phenomena. Qualitative method is basically the study of data, such as words, pictures and objects. However, the data collected with the help of this method is not very effective and cannot be generalized very easily.

Social research is very helpful for a country as it helps the government to explore the following things:

- Social and economic structures
- Social attitudes
- Social values and behaviours
- Factors motivating individuals and groups of a society

Researchers share a close relationship with government analysts, such as economists, statisticians and operational researchers. The relationship between researchers and government analysts is essential in order to find out high quality research data. Social research also informs about development, implementation and evaluation of a wide range of government policies.

Social research also helps to examine the consequences of government policies and economic changes in an organization, and the effects of globalization and its impact on small-scale and cottage industries.

1.3.2 Objectives of Scientific Research

Research is a systematic process for developing a theory by applying scientific methods. It is an impartial, objective, empirical and logical analysis and recording of controlled observation that finally leads to the development of a theory, principles, laws, etc., and helps us to predict about the phenomenon in future.

A research is said to begin with a question or a problem. The purpose of a research is to find out solutions through the application of systematic and scientific methods. Thus, research is a systematic approach to a purposeful investigation.

The main aim of research is to uncover answers to questions by applying scientific procedures. Research aims to discover hidden truths. While each research initiative has a particular purpose, the objectives of research can be broadly characterized as follows:

- **Exploratory/formulative research:** It attempts to get familiar with a concept or to develop new insights into it.
- **Descriptive research:** It seeks to accurately portray the key characteristics of an individual, a situation or a group.
- **Diagnostic research:** It establishes the frequency with which an event occurs, or the frequency with which it is associated with something else.
- **Hypothesis-testing research:** This type of research tests the hypotheses of a causal relationship between variables.

1.3.3 Characteristics of Good Research

The process of research helps to increase the creative ability of a decision-maker. The various characteristics of research are as follows:

- **Interdisciplinary team approach:** This approach is based on the principle of using expertise and experience of different personnel working in different disciplines

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within an organization. An individual cannot be an expert in all the areas of operation. So, researchers take help from other experts, who are specialists in their respective fields. Under interdisciplinary team approach, an expert may use old solutions, which were used in the past as research material for finding the most appropriate solution to a problem.

- **Methodological process:** The researcher uses scientific methods and techniques to provide optimum solution to problems. The scientific methods include observing and defining a problem and formulating hypothesis related to the results of the scientific methods and techniques. If the hypothesis is accepted, its results should be executed in an organization; but if the hypothesis is not accepted, another hypothesis is formulated.
- **Objectivistic approach:** The aim of an organization is to have optimal solutions to various problems. It is essential to measure the desirability of a solution for achieving the organizational objective. This measured desirability helps in comparing the alternative courses of action with respect to their outcomes.
- **Economical in nature:** In an uncertain and complex situation, research helps in reducing the costs of inventory, thereby improving profits. For example, in inventory control, research can provide scientific rules for reducing acquisition costs and inventory-carrying costs.

The qualities of good research are as follows:

- **Good research is systematic:** This means that the research lays out clear steps in a specified sequence in compliance with well-defined rules. Being systematic does not mean that the research cannot be based on creative thinking. On the other hand, it dramatically reduces guesswork-based and intuitive conclusions.
- **Good research is logical:** This implies that the use of sound logic provides a foundation for reasoning, induction and deduction, which are of great significance for carrying out high quality research. Induction entails reasoning from a part to the whole, while deduction is the process of reasoning, wherein a premise is driven to a conclusion which is based on that very premise. Inductive and deductive reasoning is further discussed in the next unit. In fact, logical reasoning leads to more meaningful research and better eventual decision-making.
- **Good research is empirical:** This means that research is related to one or several aspects of a real situation and uses concrete data which provides a basis for external validity to the research results.
- **Good research is replicable:** Good research allows for research results to be verified by replicating the study, thereby building a sound basis for decisions.

Further, Best and Kahn (1992) have summarized the main characteristics of research as follows:

- Research seeks to find a solution to a problem. In this objective, it could answer a question or even determine the relationship between several variables.
- Research creates generalizations, principles and theories that enable the prediction or anticipation of future occurrences. Research studies specific objects, groups or situations and then applies these characteristics observed to a larger population than the sample observed. Research goes beyond just simply retrieving or gathering information. There are many schools where the research teams gather and tabulate statistical information. This information can be used for decision-making, but it is not necessary to do so.
- Research is based on observations or empirical evidence. There are many questions which are interesting or relevant but, since they cannot be observed, they do not become research procedures. Research does not accept revelation or dogma as a basis for establishing knowledge. Research only accepts that which can be verified by observation.
- Research requires accuracy of observation and description. Researchers rely on quantitative or numerical measuring devices which are accepted as precise means of description. They identify or create appropriate data gathering instruments or procedures and employ effective mechanical, electronic, or psychometric techniques to improve human observation, recording, computation and analysis of data.
- Research entails obtaining new data from first-hand sources, or uses existing data towards a new purpose. Teachers often guide their students to undertake a project which requires them to write a paper detailing the life of a prominent person. The students consult encyclopaedias, books, or periodicals and summarize the information in writing. This is not research, the information is not new. Simply rewriting or representing what is already known may be a valuable learning experience, but it is not research. It does not provide any new information.
- Research may sometimes appear to be random or unsystematic. However, it is actually always based on carefully designed procedures and rigorous analysis. Although researchers may sometimes employ trial and error methodologies, research is not a blind, random investigation, where the researcher is just experimenting to see what happens.
- A good researcher requires significant expertise. He/She is already aware of what is known about the problem including the investigations carried out by others. The researcher familiar with the related literature and also understands the terminology, concepts and technical skills necessary to thoroughly assess the data that he/she has gathered.
- Researchers must apply objectivity and logic and must also remove all their personal biases. They must employ all possible tests in order to comprehensively validate the procedure followed, the data sourced, and the results or conclusions that have been arrived at. Researchers should not make any effort to be additionally persuasive in order to prove an emotionally held conviction by them. Their focus must be on testing, and not on proving the hypothesis. Total objectivity is just as rare as absolute righteousness, and therefore, researchers must not allow bias or emotion to affect their analysis.
- Research involves the quest for answers to unsolved problems. Pushing back the frontiers of ignorance is its goal, and originality is frequently the quality of a good research project. However, previous important studies are deliberately repeated, using identical or similar procedures, with different subjects, different settings, and at different times. This process is a replicaton, a fusion of the words, repetition and duplication. Replication is always desirable to confirm or to raise questions about the conclusions of a previous study.

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- Research must be carried out patiently and not in a rushed manner. It's outcome and result are mundane rather than spectacular, and the research team must be prepared to face disappointment in the pursuit of answers to their unanswered questions.
- The process and outcomes of research are meticulously recorded. Every key term is defined, restrictive factors are acknowledged, procedures are carefully described, all references are recorded, results are objectively documented, and the final outcomes are presented with caution and restraint. The final research reports and supporting data are made available for associates and other scholars to study, analyse, evaluate and even replicate.

1.3.4 Research Approaches

Almost all types of research primarily follow the two basic approaches depending on the need of quality and the amount of data available. These two approaches are quantitative approach and qualitative approach.

1. Quantitative Approach

This approach involves the creation of data in quantitative terms. It can be further classified into the following approaches:

- **Inferential approach:** It is used to form a database to infer features or relationships of population. This usually means a survey research in which a model of population is studied.
- **Experimental approach:** This approach attempts to establish a cause–effect relationship among the groups of subjects that make up the research study. It is characterized by a greater control over the research environment where some variables are operated to scrutinize their effect on other variables.
- **Simulation approach:** This entails the creation of an artificial environment within which relevant information and data can be produced. It is useful in building models for understanding future conditions.

2. Qualitative Approach

This approach is concerned with the subjective assessment of human attitude, opinions and behaviour. It generates results either in non-quantitative form or in non-numerical data. This technique focuses on group interviews and in-depth interviews in its approach. It can be further classified into the following approaches:

- **Ethnographic approach:** This is concerned with studying an entire culture. The researcher studies an integral cultural group in a natural setting over a specific period of time. By a cultural group, we mean any group of individuals, who share a common social identity, location or any other characteristics of interest. For example, an ethnographic study of the hurricane victims in crisis, a group of children in kindergarten, or a cultural group in tribal India.
- **Phenomenological approach:** This focuses on the subjective experiences of people over a long period of time. It aims at understanding the 'lived experience' of the group of individuals being studied.
- **Field research:** This is a broad approach to qualitative research that facilitates collection of data. The basic idea involved in this research is that the researcher goes into the field to observe the phenomenon in its natural state. He/She takes extensive field notes, which are then coded and analysed in various ways.

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1.3.5 Types of Research

The types of research depend on the field in which the specific research study is performed. The different types of research are as follows:

1. Experimental Research

Experimental research involves conducting tests in a simulated or real space and time. The emphasis of most experimental research is on establishing cause and effect relationships, acquiring sensitivity of the dependent factor on an independent factor, keeping other independent factors under control and finding the conditions under which reactions take place.

The main features of experimental research are: (i) isolation of factors into dependent, independent and catalytic, (ii) replication of the experiment to ensure the reliability of the results, and (iii) measurement of the result, i.e., inputs, conditioning environment and output. The hallmark of experimental research is precision and accuracy. Everything is structured, controlled, monitored, measured and reported.

There are different types of experimental research. These are: (i) natural or uncontrolled as in the case of natural phenomena where only observation of the phenomena is done, results analysed and conclusions drawn; (ii) the laboratory-situation research where a simulated environment is created with the input and conditioning variables manipulated to find the output behaviour; and (iii) field experiment where research is conducted in a social setting, with the researcher having a low manipulative power as far as the input variables and conditioning factors are concerned.

The first type of research is used in the case of totally uncontrollable phenomena like gravitational force, weather, astronomical or celestial events. The second type is used in physical, biological and psychological sciences. The third one is based on management, business and social sciences.

There are several experimental designs like: completely randomized design, completely randomized block design, Latin square design, cross-sectional design, longitudinal design, etc.

Experimental research is considered to be most scientifically valid. The purpose of experimental research is to establish 'cause and effect' relationships from observed findings. The effects of specific variables in a process can be understood by keeping other variables constant or using controlled experimental research. This is practised till the design and execution of the experimental hypothesis provides results. Research and marketing managers need to be confident about the conclusions drawn from the research.

Experiments call for selecting matched groups of subjects, subjecting them to different treatments by controlling extraneous variables and checking whether observed response differences are statistically significant. To the extent that extraneous factors are eliminated or controlled, the observed effects can be related to variations in the treatment. For instance, Indian Airlines might introduce in-flight Internet service on one of its regular flights from Delhi to New York. It might charge ₹1,200 one week and only ₹700 the next week. If the plane carried approximately the same number of first class passengers each week and the particular weeks made no difference, any significant difference in the number of calls made could be related to the difference in price charged. Trying other prices and including other air routes could elaborate the experimental design.

Experimentation is not easy to define. In most circumstances, experiments must create artificial situations so that they can obtain the particular data needed and can

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measure it accurately. Artificiality, in general, is the essence of an experimental research. Experimental research is commonly used in sciences, such as sociology, psychology, physics, chemistry, biology, medicine, etc.

2. Ex-post Facto Research

Ex-post facto is a term used to define an action taken to change the effect of a set of circumstances. This action relates to a past endeavour and bases the new effect on the same set of circumstances existing at that time. Ex-post facto research is similar to experimental research, which is conducted to deal with situations that occur in or around an organization. Studies that investigate possible cause and effect relationships by observing an existing condition or state of affairs and searching back in time for probable causal factors are collectively known as 'ex-post facto research'.

The characteristics of an ex-post facto research are as follows:

- Exploration of possible causes and effects
- No manipulation of independent variables as it has already been applied
- Control on comparison group
- Intact groups are used
- Researcher takes the effect-dependent variable and examines it retrospectively
- Flexible by nature

This research is used in one or more of the following cases:

- Where more powerful experimental designs are not possible to apply.
- When one is unable to select, control and manipulate the factors necessary to study the cause and effect relationship directly.
- When control variables, except a single independent variable, may be unrealistic and artificial.

Advantages of ex-post facto research are as follows:

- Shows a correlation where more rigorous experimentation is not possible
- Is an exploratory tool
- Useful to avoid artificiality in the research
- Shows cause and effect relationships

Disadvantages of ex-post facto research are as follows:

- Lack of control for independent variable and randomizing subjects
- Never certain if causative factor has been included or identified
- Relationship between two factors does not estimate cause and effect
- May be regarded as too flexible

3. Survey Research

A survey is a fact-finding study. It is a method of research involving the collection of data directly from a group of people or a sample at a particular point of time. The purpose of survey is to provide information, explain phenomena, make comparisons, etc. It is concerned with cause and effect relationships that can be useful for making predictions, knowing about customer's knowledge, beliefs, preferences and satisfaction and measuring all these magnitudes for general population.

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A company, such as Air India, might prepare its own survey to collect the information it needs or it might add questions to an anthology survey that carries the questions that are common to several companies. It can then provide services at a much lower cost. It can also put cross questions to an ongoing consumer panel run by itself or another company. A mall intercept study may also be carried out by having the researcher approach people in a shopping mall and asking them questions. The survey methodology is popular among students for two reasons. First, it seems familiar and easy to conduct. Most students take part in either an interview or questionnaire survey and many conduct a survey in their secondary school days. Second, people are often interested to respond to questions therefore the survey is a useful tool for gathering a wide range of information.

A survey collects information from a sample of the population or sometimes, the organizations that are interested in participating in it. This may involve gathering information either at one point in time, that is, cross-sectional studies or following a group of people over a period of time, that is, longitudinal studies. Most of the non-academic surveys, such as surveys in market research, are of the first type. The type of information that can be gathered from people includes factual information, their level of knowledge, attitude, personalities, beliefs and preferences.

Steps in conducting a survey

Following are the steps in conducting a survey:

- Clarify the purpose
- Define the study population
- Sample selection and estimating the sample size
- Decide what information to collect
- Decide how to measure the information
- Collect the data
- Record, analyse and interpret the data

Clarifying the purposes

It is important to be absolutely clear and explicit about the purposes right at the beginning. Surveys can be used for the following two purposes:

- To know how common a characteristic is, that is, a descriptive survey.
- To learn something about the causes for these characteristics, that is, analytic survey.

Defining the study of population

The next step is to define the exact subject of the study. It is vital to ensure that the subject of study relates to the purpose of the survey. This usually includes specific personal criteria, time and place.

4. Historical Research

Historical research turns to history or the past to study the patterns there, their impact on the present, evolutionary process and so on. In a sense most of the researches are historical in nature because it uses data and information pertaining to the past. Hence, research depends heavily on the past. How deep should research go into the past? This is a relevant question right now. Perhaps historical research concentrates on the deep distant past.

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Enquiry into the trade, commerce, business and economy of Ancient India (5000–3500 BC), the administrative system during the reign of Ashoka, etc., are truly part of historical research. Historical research requires extraordinary skills on the part of the researcher to live the distant past, to visualize the environment, to analyse and synthesize the undercurrents and overtones of the past.

We can also say that historical research studies the bygone social effects that may have given rise to current situations. The study of the current state of Indian labour based on the past labour union movements to formulate the Indian labour policy is an example of historical research.

Some other types of research are described below:

(i) **Pure/Fundamental research:** This research is mainly concerned with identifying certain important principles in a specific field. It intends to find out information that has a broad base of application. The purpose of this kind of research is to develop theories, laws or principles by observing broad generalizations or phenomena. These theories or laws were previously unknown to anybody, e.g., discovery of the Law of Gravity by Newton, Law of Operant Conditioning by Skinner, and so on. Other examples of fundamental research are John Robinson's Imperfect Competition Theory in economics and Maslow's Hierarchy of Needs Theory in motivation, etc.

Researchers select the problem from any source, which generally is not traditional. When the researchers find the solution to the problem through their research, they come to know that they have done something useful economically or socially.

(ii) **Applied research:** This research aims at finding a solution to an immediate problem faced by a society or an industrial organization. It is supposed to discover a solution to some basic practical problems. It suggests corrective methods to minimize a social or business problem. Applied research is an application of pure research and its new interpretation in a different situation. Sometimes two pure laws are compared and a third new law emerges. This is called 'applied research'.

Both the above researches use the scientific method of reflective thinking but their objectives are different. Problems involved in applied research have definite relevance to human aspirations; but pure research is not directly related to specific human needs, at least in the beginning.

Steps involved in applied research are as follows:

- A growing concern is studied and points of weaknesses in the system are isolated.
- Some of these weaknesses are selected for investigation.
- Investigations are followed by solution either in the laboratory or in the field.
- Solution is modified and installed so that it may work in practice.
- Solution must be maintained by planning it in the organization so that it may become a permanent part of the system.

(iii) **Action research:** It is 'research during action', such as observation of students in a classroom. Its findings are to be related in terms of local applicability. It means action research is generally used to solve local problems. As a result, its findings cannot be generalized beyond a particular setting. Its purpose is to improve school practices and educational outputs.

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(iv) **Formulative/Exploratory research:** It helps examine a problem with suitable hypothesis. This research on social science is mainly significant for clarifying concepts and innovations for further research. The researchers are mainly concerned with the principles of developing hypothesis and testing the hypothesis with statistical tools.

(v) **Case study:** This research undertakes intensive research that requires a thorough study of a particular unit, such as industrial or banking for data collection. Unit 4 will further deal with case study and the methods of data collection.

Besides these, there are several other types of research, such as evaluation research, assessment research and comparative research.

It is difficult to categorize a particular research under any major head. Irrespective of the nature and method of research, the research problem is essentially treated in an interdisciplinary manner. Interdisciplinary treatment means borrowing of an idea from related disciplines connected with the research topic for more authenticity. For example, management is not an individual discipline in its own right; rather, it requires an integral approach of various disciplines like finance and human resources.

1.3.6 Nature and Scope of Research

A good and effective research is identified by its nature, which signifies its focus on the research topic, systematic way of implementation, control over variables, etc. The nature of a good and effective research is as follows:

- **Objectivity:** A good research is objective in terms of offering solutions to the research questions. This calls for planning and creation of suitable hypothesis to avoid lack of relationship between the research questions and hypothesis.
- **Control:** A good research is capable of controlling all the variables. This necessitates randomization at all stages and ascertains sufficient control over the independent variables.
- **Universality:** A good research should have almost the same result by using identical methodology so that the result can be applied to similar situations.
- **Free from personal biases:** A good research is free from the researcher's personal biases and is based on objectivity and not subjectivity.
- **Systematic:** A good research has several well-planned steps that are interconnected and logical.
- **Reproductivity:** A researcher while conducting a research is able to get approximately the same results by using an identical methodology of conducting investigation.

Research plays an important role in many application areas. Some of them are as follows:

- **Finance, budgeting and investments:** This includes the following activities:
  - Cash flow analysis, long-range capital requirement analysis, creation of investment policies and dividend policies
  - Creation of credit policies, credit risks and account procedures, such as deposits and withdrawal

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- **Purchasing, procurement and exploration:** This includes the following activities:
  - Determining the quantity and time of purchase of raw materials, machinery, etc.
  - Defining the rules for buying and supplying products under varying prices
  - Determining the quantities and timings of purchases of finished products
  - Formulating strategies for exploration and exploitation of new material sources
- **Production management:** This includes physical distribution of products, facility planning and manufacturing planning as follows:
  - **Physical distribution:** It is further divided into the following elements:
    (a) Location and size of warehouses, distribution centres, retail outlets, etc.
    (b) Distribution policy
  - **Facility planning:** It is further divided into the following elements:
    (a) Production scheduling and sequencing of available resources
    (b) Project scheduling and allocation of resources
    (c) Determining the optimum production-mix
  - **Manufacturing planning:** It is further divided into maintenance policies and preventive maintenance.
- **Research and development:** It includes the following activities:
  - Determining the areas of concentration of research and development
  - Reliability and evaluation of alternative designs of research and development
  - Control of developed projects
  - Coordination of multiple research projects
  - Determining the time and cost requirements

1.4 AIMS OF SOCIAL RESEARCH

The subject matter of sociology is society. Sociologists study man's social behaviour in a variety of contexts. They use a number of methods in social research including 'comparative method', 'participant observer method', 'community studies', etc. Descriptive and explanatory research aims only at describing, in detail, a situation or set of circumstances. On the other hand, action research refers to 'that is done when some reform or change has been introduced. Its purpose is to monitor the effect of the change and to decide whether it has achieved what it was supposed to achieve.'

Many eminent sociologists defined statistics and came out with several definitions. Some of them approached it as 'statistical data', i.e., numerical statement of facts. In this tradition, Horace Secrist said: 'Statistics may be defined as the aggregate of facts affected to a marked extent by multiplicity of causes, numerically expressed; enumerated or estimated according to a reasonable standard of accuracy, collected in a systematic manner, for a predetermined purpose and place in relation to each other.' In contrast, certain other experts defined it as 'statistical methods', i.e., complete body of the principles

Check Your Progress

3. Why is the knowledge obtained from science seldom conclusive?
4. For what purpose is social research conducted?
5. What are the two approaches to research?
6. How does research depend heavily on the past?

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and techniques used in collecting and analysing such data. In this genre, Croxton and Cowden writes: 'Statistics may be defined as the science of collection, presentation, analysis and interpretation of numerical data.'

In ancient times, the use of statistics was related to the state-craft or the administration of the affairs of the state. As a result of advancement in the field, statistics finds ready application in all physical as well as social sciences. Today, there is hardly any field that does not lend itself for application of statistical techniques and principles. It is applied, among others, in social sciences, planning, mathematics, economics, business, biology, astronomy, medical sciences, psychology and education. It extends beyond mere collection of data but involves scientific techniques to analyse it and draw sound inferences from it.

However, it has the following limitations:

- Statistics is not suited to the study of qualitative phenomenon but only to those things which are capable of quantitative measurement.
- Statistics does not study individuals but deals with an aggregate of objects and group characteristics.
- Statistical laws are not exact but are based on probability and its results are true only on an average.
- Statistics is liable to be misused as they can be moulded and manipulated in to suit one's arguments and reasoning. Incomplete data often leads to wrong and misleading conclusions.

Most disciplines undertake research. Research is more of a way of thinking than a set of skills. Research entails critically examining aspects of the study; making guiding principles for testing particular procedure; developing testing theories, etc.

For any study undertaken to be called a 'research', it should adhere to the following three criteria:

- A set of philosophies guide the research
- Methods, techniques and procedures which have proven reliability and validity are used
- Research has to be objective as well as unbiased

The philosophical orientation of research may stem from one of the two paradigms in research—*positivism* and *interpretivism*. Validity ensures that in a research study correct procedures have been applied to find answers to a question. Reliability refers to quality of a measurement procedure. Validity and reliability will be dealt with in detail in the following unit. 'Unbiased and objective' means that researchers take each step and draws each conclusion to the best of their ability without introducing their own biases and prejudices. (Ranjit Kumar, 1999).

1.4.1 Paradigms of Research: Positivism and Interpretivism

The application of scientific methods practised in natural sciences like physics and chemistry in researching various areas in social sciences is known as the *positivist approach*. Social scientists maintain absolute objectivity in the methods of study they follow and are concerned only with measurable phenomena. Quantitative approaches like experiments, surveys, etc., are concerned with positivism which stresses on generalizations and reliability. Social research basically wishes to establish scientific laws of society, or causal relationships that are arrived at by testing research hypothesis.

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In order to explain human behaviour, social researchers need to be conversant with people's interpretations of social phenomena. This approach is known as *interpretivism*. The methods used in natural sciences cannot be used without modifications in the social sciences. The perceptions, motivations and experiences of the social actors are explored by the research designs. Qualitative methods like interviews, observation studies, etc., that stresses on validity is mostly associated with interpretivism. The motives and intentions that underpin social behaviour are studied by social research.

1.4.2 Objectivity in Social Research

Social scientists are often influenced by their biases, passions, likes and dislikes, and preconceived notions. These are seen to interfere with the scientific objectivity that they would need while researching on social sciences. Objectivity is the capacity to represent truthfully and without prejudice, the results of one's research. A social researcher needs to be aware of his personal biases and prejudices and take adequate care that these do not affect the objectivity of the research. Max Weber, an exponent in social research argued, that actually, the thoughts and beliefs of the researchers *should* affect their topics of study. However, the social scientist needs to be value-neutral once the research question has been framed. Objectivity can be attained by sharing the results of research with experts who then may be asked to critically examine them. In his *The Logic of Scientific Discovery* (1959), Karl Popper maintained that *confirmation* and *refutation* are the essence of scientific discovery. Social researchers publish their work so that their work can be scrutinized by others. Journals have dedicated teams to decide whether the research material lives up to the standard of the journal and should, therefore, be published. Once a research material is published, other scholars look at it critically, especially when they do not agree with the findings. Some others may wish to replicate the study by changing the strategies and settings to check if the conclusion would remain the same.

1.5 TYPES OF SOCIAL RESEARCH

Sociologists employ a variety of methods to learn about the social world. These methods are not mutually exclusive. Since each research method has strengths and weaknesses, a good research strategy may use several of them. Appelbaum and Chambliss (1997:40) hold that the principal methods of social research include survey and fieldwork.

1.5.1 Survey

A survey entails administering a precisely worded questionnaire to a group of people in order to determine their characteristics, opinions and behaviours. First, the researcher has to define a *population universe* to which the study applies: this is the group of people about whom generalization is to be made. Once the population universe is identified, a *sample*—a subset of cases selected to represent the larger population—must be selected, since it is seldom economically feasible or desirable to interview everyone in a chosen population universe.

Two principal type of sampling are used: *probability* and *non-probability sampling*. In the most common type of probability sampling, termed *random sampling*, everyone in the population universe has an equal chance of being in the sample. In *non-probability sampling*, subjects are deliberately chosen because of their specific characteristics. Once the sample is constructed or drawn, the questionnaire is

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7. List two limitations of the use of statistics in various fields.
8. What is the positivist approach to research?
9. Define objectivity.

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administered. Questionnaires may contain *open- or close-ended questions*. In *close-ended questions*, the respondents are required to choose only from predetermined alternative responses. In *open-ended questions*, there are no fixed responses to choose from. The respondents are provided with a wide range of opportunities to express a wide range of feelings and opinions.

One of the strengths of survey method is that it permits the researcher to draw conclusions about a large number of people on the basis of a much smaller number of interviews. This is a major advantage in terms of time and money. Surveys also have some weaknesses. Sometimes, surveys can be superficial since in order to be feasible economically, they usually call for brief responses to close-ended questions. Many-a-times, responses are self-serving, just intended to make the interviewee look good in the eyes of the researcher.

1.5.2 Fieldwork

Fieldwork consists of many methods. The most common fieldwork is that of *participant observation*. The researchers become a part of the community under study; immerses themselves completely in the daily life of the community and participates in the activities of the members of the community but with a sense of detachment. They then attempt to report all their findings on every aspect of their lives with a sense of impartiality and disinterestedness. Classical examples of fieldworks are William Whyte's (1915) *Street Corner Society (1943)*, A Study of Italian-American Working-Class Men and B. Malinowski's *Study of the Tribes of Trobriand Island*.

Sometimes the research strategy requires that the researchers stay away from the people they are studying, simply observing what is going on. A sociologist studying crowd behaviour at a rally or student participation in a seminar would be an example. The researcher tries to be a 'fly on the wall', invisible and unobtrusive, yet constantly recording what is going on. This technique is called *detached observation*.

Interview is another method of fieldwork. It is a detailed conversation designed to obtain in-depth information about a person. In a *structured interview*, researchers have a detailed list of specific questions to ask. In the *semi-structured interview*, the researchers have a list of topics to cover depending on the interview situation, to determine the course of questioning and the details of the question.

Participatory research is another method under fieldwork. It is designed to involve the subjects of the research in the research process itself, with an eye to empowering them to overcome some difficulty or problem. This research is usually tied with community action. It is conducted when a group or community wants to engage in some form of social change but lacks the expertise to do so. The researcher is invited to become a fully engaged member of the social change process, helping the members of the group to conduct the necessary research and training them in the techniques for doing so.

Another method is *experiment*. In it, we choose two groups—*the experimental group* and *the control group*. An experimental group is one which is exposed to the independent variable. The control group is kept constant—no experiment is carried out on it. In the end, we compare both the groups to find out the resultant effects of the experiment.

Working with *available information* is another strategy. This involves working with data collected by other people. Often such data are the only information available. Examples include statistical data, documentary analysis or comparative-historical research

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(study of several different countries as well as examination of changing historical patterns in a single country).

APPROACH	WHEN APPROPRIATE
Survey	Basic information about a large population is required and sampling is a feasible strategy.
Interview	In-depth information is desired and direct access to informants is possible.
Detached observation	Information should be gathered but the data gathering should be as unobtrusive as possible.
Participant observation	First hand knowledge of the direct experience of subjects is required.
Participatory research	Primary goal is empowerment: training people to acquire the necessary skill to do research themselves.
Experiments	To determine specific causal relationships.
Using the available information	Direct acquisition of data is either not feasible or not desirable.

1.6 MAJOR STEPS IN SOCIAL RESEARCH

Research process includes steps or a series of actions and logical sequence of those steps to carry out research effectively. The various steps in a research process are not mutually separate, exclusive or discrete, but they at the same time need not always follow each other. The researcher, at each step, anticipates subsequent steps and requirements. The tentative order of the steps and the procedural guidelines of the research process are as given below:

(i) **Formulating the research problem:** At the very beginning of research, the researcher must clearly define the research problem, i.e., the area of interest, the matter to be inquired into, etc. The problem, before being solved, is initially stated in a broader perspective and then the researcher arrives at the specific question by gradually reducing the ambiguities, if any. Then, immediately after formulating the problem, the feasibility of different solutions is studied before choosing the right solution.

(ii) **Extensive literature survey:** After formulating the research problem, a brief summary of it should be prepared—this is an essential step. While writing a Ph.D. thesis a researcher has to prepare a synopsis of the topic and submit it to the appropriate committee or research board for approval. Synopsis preparation needs extensive survey of the literature connected with the problem.

(iii) **Development of a working hypothesis:** After surveying the literature, the researcher should clearly state the working hypothesis, which is a tentative assumption made before testing it in logical or empirical sequences. Hypothesis must be as specific as possible and should be limited to the intended research. This helps to choose the right process.

(iv) **Preparing the research design:** The next step, after clearly defining the research problem, is preparing the suitable research design. The research design includes the conceptual framework within which research would be carried out. A good and planned research design helps to carry out the study in an efficient manner saving time and resources. It helps to gather the most useful information and assists in arriving at the accurate results. Simply put, a good research design facilitates the collection of relevant evidence with minimal expenditure of money, effort, time and other resources.

(v) **Determining sample design:** A universe or population includes all the items under inquiry. If all the items in the population are inquired then such an inquiry is called census inquiry. In a census survey, all the items are covered and so the highest accuracy is obtained. But this may not be practicable in surveys involving a big population. Census surveys need huge amounts of time, money and energy. Hence, quite often it is wise to select only a few items from the universe for study purposes. Technically, such a small and convenient number of items selected, is called a **sample**. Specified plan of the size and method of collecting the sample is technically known as **sample design**.

(vi) **Collecting the data:** In most cases, the data in hand is insufficient and there is always a need of fresh data. There are different ways of collecting the appropriate data which differ considerably in terms of relevance, expenditure, time and other resources. Therefore, the researcher must select the most appropriate method of collecting the data after considering the objective of the research, the nature of investigation, time and financial resources available, scope of the inquiry, and the desired degree of accuracy.

(vii) **Execution of the project:** This is an important step in the research process because if the execution proceeds on the correct lines, the collected data would be dependable, adequate and accurate. Therefore, systematic and timely execution of a project plays a crucial role in ensuring the right results at the end.

(viii) **Analysis of data:** After collecting the data, the next step is analysing the data. The data analysis includes a number of closely-related operations like specifying different categories of data, differentiating and tabulating the data into different categories, applying the statistical techniques and formulae to the data, doing the right calculations and then drawing statistical inferences. Various tests, such as chi-square test, *t*-test, *F*-test, etc., help in data analysis.

(ix) **Hypothesis-testing:** After analysing the data, the researcher should test the working hypothesis against the statistical inferences obtained after analysing the data. The question that should be answered now is: Do the findings support the working hypothesis or do they contradict?

(x) **Generalizations and interpretation:** If a hypothesis is tested and upheld sufficient number of times, the researcher can arrive at a generalization. The degree of success of a research is calculated on the basis of how much the arrived generalizations are close to the acceptability. If the researcher starts with no hypothesis, the researcher will interpret his findings on the basis of some existing theory and this is known as **interpretation**. The process of interpretation often triggers new questions which lead to further researches.

(xi) **Preparation of the report or the thesis:** Finally, the researcher has to prepare the report of what has been studied. Report must be written with great care keeping the following layout in mind:

- **Preliminary pages:** These pages of the report should contain the title, the date, acknowledgments, foreword, table of contents, list of tables, list of graphs and charts (if any).

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10. What does a survey entail?
11. Name the most common fieldwork.
12. What are the two types of sampling?

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- **Main text:** The main text of the report should have introduction, summary of findings, main report, conclusion and suggestions for future research.
- **Closure:** At the end of the report, appendices should be listed in respect of all technical data, followed by bibliography. Index terms should also be given specially in a published research report. All references should be cited as per the research writing formats.

1.6.1 Flow Chart: Research Process

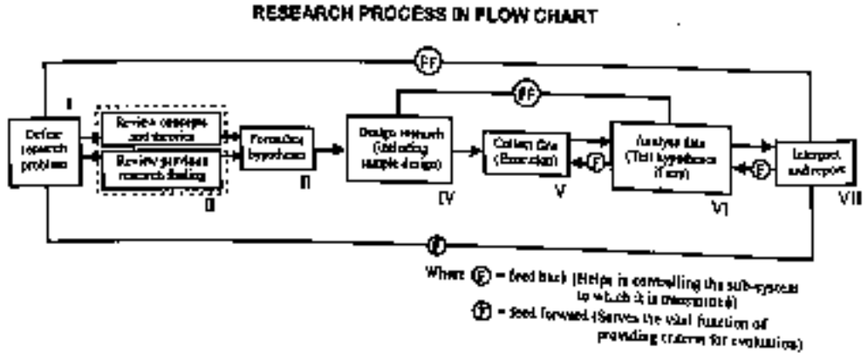

Fig. 1.1 Research Process

In Figure 1.1, the flow chart indicates the sequential steps to be followed in the research process. One must start with defining the research problem along with reviewing the relevant literature in the field to become familiar with the concepts and theories relevant to the issue to be investigated. The next step is the formulation of the hypothesis, which is followed by the research design and sample selection. Then the collection of data and its analysis is to be attempted. After that the interpretation and the report writing stages complete the research report. These have to be written step by step and then edited and refined several times before preparing the final report.

1.6.2 Criteria of Good Research

Whatever be the type of research one undertakes, certain common criteria of good scientific methods have to be followed. A good research follows logical methods, is systematic, and structured in accordance with well-defined sets of rules and practices to enable the researcher in arriving at dependable conclusions. Both, deductive reasoning and inductive reasoning, should be followed for meaningful research.

Good research also implies obtaining reliable data which provides sound validity to the research findings.

The following principles underlie a good research criteria:

- The aim and objective of the research being conducted should be clearly specified.
- The research procedure should be replicable so that if the research needs to be continued or repeated, it can be done easily.
- The research design should be so chosen that the results are as objective as possible.
- Interpretation of any research should be done keeping in mind the flaws in the procedural design and the extent to which it has an effect on the results.

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- Research should be carried out systematically. It should progress in predefined stages, and researchers should avoid using their intuition or guesswork to arrive at conclusions.
- Research should be logical so that it is meaningful, and help in decision-making.
- Research should be empirical as far as possible.
- The results of the research should only be used and generalized for the population for which the data provides an adequate basis.
- The validity and reliability of the data used in research should be double checked.
- Further, good research produces results that are examinable by peers, methodologies that can be replicated, and knowledge that can be applied to real-world situations.

1.6.3 Problems Encountered by Researchers in India

There are some common problems faced by researchers in developing countries and India is no exception. Basically, there is a dearth of tools required for good research. Many of the universities and research institutions are now providing computers with Internet connection to researchers but the facilities provided are not adequate. Luckily, the costs of both hardware and Internet bandwidth have reduced over a period of time. While Indian researchers now have easy access to these tools, there is still the problem of low visibility of papers published by them. Indian researchers are often demotivated to continue further research. Other factors like lack of scientific training in the methodology of research and a non-existent code of conduct also serve as challenges for the Indian researcher. There is also insufficient interaction between researchers and the end-users. End-users of research are the ones who stand to benefit from research and if they are not made aware of the benefit they can derive, getting sponsors to provide funds for research would be difficult.

There is also a lack of safeguards against any violation of confidentiality in data collection. Research studies that overlap lead to unnecessary repetition. There is an absence of research culture in our country.

Other problems that Indian researchers face that are common to developing countries are:

- Limited or no access to international research journals
- Lack of infrastructure except in a few metropolitan cities
- Low investment in research due to financial constraints
- Inadequate library facilities and where such facilities exist, they are not easily accessible
- Poor encouragement to do research

These problems need to be surmounted effectively in order to promote research as a professional activity.

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13. Fill in the blanks with appropriate words.
    (i) The process of _____ often triggers new questions which lead to further researches.
    (ii) The research design should be so chosen that the results are as _____ as possible.
    (iii) Research studies that overlap lead to unnecessary _____.

1.7 HYPOTHESIS

A hypothesis is an approximate assumption that a researcher wants to test for its logical or empirical consequences. It can contain either a suggested explanation for a phenomenon

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or a proposal having deductive reasoning to suggest a possible interrelation between multiple phenomena. A deductive reasoning can be defined as a type of reasoning that can be derived from previously known facts.

Some definitions of hypothesis are:

- According to Townsend, '*Hypothesis is defined as suggested answer to a problem.*'
- According to McGuigan, '*A hypothesis is a testable statement of a potential relationship between two or more variables.*'
- According to Uma Sekaran, '*A hypothesis is defined as a logically conjectured relationship between two or more variables in the form of testable statement. These relationships are based on theoretical framework formulated for the research problem. The hypotheses are often statements about population parameters like expected value and variance, for example a hypothesis might be that the expected value of the height of 10-year-old boys in the Scottish population is not different from that of 10-year-old girls.*'
- According to Kerlinger, '*A good hypothesis is one which satisfies the following criteria:*

  (i) Hypothesis should state the relationship between variables.

  (ii) They must carry clear implications for testing the stated relations.'

This means that: (a) statements contain two or more variables which can be measured, (b) they must state clearly how the two or more variables are related, and (c) it is important to note that facts and variables are not tested but relations between variables exist.

1.7.1 Characteristics of Valid Hypothesis

There are several characteristics of hypothesis, which are as follows:

- **Conceptually clear and accurate:** The hypothesis must be conceptually clear. The concepts and variables should be clearly defined operationally. The definition should use terms which are commonly accepted and it should ensure that communication is not hindered. Hypothesis should be clear and accurate so as to draw a consistent conclusion.
- **Statement of relationship between variables:** If a hypothesis is relational, it should state the relationship between the different variables.
- **Testability:** A hypothesis should have empirical referents which means that it should be testable through the empirical data. Hypothesis involving mystical or supernatural arenas are impossible to test. For example, the hypothesis 'education brings all-round development' is difficult to test because it is not easy to operationally isolate the other factors that might contribute towards all-round development. Since a hypothesis predicts the outcome of a study and it must relate variables that are capable of being measured. The hypothesis such as '*there is a positive relationship between the learning style and academic achievement of 8th grade students*' can be tested since the variables in the hypothesis are operationally defined, and therefore can be measured.

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- **Specific with limited scope:** A hypothesis, which is specific with limited scope, is easily testable than a hypothesis with limitless scope. Therefore, a researcher should give more time to conduct research on such a kind of hypothesis.
- **Simplicity:** A hypothesis should be stated in simple and clear terms to make it understandable.
- **Consistency:** A hypothesis should be reliable and consistent with established and known facts.
- **Time limit:** A hypothesis should be capable of being tested within a reasonable amount of time. In other words, the excellence of a hypothesis is judged by the time taken to collect the data needed for the test.
- **Empirical reference:** A hypothesis should explain or support all the sufficient facts needed to understand what the problem is all about.

A few more characteristics of a good hypothesis are as follows:

- It ensures that the sample is readily approachable.
- It maintains a very apparent distinction with what is called theory, law, facts, assumptions and postulates.
- It should have logical simplicity, large number of consequences and be expressed in quantified form.
- It should have equal chances of confirmation and rejection.
- It permits the application of deduction reasoning.
- Tools and data should be easily available and effectively used.
- It should be based on the study of previous literature and an existing theory, and should be verifiable.

As soon as a research question is formulated, it makes the hypothesis formulation imperative since a *hypothesis* is a tentative solution or an intelligent guess about a research question under study. It is an assumption or proposition whose tenability is to be tested on the basis of its implications with empirical evidence and previous knowledge. Modern investigators agree that, whenever possible, research should proceed from a hypothesis. In the words of Van Dalen (1973), 'a hypothesis serves as a powerful beacon that lights the way for the research worker'.

1.7.2 Need for Hypothesis Formulation

The reasons for formulating a hypothesis are as follows:

- A hypothesis directs, monitors and controls the research efforts. It provides tentative explanations of facts and phenomena and can be tested and validated. Such explanations, if held valid, lead to generalizations, which help significantly in understanding a problem. They, thereby, extend the existing knowledge in the area to which they pertain and thus help in theory building and facilitate the extension of knowledge in an area.
- The hypothesis not only indicates what to look for in an investigation but also how to select a sample, choose the design of research, how to collect data and how to interpret the results to draw valid conclusions.
- The hypothesis orients the researcher to be more sensitive to certain relevant aspects of the problem so as to focus on specific issues and pertinent facts. It

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helps researchers to delimit their study in scope so that it does not become broad and unwieldy.

- The hypothesis provides rational statements to the researcher, consisting of elements expressed in a logical order of relationships, which seek to describe or explain conditions or events that have not been confirmed by facts. Some relationships between elements or variables in a hypotheses are known facts, and others transcend the known facts to give reasonable explanations for known conditions. Hypothesis help researchers to relate logically known facts to intelligent guesses about unknown conditions (Ary, *et al*., 1972, pp. 73–74).
- Hypothesis formulation and its testing add a scientific rigour to all types of researches. A well thought set of hypothesis places a clear and specific goal before the researcher and equips him/her with understanding. It provides the basis for reporting the conclusions of the study on the basis of these conclusions. Researchers can make their research report interesting and meaningful to the reader. The importance of a hypothesis is generally recognized more in the studies which aim to make predictions about some outcome. In an experimental study, the researcher is interested in making predictions about the expected outcomes and hence the hypothesis takes on a critical role. In the case of historical or descriptive studies, however, the researcher investigates the history of an event, or the life of a man, or seeks facts in order to determine the *status quo* of a situation and hence may not have a basis for making a prediction of the results. In studies of this nature, where finding facts is the objective of the study, a hypothesis may not be required.

Most historical or descriptive studies involve fact finding as well as the interpretation of facts in order to draw generalizations. For all such major studies, a hypothesis is recommended so as to explain observed facts, conditions or behaviour and to serve as a guide in the research process. If a hypothesis is not formulated, researchers may waste time and energy in gathering extensive empirical data, and then find that they cannot state facts clearly and detect relevant relationships between variables as there is no hypothesis to guide them.

1.7.3 Hypothesis Testing

Hypothesis testing is carried out to determine whether or not the hypothesis is appropriate. This involves either accepting or rejecting a null hypothesis. The researcher has to pursue certain activities contained in the procedure of hypothesis.

In the formulation of a hypothesis, the investigator looks for those statements where he/she relates one or more variables to make predictions about the relationships. The hypothesis guides the researcher what to do and why to do it in the context of the problem.

For example, if a researcher is interested to study the problem, 'Why does a gifted child become a poor achiever in school?' The researcher then moves towards finding out the causes and factors that have been responsible for the child's poor achievement. The researcher makes a conjecture that the child might be suffering from some disease at the time of examination. Conjecture is in the form of a hypothesis, and this now determines what the researcher should do to verify whether it is a fact or not. The researcher will then go to the student's home, meet his/her parents and enquire about the student's health. All that the investigator is doing is guided by the hypothesis he/she had developed.

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Thus, a hypothesis refers to a conjecture statement about the solution to a problem, which researchers verify on the basis of the relevant information collected by them. It is said to be a hunch, shrewd guess or supposition about what the answer to a problem may be. It is a statement which is tested in terms of the relationship or prediction, etc., which after testing is either accepted or rejected.

A hypothesis relates theory to observation and vice-versa. Hypotheses when tested are either rejected or accepted, and help to infer the conclusion, which helps in theory building. Being a specific statement of prediction, a hypothesis describes in concrete (rather than theoretical) terms what you expect will happen in your study. Not all studies have hypotheses. Sometimes a study is designed to be exploratory. In such researches, no formal hypothesis is established, and it may happen that the actual objective of the study is to explore one or more specific areas more thoroughly in order to develop specific hypotheses or predictions that could be tested through research in the future. A single study could result in one or several hypotheses.

Sources of Hypothesis

Since the mind is fed by innumerable streams and sources, it is difficult to pinpoint how a particular good idea comes to a researcher. The following are some of the popularly known sources of research hypothesis:

- **Scientific theories:** A systematic review and analysis of theories developed in the field of psychology, sociology, economics, political science and biological science may provide the researcher with potential clues for constructing a good and testable hypothesis.
- **Expert opinions:** Discussion with the experts in the field of research may further help the researcher obtain necessary insight and skill into the problem and in the formulation of a hypothesis.
- **Method of related difference:** When we find that two phenomena differ constantly and the other circumstances remain the same, we suspect a causal connection. For example, when we find uncontrolled traffic in a locality, resulting in a greater number of road accidents, we suspect a causal connection between uncontrolled traffic and road accidents. This method also suggest hypothesis.
- **Intellectual equipment of researcher:** Intellectual abilities of a researcher like creative thinking and problem solving techniques are very helpful in the formulation of a good hypothesis.
- **Related literature:** Related literature is the most important source of hypothesis formulation. A review of this literature may reveal to the researcher the variables that have been considered important in relation to his/her problem, which aspects have already been studied and which are left to be studied, which theories have supported the relationships and which theories present a contradictory relationship. Familiarity with related literature may give the researcher a tremendous advantage in the construction of hypothesis.
- **Experience:** One's own experience may be a rich source of hypothesis generation. Personal experiences of an individual which has been gained through reading biographies, autobiographies, newspaper readings or through informal talks among friends, etc., can be a potential source of generation of a hypothesis. For example, a researcher who is working on the effectiveness of guidance in teaching, can think of factors such as the teacher's polite behaviour, techniques

of counselling, mastery over the subject, effective use of teaching skills, decision-making capability, perception of his/her competence, perception of student's capacity for better interaction, use of communication skills, etc.

- **Analogies:** Several hypotheses in a branch of knowledge may be made by using analogies from other sciences. Models and theories developed in a discipline may help, through extrapolation, in the formulation of hypothesis in another discipline. By comparing the two situations, analysing their similarities and differences, some rationale may emerge in the mind of the researcher which may take the form of a hypothesis for testing. For example, in a research problem like studying the factors of unrest among college level students, the researcher insightfully thinks: 'Why was unrest found among school students?' and 'What has changed them: quality of teaching or quality of leadership?'

  Arguing analogically in this way may lead the investigator to some conclusions which may be used for identifying variables and relationships, which form the basis of hypothesis construction. If a researcher knows from previous experience that the old situation is related to other factors Y and Z as well as to X, he/she may reason out that the new situation may also be related to Y and Z.
- **Methods of residues:** When the greater part of a complex phenomenon is explained by some causes already known, we try to explain the residual part of phenomenon according to the known law of operation. It also provides possible hypothesis.
- **Induction by simple enumeration:** Sometimes scientists take common experience as a starting point of their investigation. For example, after observing a large number of scarlet flowers that are devoid of fragrance, we frame a hypothesis that all scarlet flowers are devoid of fragrance. Thus, induction by simple enumeration is a source of discovery.
- **Formulation of hypothesis:** It may also originate from the need and practice of present times.
- **Existing empirical uniformities:** In terms of common sense proposition, the existing empirical uniformities may form the basis for scientific examination.
- **A study of general culture:** It is also a good source of hypothesis.
- **Suggestions:** When given by other researchers in their reports, suggestions are quite helpful in the establishment of hypothesis for future studies.

Procedure of Hypothesis Testing

The procedure for hypothesis testing are as follows:

- **Making formal statement:** In this step, the nature of a hypothesis is clearly stated, which could be either a null hypothesis or an alternative hypothesis. Stating a problem in hypothesis testing is of utmost importance, which should be done with proper care, keeping in mind the object and nature of the problem.
- **Choosing a significance level:** In this step a hypothesis is tested on the basis of a present significance level, which has to be adequate in terms of nature and purpose of the problem.
- **Sampling distribution:** In this step, determination of an appropriate sampling distribution and making a choice between normal distribution and *t*-distribution is included.

- **Selection of a sample randomly:** In this step, a random sample is selected from the sample data for determining an apt value.
- **Probability calculation:** In this step, the probability regarding viability of the sample result is made dependent on the null hypothesis.
- **Comparison:** In this step, the calculated probability and the value of alpha in case of one-tailed test and alpha in case of two-tailed test is compared.

Types of Hypothesis Testing

Hypothesis is tested to identify the errors occurred in the statements and concepts used in hypothesis. Hypothesis testing can be broadly divided into two types, which are as follows:

- Parametric tests or standard tests of hypothesis
- Non-parametric tests or distribution-free tests of hypothesis

1. Parametric Tests or Standard Tests of Hypothesis

These kinds of tests assume certain properties of the population sample such as observations from a normal population, large sample size, population parameters like mean and variance. The various parametric tests of hypothesis are based on the assumption of normality. In other words, the source of data for them is normally distributed. They can be listed as follows:

- **Z-Test:** This kind of test is based on normal probability distribution. It is mostly used to judge the significance of mean as a statistical measure. This is the most frequently used test in research studies. It is generally used to compare the mean of a sample with the hypothesized mean of the population. It is also used in case the population variance is known. It is helpful in judging the significance of difference between the means of two independent large samples, to compare the sample proportion to a theoretical value of population proportion and to judge the significance of median, mode and coefficient of correlation.
- ***T*-test:** This test is based on *t*-distribution and is aptly considered to judge the significance of a sample mean or the difference between the means of two small samples when population variance is not known.
- **χ^2:** This test is based on a chi-square distribution and is used for comparing a sample variance to a theoretical population variance.
- **F-test:** This test is based on F-distribution and is also used to compare the variance of two independent samples. It is also used to compare the significance of multiple correlation coefficients.

2. Non-parametric Tests or Distribution-free Tests of Hypothesis

There are situations where assumptions cannot be made. In such situations, different statistical methods are used which are known as 'non-parametric tests'. There are various types of non-parametric tests. The important non-parametric tests are as follows:

- **Sign test:** This is one of the easiest tests in practice based on the plus/minus sign of an observation in a sample. The sign may be one of the following two types:
  - **One-sample sign test:** This is a very simple distribution-free test and is applied in case of a sample from a continuous symmetrical population, wherein the probability of a sample to be either less or more than the mean is half.

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Here, to test a null hypothesis, all those items which are greater than the alternate hypothesis are replaced by a plus sign and those which are less than the alternate hypothesis are replaced by a minus sign.

- **Two-sample sign test:** In case of all the problems consisting of paired data, two-sample sign test is used. Here, each pair of values can be replaced with a plus sign in the first value of the first sample with the first value of the second sample. If the first value is less, minus sign is assigned.

- **Fisher-Irwin test:** This is applied when there is no difference between two sets of data. In other words, it is used where you can assume that two different treatments are supposedly different in terms of the results that they produce. It is applied in all those cases where result for each item in a sample can be divided into one of the two mutually exclusive categories.
- **McNamara test:** It is applied where the data is nominal in nature, and is related to two interrelated samples. By using this test, you can judge the significance of any observed changes in the same subject.
- **Wilcoxon matched-pairs test:** This test is applied in the case of a matched-pair such as the output of two similar machines. Here, you can determine both the direction and the magnitude between the matched values. This test is also called Signed Rank Test.

1.8 SUMMARY

In this unit, you have learnt that:

- Research in common parlance refers to search for knowledge. One can also define research as a scientific and systematic search for pertinent information on a specific topic. In fact, research is an art of scientific investigation.
- Research in a technical sense is an academic activity. Clifford Woody defined research as an activity that comprises defining and redefining problems, formulating a hypothesis; collecting, organizing and evaluating data; making deductions and reaching conclusions; and carefully testing the conclusions to determine if they support the formulated hypothesis.
- The basic principles of research include a systematic process to identify a question or problem, set forth a plan of action to answer the question or resolve the problem, and meticulously collect and analyse data.
- The objective of any research is to find answers to questions through the application of scientific procedures. The main aim of any research is exploring the hidden or undiscovered truth.
- Science refers to organized knowledge, but this knowledge and these facts are seldom conclusive. New experiences and additional information constantly alter the previous findings and replace them with generalizations that confirm the latest bodies of findings.
- Research plays a very significant role in the field of social science. In order to study the importance and relationship between social science and research, social research is conducted or undertaken.

Check Your Progress

14. List two characteristics of hypothesis.
15. Why is a hypothesis tested?

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- Research that attempts to measure, describe, explain and predict the social and economic phenomena or social behaviour of human beings is known as 'social research'.
- Quantitative and qualitative are the two methods of research that are generally used by social scientists to conduct a research. In quantitative method, numerical data is collected and then analysed in order to measure the social phenomena. Qualitative method is basically the study of data, such as words, pictures and objects.
- Good research allows for research results to be verified by replicating the study, thereby building a sound basis for decisions.
- Almost all types of research primarily follow the two basic approaches depending on the need of quality and the amount of data available. These two approaches are:
  (a) quantitative approach, and (b) qualitative approach.
- Qualitative approach is concerned with the subjective assessment of human attitude, opinions and behaviour. It generates results either in non-quantitative form or in non-numerical data.
- Experimental research involves conducting tests in a simulated or real space and time. The emphasis of most experimental research is on establishing cause and effect relationships, acquiring sensitivity of the dependent factor on an independent factor, keeping other independent factors under control and finding the conditions under which reactions take place.
- Ex-post facto research is similar to experimental research, which is conducted to deal with situations that occur in or around an organization. Studies that investigate possible cause and effect relationships by observing an existing condition or state of affairs and searching back in time for probable causal factors are collectively known as 'ex-post facto research'.
- Historical research turns to history or the past to study the patterns, their impact on the present, evolutionary process and so on. In a sense most of the researches are historical in nature because it uses data and information pertaining to the past. Hence, research depends heavily on the past.
- The subject matter of sociology is society. Sociologists study man's social behaviour in a variety of contexts. They use a number of methods in social research including 'comparative method', 'participant observer method', 'community studies', etc.
- The application of scientific methods practiced in natural sciences like physics and chemistry in researching various areas in social sciences is known as the *positivist approach*.
- In order to explain human behaviour, social researchers need to be conversant with people's interpretations of social phenomena. This approach is known as *interpretivism*.
- Objectivity is the capacity to represent truthfully and without prejudice, the results of one's research. A social researcher needs to be aware of his personal biases and prejudices and take adequate care that these do not affect the objectivity of the research.
- A survey entails administering a precisely worded questionnaire to a group of people in order to determine their characteristics, opinions and behaviours.

- Fieldwork consists of many methods. The most common fieldwork is that of *participant observation*. The researcher becomes a part of the community under study; immerses himself/herself completely in the daily life of the community and participates in the activities of the members of the community but with a sense of detachment.
- Research process includes steps or a series of actions and logical sequence of those steps to carry out research effectively. The various steps in a research process are not mutually separate, exclusive or discrete, but they at the same time need not always follow each other.
- There are some common problems faced by researchers in developing countries and India is no exception. Basically, there is a dearth of the tools required for good research.
- A hypothesis is an approximate assumption that a researcher wants to test for its logical or empirical consequences. It can contain either a suggested explanation for a phenomenon or a proposal having deductive reasoning to suggest a possible interrelation between multiple phenomena.
- A hypothesis directs, monitors and controls the research efforts. It provides tentative explanations of facts and phenomena and can be tested and validated.
- Hypothesis is tested to identify the errors occurred in the statements and concepts used in hypothesis. Hypothesis testing can be broadly divided into two types, which are as follows:
  - Parametric tests or standard tests of hypothesis
  - Non-parametric tests or distribution-free tests of hypothesis

1.9 KEY TERMS

- **Research:** It is a careful investigation or enquiry, especially a thorough search for new facts in any branch of knowledge.
- **Social research:** Research that attempts to measure, describe, explain and predict the social and economic phenomena or social behaviour of human beings is known as 'social research'.
- **Ex-post facto:** It is a term used to define an action taken to change the effect given to a set of circumstances.
- **Positivist approach:** The application of scientific methods practiced in natural sciences like physics and chemistry in researching various areas in social sciences is known as the positivist approach.
- **Interpretivism:** In order to explain human behaviour, social researchers need to be conversant with people's interpretations of social phenomena. This approach is known as interpretivism.
- **Objectivity:** It is the capacity to represent truthfully and without prejudice, the results of one's research.
- **Hypothesis:** It is an approximate assumption that a researcher wants to test for its logical or empirical consequences.

1.10 ANSWERS TO 'CHECK YOUR PROGRESS'

1. Research in common parlance refers to the search of knowledge.
2. The basic principles of research include a systematic process to identify a question or problem, set forth a plan of action to answer the question or resolve the problem, and meticulously collect and analyse data.
3. Science refers to organized knowledge, but this knowledge and these facts are seldom conclusive. New experiences and additional information constantly alter the previous findings and replace them with generalizations that confirm the latest bodies of findings.
4. Research plays a very significant role in the field of social science. In order to study the importance and relationship between social science and research, social research is conducted or undertaken.
5. Almost all types of research primarily follow the two basic approaches depending on the need of quality and the amount of data available. These two approaches are:

   (a) quantitative approach, and (b) qualitative approach.
6. Historical research turns to history or the past to study the patterns, their impact on the present, evolutionary process and so on. In a sense most of the researches are historical in nature because it uses data and information pertaining to the past. Hence, research depends heavily on the past.
7. The limitations of using statistics are:
   - Statistics is not suited to the study of qualitative phenomenon but only to those things which are capable of quantitative measurement.
   - Statistics does not study individuals but deals with an aggregate of objects and group characteristics.
8. The application of scientific methods practiced in natural sciences like physics and chemistry in researching various areas in social sciences is known as the *positivist approach*.
9. Objectivity is the capacity to represent truthfully and without prejudice, the results of one's research.
10. A survey entails administering a precisely worded questionnaire to a group of people in order to determine their characteristics, opinions and behaviours.
11. The most common fieldwork is that of participant observation.
12. The two types of sampling are: probability and non-probability sampling.
13. (i) interpretation

    (ii) objective

    (iii) repetition
14. The characteristics of hypothesis are:
    - **Simplicity:** A hypothesis should be stated in the most simple and clear terms to make it understandable.
    - **Consistency:** A hypothesis should be reliable and consistent with established and known facts.
15. Hypothesis is tested to identify the errors occurred in the statements and concepts used in hypothesis.

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1.11 QUESTIONS AND EXERCISES

Short-Answer Questions

1. Give Clifford Woody's definition of research.
2. What are the objectives of scientific research?
3. Enumerate the steps in scientific process.
4. What is social research?
5. What are the qualities of good research?
6. How can the qualitative approach to research be classified?
7. What is the similarity between experimental research and ex-post facto research?
8. List the nature and scope of a good and effective research.
9. Describe the positivist and interpretivist approach to research.
10. What is a fieldwork? Describe the various methods of fieldwork.
11. State the problems faced by researchers in India.
12. What is a hypothesis? What are its sources?
13. What are the types of hypothesis testing?

Long-Answer Questions

1. Explain the meaning of the term research.
2. Discuss the concept of scientific research and the relationship between social science and research.
3. Evaluate the characteristics of good research.
4. Critically analyse the aims of social research.
5. 'Appelbaum and Chambliss (1997:40) hold that the principal methods of social research include survey and fieldwork.' With regard to this statement, assess the two types of social research.
6. Describe the major steps involved in social research.
7. What is a hypothesis? Assess the need for hypotheses formulation.

1.12 FURTHER READING

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UNIT 2 CONCEPT, THEORY AND FACT

Structure

2.0 INTRODUCTION

The previous unit dealt with the meaning, characteristics and objectives of scientific research; aims and types of social research; major steps in social research and the concept of hypothesis. In this unit, you will learn about the meaning of the terms concept, fact and theory; inductive and deductive reasoning; theory building; objectivity-subjectivity debate; and validity and reliability.

The basic elements that define scientific methods are known as concepts, yet all concepts are by and large only abstractions. Facts are logical constructions of concepts. A close relationship exists between a theory and fact where a theory is only a speculation and it has to be proved before it can be called a theory definitively. When a theory is proved, it becomes a fact.

There are various methods of scientific enquiry. The two most important ones are—deductive and inductive reasoning. Deductive reasoning is one where the researcher moves from the general to the specific part of the research. Inductive reasoning is also called the bottom-up approach. It tends to move from particular observations to wide generalizations.

There is an ongoing debate on the subject of objectivity or subjectivity of research carried out by researchers where the researchers are supposed to be unbiased and objective rather than subjective. Herein, value neutrality is the duty of sociologists to strive to be impartial and overcome their biases as they conduct their research.

Every good measuring tool must be subjected to the tests of validity, reliability and practicality. Validity means that the test must measure what it purports to measure. Reliability implies the consistency with which a test measures what it seeks to measure.

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2.1 UNIT OBJECTIVES

After going through this unit, you will be able to:

- Discuss the term concept in detail
- Evaluate the relationship between concept, fact and theory
- Discuss the function of theory building
- Assess the differences between inductive and deductive reasoning
- Analyse the debate on objectivity and subjectivity in the field of research
- Explain the concepts of validity and reliability with regard to research

2.2 CONCEPT, THEORY AND FACT: AN OVERVIEW

The basic elements that define scientific methods are known as concepts, yet all concepts are by and large only abstractions. That is to say, concepts are representative of only a part of reality. Yet, concepts should be communicative. There are many definitions of concept but there is no one clear cut definition.

There is a close relationship between concept and phenomena. A discipline may be a pure or applied science, yet each will have its terms or concepts to communicate its objectives and findings. Thus, concepts help towards the comprehension of a phenomena or such aspects which we try to understand as researchers. Concepts thus symbolize a phenomena. At times, concept and phenomena are taken together but that is not the case in reality. Students should remember that concepts are only abstractions and are not representative of the whole reality, but part of it. Therefore, it is important to know as to which concepts are required to be understood in order to further develop concepts. In cases where concepts are confused with phenomena, it can lead to error. The failure to separate concept from phenomena is called 'fallacy of ramification', i.e. believing abstractions are but phenomena in real.

Further, there are differences between concepts and facts. Concepts are symbolic of the empirical relationships whereas phenomena are in turn represented by facts. Facts thus become logical constructions of concepts and hence concepts not only define the basic scientific method but also are key to most human thoughts and communications.

This brings us to the definition of concept. Fred N. Kerlinger is of the view that, 'A concept expresses an abstraction formed by generalization from particulars.' For instance, energy, force, weight, are all concepts. Then there are concepts of achievement, failure, I.Q., which are used to understand the human nature. P. V. Young has written,

> Each new class of data, isolated from the other classes on the basis of definite characteristics, is given a name, a label—in short a concept. A concept is in reality a definition in shorthand of a class or a group of facts. Truancy, attitude, aggression, frustration, anxiety, are all illustrations of concepts into which are condensed a number of events or phenomena under one general heading.

But no concept can be easily and precisely defined. Even concepts are complex and varied, especially those concerned with human nature which are abstract and cannot be concretely defined.

There are several reasons why concepts lack clarity. One of these is due to the fact that concepts develop from shared experiences and they may be shared differently

in numerous languages and words. For example, people of different regions grow up in a different geographical location, have different tastes and work under diverse circumstances and thus they develop their own concepts out of their experiences. Hence, a precise definition of concept becomes difficult.

Concepts also develop in dissimilar frameworks since a concept is developed with certain objectives and is used only towards addressing that particular objective. With time, that concept may be used in different studies and frameworks, thereby making its exact definition difficult. For instance, the concept of mass has different conceptual understanding in physical and social sciences.

Concepts also originate in different regions and languages. For example, some have gained knowledge and have laid their foundations in the Greek language, some in Latin and some in English. Each concept founded in these languages has a background and context related to it, hence it becomes more or less difficult to use the same context in other languages.

Concepts may be used differently in the same discipline. For instance, the concept of 'function' has a different meaning in sociological theory than when used in the context of socio-economics. We understand 'function' even more differently in our day-to-day usage and it has yet other meanings in other disciplines, thus making it difficult to define it. Sometimes, a common phenomenon is defined by diverse terms and that is because they have been developed in different languages, at different times and in different regions. Thus, different terms may be used by researchers to refer to the same phenomena. Concepts are also difficult to define at times because they cannot be immediately tested empirically and are left to the judgment of the researcher. For example, the concept of social structure cannot be defined at once using empirical statistics because a groups' structure cannot be weighed and is not physically measurable.

Furthermore, concepts keep changing meanings and are developed originally in a context. As knowledge develops and research is carried forward, the meaning of concepts also changes. New knowledge adds to the new understanding of a concept and its meaning thus keeps changing. There are several levels at which concepts are developed. These are mainly two—the formal definition of concepts and the operational level of concepts. Formal definition means describing the general nature in which a concept processes while operational level means collection of data which every researcher carries out to define a concept. During the course of research, it may happen that while at the definition level a concept may appear easy, whereas it becomes complex at the operational level. For instance, Durkheim is said to have taken up the study of 'suicide', believing it was easy to define the term but during the course of research, it became difficult for him to give a definition of suicide. Also, there is no set procedure for the development of a concept which makes it difficult for researchers to attempt a definitive explanation of a concept.

There are two categories of concepts—the concepts by postulation and those by intuition. The concepts of postulation are those concepts which do not have any meaning besides the scientific theory. They have different meanings when they are used as part of two different researches; in fact, they can have dramatically different meanings and come across as binaries. A concept by intuition is one whose apprehension is made immediately. Whenever they are used, their meaning remains constant. However, both these concepts hold equal significance in social science and are not to be underestimated.

Students should remember these three features which make a good concept: First, a concept should be precise in nature; second, it should be clearly formulated and

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understandable and; third, it should not have several meanings at once and should be able to convey what it exactly was meant to explain.

Meaning of Theory

Theories are systematic statements that explain a particular segment of phenomenon by specifying certain relationships among variables.

Kerlinger has defined a theory as: '*...a set of interrelated constructs (concepts), definitions and propositions that present a systematic view of phenomena by specifying relationship among variables with the purpose of explaining and predicting the phenomena.*'

A theory can be explained on the following concepts:

- Theory is a set of interrelated concepts, definitions and propositions.
- The interrelated concepts and definitions in a theory help us to understand the phenomena in a systematic manner.
- Theory establishes a relationship among various variables in a systematic manner. With the help of this relationship, we can predict the future nature of the phenomena.
- A theory helps us to formulate a hypothesis on the basis of which future research can be based.

2.2.1 Theory and Facts

Theory and facts (data) are the two most important elements of a scientific work. Without them, a scientific work cannot exist. A theory may be defined as a set of systematically related propositions specifying causal relationships among variables. It is, thus, a statement held as explanation of facts or phenomena. A fact is something which is certain, definite and has no ambiguity. It is self-evident in itself. Facts are the data. A theory is a structure of ideas that explain and interpret facts. Goode and Hatt (1952) hold that theory and facts are interlinked. Facts have two important contributions to theory building.

- **Facts initiate theory:** A theory is made only by a systematic organization and analysis of facts. Without facts, no theory can exist.
- **Facts can lead to the rejection of existing theories and reformulation of new ones:** An existing theory must explain the new observed facts. If it fails to do so, it is reformulated or even rejected.

A theory also has important role to play in the study of facts:

(*i*) **Theory predicts facts:** Since theory is a summation of facts, it can predict facts in unobservable areas; for example, since it is known that the introduction of western technology results in a drop in death rate, we may expect the same in any region (which is not yet studied) that the introduction of western technology will produce the same results.

(*ii*) **Theory points to gaps in knowledge:** Since theory summarizes and predicts facts, it also points to areas which have not yet been explored.

An instance is Sutherland's study of criminal psychology. While reviewing the existing theories, he found that all of them dealt with crimes committed by lower-class people and not by middle-class people. The theories did not even deal with white-collar crimes. Such a gap would not have been visible if the facts were not organized into a theoretical proposition.

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Theory and fact are in constant interaction. Development in one leads to development in another. A scientific work actually depends upon a constant stimulation of facts by theory and of theory by facts.

2.2.2 Relationship between Theory and Fact

There is a close relationship between the concepts of theory and fact. For students, it may seem that the two concepts are more ambiguous than providing an understanding of differences between the two. Most often, they are seen as polarized concepts. A theory is only a speculation and it has to be proved before it can be called a theory definitively. When a theory is proved, it becomes a fact. Facts as a concept are definitive in nature; they are certain, cannot be questioned and are also self-evident. In the initial debates in the philosophy of science, the discipline of science was supposed to have been a matter of facts only, while the philosophers were seen as concerning themselves with theories. Therefore, when we refer to the concept of theory, we are mainly indicating at the accumulation of facts on any given subject which come together to form a theory. Thus, a fact is a concept which can be cross-checked or verified empirically. On the other hand, theory is the relationship between facts.

In practical and day-to-day usage of the terms, it has been seen that both the concepts are not in opposition to each other but are entwined. Theory ceases to be merely speculative on the day-to-day basis and it appears that philosophers work both within the realm of theories and facts. In science, facts may also be a concept which has been observed and made relevant to the theory while in other disciplines, like sociology, facts may be collected empirically to help support a theory. Therefore, one cannot assume that facts and theories are binary opposites; rather both are inter-related in a complex as well as in a meaningful manner.

2.2.3 Theory Building

A working theory or hypotheses serves a dual function in the sense that it may be accepted as pro tempore by researchers as it serves as a frame of reference to explore new possibilities and also the discovery of new empirical facts. A working theory is also used in the hope that it may later be accepted as a theory in itself. Thus, while a working theory can be put through deductive elaboration, it also acts as a tool of improvement upon theory construction.

Theory development is also a complex process since several modifications are made at every stage. Thus, there is no single cycle which can explain the process of theory construction, beginning with the formation of hypotheses and then its testing. This calls for several tests at each stage which leads to modification in the theoretical model and a near fresh start to the entire procedure. Thus, scientific enquiry continues as a process in itself and these recurring cycles of investigation best describe the process of theory development. A significant feature of theory development is the continuous process of factual findings and theoretical analyses wherein theory is tested and revised again and again. Besides, each test in itself raises new questions and new theoretical problems. The search for new knowledge is constant and thus, theory development continues as a process.

However, researchers can adopt methods to put a stop to modification as soon as a testing has been completed. It is methodologically useful to make a strict discrimination at all times before modifying a theory. It needs to be remembered that even a modified theory will have to be tested with the help of new materials.

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2.2.4 Inductive and Deductive Reasoning

The methods of scientific enquiry is essential and is needed in clear-cut and unambiguous forms to proceed with research. The empirical cycle will always undergo some changes at all stages but this will lead to greater precision and systematic approach to research. This empirical cycle takes shape in different phases. They are:

Phase 1: Observation: This is a method through which empirical material is collected and grouped and tentatively a hypothesis is formed.

Phase 2: Induction: This is the phase where hypothesis is formulated.

Phase 3: Deduction: Key consequences of hypotheses are derived which are in the form of testable hypotheses.

Phase 4: Testing: This is where hypotheses is tested against the available set of empirical material and it is checked whether the predictions are fulfilled or not.

Phase 5: Evaluation: In this phase, the findings of the testing procedure with regards to the theory or the hypotheses are tested and views regarding subsequent researches made.

Of key importance in this empirical cycle are the **methods of inductive and deductive reasoning**. Deductive reasoning is one where the researcher moves from the general to the specific part of the research. It is also called a kind of top-down research wherein one may begin by thinking of a theory of interest and then form a particular hypothesis. This hypothesis is then tested through collection of data and analysis is carried out to confirm or discard the original theory. The word deduction is used comprehensively because it includes both empirical specifics and derivations. Therefore, inherent to 'deduction' is the process of making concepts measureable and hypotheses testable. The whole process thus becomes operational.

Inductive reasoning is directly opposite to deductive reasoning and is also called the bottom-up approach. It tends to move from particular observations to wide generalizations. Herein, the researcher begins by having in hand some specific observations and then proceeds by seeing patterns which can be explored and tested, and finally develops conclusions and theories about the concept. Inductive reasoning is a kind of a broad, exploratory research to begin with while deductive reasoning is specific and seeks to test particular hypotheses. Social science researches can be both inductive and deductive in nature.

2.3 OBJECTIVITY-SUBJECTIVITY DEBATE

It is important for a study to be objective in nature, no matter which discipline it represents. Whether it is natural or social science's research, a study which is subjective in nature does not produce results which can be depended upon. That is because being objective in social science means being able to check and examine the evidences which the study has produced. An objective study is free from personal biases and beliefs of the researcher. Objective studies are not speculative in nature but are dominated by actual observations.

When compared with natural sciences, it is much more difficult to obtain objectivity in social sciences. This is largely because social sciences deals with humans who live in a society and pursue their own interests. Both of these are highly dynamic and their attitudes and approaches to life can change at any given time and also evolve with time. Therefore, while objectivity is important, it is difficult to obtain the same in social sciences as personal views and biases often enter the researcher's work. There are hindrances like emotional values, complex subjects, uniformity problems, self-interest, lack of time for research, and bias and prejudices. Among all these, the most severe in terms of research are prejudices and biases which can greatly affect the nature of the study. These biases can enter different stages of research, like during the collection of the sample, in the choice of the participants, during data collection, analysis and finally in the findings.

Check Your Progress

1. Define concepts.
2. What is 'fallacy of ramification'?
3. Give one reason as to why concepts lack clarity.
4. What is a theory? When does a theory become a fact?

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2.3.1 Value Neutrality

Value neutrality is the duty of sociologists to strive to be impartial and overcome their biases as they conduct their research. A researcher can easily mix his past experiences and present them as part of the present study. This leads to inclusion of subjectivity in the study. Biases can also enter during the supply of information because many times information is collected by those who may carry their own prejudices. They may present information which is suited to their needs, thus keeping the wholesome information out of reach of the researcher. All these can increasingly influence the findings of the study and mar the objectives with which it was undertaken in the first place. There are several ways by which subjectivity can be removed from research. These are, first, depending less on the investigation. This means that while data is critical to social science research, the researcher can avoid hiring other investigators and have first-hand information of the field to avoid subjectivity. Second, use of statistical measurements and methods can be made wherein data can be correlated and checked to remove subjectivity. Third, concepts and terms could be standardized to avoid multiple usage and inculcate clear and precise use to suit the views of the researcher. Fourth, the introduction of a questionnaire through which information is collected can lead to clarification and also provision of matter which can be cross-checked any time. Fifth, at various stages, the researcher can employ counter-checks and compare findings at several stages to avoid biases and prejudices from entering the study. Another method is that of random sampling with which the researcher can select participants from different shades to avoid his own prejudice that might enter the study during the collection of the sample.

2.3.2 Problems of Subjectivity and Objectivity

Qualitative methodology is familiar with the fact that the subjectivity of the researcher is a deep ingredient of his scientific research. Everything is guided by subjectivity, beginning from the choice of topic that one studies, to devising hypotheses, to selection of methodology and interpretation of data. Qualitative methodology motivates researchers to mirror the values and objectives brought by them into their research and the manner in which they influence the research project. It also motivates other researchers to replicate the values used by a particular investigator.

The most important issue that comes up when subjectivity is recognized, is its impact on objectivity. Two types of arrangements have been expressed. Many qualitative researchers make subjectivity and objectivity counterbalance each other. It is believed that objectivity negates subjectivity. The reason for this is because it makes the observer an inert recipient of external information, without an agency. The subjectivity of the researcher is said to negate the possibility of objectivity, knowing a social psychological world. The investigator's values are said to define the world that is studied. It never happens that one really sees or talks about the world, per se. However, one only sees and talks about what one's values dictate.

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Subjectivity is usually considered as the most essential and initiating part of qualitative methodology. Nevertheless, this is not true. Qualitative methodology also has traces of objectivity. Objectivity indicates that the subjectivity of a researcher can empower him to precisely understand the world in its true state. Beyond doubt, subjectivity can cause prejudice to affect the researcher and rule out objective understanding of a subject's psychological reality. However, this is not unavoidable. In the true sense, one of the benefits of getting to recognize subjectivity is to reflect on whether it makes objective comprehension easy or obstructs it. Distorting values can then be replaced by values that improve objectivity.

Objectivism puts subjectivity and objectivity together since it reasons that objective knowledge needs active, sophisticated and subjective processes like: perception, analytical reasoning, synthetic reasoning, logical deduction and the ability to differentiate essences from appearances. On the other hand, subjective processes can augment objective conception of the world.

Objectivism is the highest form of the subjects being studied as part of research methodology. It considers psychological reality as something meaningful and important which must be accurately comprehended. Subjectivism either denies a psychological reality to subjects, or else makes it unknowable. The psychology of other people is clouded by the subjectivity of the observer and is not recognized for what it (truly) is.

2.4 VALIDITY AND RELIABILITY

All researches have one common aim—to explore and find answers to questions which are scientific in nature. Therefore, it becomes reasonable to question how good the answer can be provided in the research. Validity and reliability are concepts which are used to judge if the answers to a research problem are good or bad. Validity thus is an all-encompassing concept in research which is used to find out whether the answers yielded by a study are sound in nature or not. If it seems that the answers to be given by the research will be close to the objectives of the research, then the research can be said to be valid in nature. As a concept, validity can be used to judge a research on the whole or it can be used to study one or another area of research. By using the concept of validity, students should be able to judge whether their study is valid in nature and its conclusions are sound or not. **Validity** means that the test must measure what it purports to measure. For example, if a test is a measure of speed, then speed is what that test should measure. **Reliability** implies the consistency with which a test measures what it seeks to measure.

Check Your Progress

5. Why does objectivity in social science research take an upper hand over subjectivity?
6. How do biases enter during the supply of information while conducting a research?
7. What is the highest form of the subjects being studied as part of research methodology?

Reliability is a constituting part of the concept of validity. In essence, reliability is the degree of random variation in the results of a study. When a study produces highly unreliable results, a study is said to be invalid. For instance, in a study, if results indicate high I.Q. levels and low I.Q. levels of a same child at different times during the study, the results can be said to be unreliable and the study using the test to be invalid.

There are two key sub-concepts of validity that can be used for research as a whole. One of these is construct or external validity. It can often happen that while a researcher may have tried to make the study absolutely accurate and error-free, it cannot be applied to the original research questions. For instance, the I.Q. tests of children of one country, say India, may be inapplicable to measure the intellectual capacity of children of other countries or cultures. Similarly, the sexual practices of people of one culture may not be suitably indicative of those people of a different culture. All these may yield a research externally invalid.

A research may also be called invalid when the procedures internal to it become invalid. For instance, a study proposes to find out the effects of early stair-climbing on a group of infants. This will remain invalid unless the results are not compared with those groups of infants which start climbing stairs late as compared to the previous group or those who obtain no training in this regard. This may help in making a comparison between the two groups; show the effects of training for stair-climbing, wherein it may eventually be found that it has no long-term benefit and untrained infants tend to catch up soon with their trained counterparts.

One of the causes why a study becomes unreliable and often a cause of invalidity is the selection of a small sample of participants. For instance, a sample of ten people used to find out the voting patterns in a general election of a country is likely to be highly unrepresentative because all different samples which will have ten participants will yield different answers to the research questions.

Different elements which constitute a study may be called as invalid or valid or reliable or unreliable. We will now look at the operative definitions of all these parts of the studies. Whenever a particular set of conditions of a study, that is, the measuring device or a definition, gives the same output as the input, it is called reliable. Reliability can also be identified as consistency or repeatability and it may be applied either to definitions in use or measuring devices. An operational definition can be called very reliable when its application produces the same results every time. This can be thought of as a weighing scale which is considered reliable if it gives the same weight every time an iron bar is placed upon it. Or, an I.Q. test is considered reliable if participants score the same score every time they are tested. However, it might be easy to check whether the weighing scale is reliable by simply placing the same iron bar on it. But it may be difficult to check the reliability of an I.Q. test because the same participants may give better answers in the second round of the test. This can be rectified by dividing the I.Q. test itself into two halves and check whether the scores of the two tests are similar or not.

Many times operational definitions or measurements may turn out to be invalid even though they may be reliable initially. They may lack validity and therefore, a definition can be said to be valid only when it is able to classify what the researcher wants to classify. For instance, an I.Q. test can only be said to be valid when it is able to measure the success of students in future because this is what was intended for its development. A poll conducted before the elections is considered valid only if it is able to pick out the poll winner. In the hindsight, there can be no one rule for deciding whether an operational definition may be valid or not. The decision lies in the judgment of the researcher. The validity has to match with the objectives of the study and this can be used as one of the rules to check the validity of the operational definition. Also, the researcher can think of the factors that the readers of the study will have in mind when its objectives are being detailed to them.

2.4.1 Tests of Validity

A simple way to determine validity is to ask the question: Is one measuring what is being thought that the test is measuring? Another way to determine the validity of a test is the accuracy with which specific predictions can be made from the test scores. This is determined by comparing the scores obtained with some external test scores as standard.

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This means one can assess the individual's present status or predict his/her future status with respect to some type of functioning. This comparison with other relevant evidence is one of the better ways of establishing the validity of an instrument.

Types of Validity

1. **Content validity:** This implies the extent to which the measuring instrument has covered adequately all the aspects of the topic that is to be measured. If the measure includes a representative sample of the population, then the content validity would be assumed to be good. This can be determined by a panel of judges who evaluate the contents of an instrument for yielding the measures the tool is intended to measure. Another way of establishing the content validity is intuitive judgments involving the theme of the measuring tool.
2. **Criterion-based validity:** Here the success of the measuring instrument is determined by the ability of the scores obtained to predict some outcomes of a current condition. For example, those who train hard can be predicted to be winners. The extent of training can thus be reflected in the number of winners.
3. **Predictive validity:** The test must be useful in predicting some future performance from present measures. This is known as predictive validity.
4. **Construct validity:** This involves finding out if the individual possesses a trait or a characteristic. The degree of the existence of this trait is also of interest to the assessor. This is the construct on which a test rests; for example: anxiety, intelligence, etc. So, the instrument is validated against the construct. The greater the ability of the instrument measuring the construct, the higher will be the validity of the tool.
5. **Pragmatic validity:** This refers to the usefulness of an instrument as an indicator or as predictor of some behaviour in the future. So, the validity of a measure rises from this ability of the tool. Under this approach to validity, two sub-types are included:
   - *Concurrent validity:* This seeks to see how closely the scores relate to other known measures of validity.
   - *Predictive validity:* Here the object of the scores is to predict the future situation/behaviours on the basis of the scores obtained from the tool, at the present.

If these criteria are met by a tool used for measurement, then the instrument is thought to be valid. The measures obtained from such a tool can be viewed as a correct estimate of the feature under assessment.

2.4.2 Tests of Reliability

The test of reliability of a measuring device is its ability to yield consistent results from one set of measures to another.

A valid instrument is always reliable

A reliable instrument is not always a valid one. For example, a machine may consistently under weigh objects by 2 kg. It is a *reliable* machine, but it is not *valid* as a good measure of weight.

If an instrument is reliable, then temporary and extraneous factors would not affect the measures obtained.

There are two aspects to reliability. These are:

- **Stability:** The extent to which consistent results are obtained with repeated measurements with the same instrument on the same individual. A measure of stability is obtained by comparing the results of repeated measurements.
- **Equivalence:** This is estimated by comparing the measures obtained by two assessors on the same aspect/situation or individual.

Reliability can be enhanced by three procedures. These are:

- By standardizing the conditions under which measurements are made. Here, all extraneous factors can be kept under control.
- By systematizing the directions for measurement.
- By training personnel suitably, e.g., technicians who are trained for measuring blood pressure. Also, having larger samples from the person on whom the measurement is done.

Types of Reliability

There are three common methods of estimating reliability:

- Retest reliability
- Internal consistency reliability
- Parallel forms/or alternate forms/or equivalent forms. Here, a single form of the test is administered twice on the same sample with a reasonable time gap.

1. **Retest reliability:** Two measures yield independent sets of scores. The two scores when correlated would give the value of the reliability coefficient. Such a coefficient is also known as the **temporal stability coefficient**. This means how far the examinees retain their relative position as measured in terms of test scores over a given period of time. The ideal time gap between the two administrations is about fifteen days.
2. **Internal consistency reliability:** This indicates the homogeneity of the test. If all the items of a test measure the same function or trait, then the test is seen to be homogeneous and the internal consistency would be high. The most common way of determining internal consistency reliability is by the split-half method. Here the items to be tested are divided into two equal or nearly equal halves. Another way to split a test is by using the odd and even numbered items. This method is preferred to the regular split-half method because in a power test, the first half would normally be made up of the easier items while the second half would have the tougher items. The odd numbers 1, 3, 5, 7, 9 and so on and even numbers 4, 6, 8, and so on would balance the items. Each examiner would receive two scores, i.e., the scores of the odd and those of the even numbers of a given test. Thus, from a single administration of the same test, two sets of scores are generated. A 'product moment correlation' is computed to obtain the reliability of the half test. On the basis of the reliability of this half test, the reliability of the whole test is estimated. The Spearman/Brown formula is used for estimating the reliability of the whole test.

This is a useful method as it eliminates two administrations of the same test. A quick estimate of reliability is possible. This is a kind of on-the-spot reliability measure. The demerit of this method is that it cannot be used for power tests.

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The Kuder–Richardson formula is used for determining the reliability coefficient in a test where the terms are scored as 0 or 1 or (right or wrong). This estimates the coefficient alpha which yields a measure of internal consistency.

3. **Alternate forms reliability:** These are also known as parallel forms or equivalent forms or comparable forms reliability. This requires that the test be developed in two forms which are comparable or equivalent. Two forms of the test are administered to the same sample either immediately the same day or in a time interval of a fortnight. When the reliability is calculated on the basis of data obtained from the two administrations of the test, it is the alternate form reliability. Pearson coefficient (r) between two sets of scores obtained from two equivalent forms becomes the measure of reliability. Such a coefficient is known as the **coefficient of equivalence**. Alternate forms reliability measures the consistency of the examinee's scores between two administrations of parallel forms of a single test.

   The biggest problem with this procedure is making the two forms of a test, truly equivalent.

   Criteria for judging whether the forms are parallel are:

   - The number of items in both the form should be same.
   - The item-difficulty levels in both the forms should be similar.
   - Mode of administration of both forms should be the same.

4. **Scorer reliability:** This kind of reliability is important in tests of creativity, projective tests, etc. This is the reliability which can be estimated by having a sample of test independently scored by two or more examiners. The two sets of scores obtained by each examiner are completed and the resulting correlation coefficient is known as scorer reliability.

Test–Retest reliability, internal consistency reliability, and parallel forms reliability all express reliability in terms of the correlation coefficient.

2.5 SUMMARY

In this unit, you have learnt that:

- The basic elements that define scientific methods are known as concepts, yet all concepts are by and large only abstractions. That is to say, concepts are representative of only a part of reality.
- There is a close relationship between concept and phenomena. A discipline may be a pure or applied science, yet each will have its terms or concepts to communicate its objectives and findings. Thus, concepts help towards the comprehension of a phenomena or such aspects which we try to understand as researchers. Concepts thus symbolize a phenomena.
- The failure to separate concept from phenomena is called 'Fallacy of Ramification', i.e. believing abstractions are but phenomena in real.
- There are differences between concepts and facts. Concepts are symbolic of the empirical relationships and phenomena are in turn represented by facts. Facts thus become logical constructions of concepts and hence concepts not only define the basic scientific method but also are key to most human thoughts and communications.

Check Your Progress

8. Define reliability.
9. What is predictive validity?
10. List the three common methods of estimating reliability.

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- There are several reasons why concepts lack clarity. One of these is due to the fact that concepts develop from shared experiences and they may be shared differently in numerous languages and words.
- Concepts also develop in dissimilar frameworks since a concept is developed with certain objectives and is used only towards addressing that particular objective. With time, that concept may be used in different studies and frameworks, thereby making its exact definition difficult.
- There are two categories of concepts—the concepts by postulation and those by intuition. The concepts of postulation are those concepts which do not have any meaning besides the scientific theory.
- There is a close relationship between the concepts of theory and fact. For the students, it may seem that the two concepts are more ambiguous than providing an understanding of differences between the two.
- A theory is only a speculation and it has to be proved before it can be called a theory definitively. When a theory is proved, it becomes a fact.
- A working theory or hypotheses serves a dual function in the sense that it may be accepted as pro tempore by researchers as it serves as a frame of reference to explore new possibilities and also the discovery of new empirical facts.
- A significant feature of theory development is the continuous process of factual findings and theoretical analyses wherein theory is tested and revised again and again.
- Deductive reasoning is one where the researcher moves from the general to the specific part of the research. It is also called a kind of top-down research wherein one may begin by thinking of a theory of interest and then form a particular hypotheses.
- Inductive reasoning is directly opposite to deductive reasoning and is also called the bottom-up approach. It tends to move from particular observations to wide generalizations.
- It is important for a study to be objective in nature, no matter which discipline it represents. Whether it is natural or social science's research, a study which is subjective in nature does not produce results which can be depended upon.
- When compared with natural sciences, it is much more difficult to obtain objectivity in social sciences. This is largely because social sciences deals with humans who live in a society and pursue their own interests. Both of these are highly dynamic and their attitudes and approaches to life can change at any given time and also evolve with time.
- Objectivism puts subjectivity and objectivity together since it reasons that objective knowledge needs active, sophisticated and subjective processes like: perception, analytical reasoning, synthetic reasoning, logical deduction and the ability to differentiate essences from appearances.
- All researches have one common aim—to explore and find answers to questions which are scientific in nature. Therefore, it becomes reasonable to question how good the answer can be provided in the research. Validity and reliability are concepts which are used to judge if the answers to a research problem are good or bad.
- One of the causes why a study becomes unreliable and often a cause of invalidity is the selection of a small sample of participants.
- The test must be useful in predicting some future performance from present measures. This is known as predictive validity.

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- The Kuder–Richardson formula is used for determining the reliability coefficient in a test where the terms are scored as 0 or 1 or (right or wrong). This estimates the coefficient alpha which yields a measure of internal consistency.

2.6 KEY TERMS

- **Concepts:** The basic elements that define scientific methods are known as concepts.
- **Fallacy of ramification:** The failure to separate concept from phenomena is called 'fallacy of ramification', i.e. believing abstractions are but phenomena in real.
- **Deductive reasoning:** It is one where the researcher moves from the general to the specific part of the research.
- **Value neutrality:** It is the duty of sociologists to strive to be impartial and overcome their biases as they conduct their research.
- **Validity:** It means that the test must measure what it purports to measure.
- **Reliability:** It implies the consistency with which a test measures what it seeks to measure.
- **Predictive validity:** The research must be useful in predicting some future performance from present measures. This is known as predictive validity.
- **Pragmatic validity:** This refers to the usefulness of an instrument as an indicator or as predictor of some behaviour in the future.

2.7 ANSWERS TO 'CHECK YOUR PROGRESS'

1. The basic elements that define scientific methods are known as concepts.
2. The failure to separate concept from phenomena is called 'Fallacy of Ramification', i.e. believing abstractions are but phenomena in real.
3. There are several reasons why concepts lack clarity. One of these is due to the fact that concepts develop from shared experiences and they may be shared differently in numerous languages and words.
4. A theory is only a speculation and it has to be proved before it can be called a theory definitively. When a theory is proved, it becomes a fact.
5. Being objective in social science means being able to check and examine the evidences which the study has produced. An objective study is free from personal biases and beliefs of the researcher. Objective studies are not speculative in nature but are dominated by actual observations.
6. Biases can also enter during the supply of information because many times information is collected by those who may carry their own prejudices. They may present information which is suited to their needs, thus keeping the wholesome information out of reach of the researcher.
7. Objectivism is the highest form of the subjects being studied as part of research methodology.
8. Reliability implies the consistency with which a test measures what it seeks to measure.
9. Research must be useful in predicting some future performance from present measures. This is known as predictive validity.
10. There are three common methods of estimating reliability:
    - Retest reliability
    - Internal consistency reliability
    - Parallel forms/or alternate forms/or equivalent forms

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2.8 QUESTIONS AND EXERCISES

Short-Answer Questions

1. 'Concepts symbolize a phenomena.' With reference to this statement, describe the relationship between concept and phenomena.
2. Differentiate between concepts and facts.
3. What are the levels at which concepts are developed?
4. List the two categories of concepts.
5. What is the relationship between theory and fact?
6. Differentiate between deductive and inductive reasoning.
7. State the various ways by which subjectivity can be removed from research.
8. What is value neutrality?
9. What is validity? What are its types?
10. What is reliability? What are the tests of reliability?

Long-Answer Questions

1. Discuss the term concept in detail.
2. Evaluate the relationship between concept, fact and theory. Also, discuss the function of theory building.
3. Assess the differences between inductive and deductive reasoning.
4. Critically analyse the debate on objectivity and subjectivity in the field of research.
5. Explain the concepts of validity and reliability with regard to research.

2.9 FURTHER READING

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UNIT 3 RESEARCH DESIGN AND SAMPLING

Structure

3.0 INTRODUCTION

A research design is a conceptual framework for conducting research. It is a blueprint for collecting, measuring and analysing data. There are several types of research designs depending on the type of research study being conducted. The quality of a good research design depends on the extent of its flexibility, efficiency and economy. Research design is also determined by adhering to certain basic principles of research design, such as the randomization principle and the local control principle. It involves the technique of determining the methods of data collection and the ways in which the research work should be performed, giving due consideration to time and cost constraints. A research design is a predefined part of a research study. It is a statement that clearly defines the problem for which the research is being done.

The main aim of research is to discover principles that have universal application. Generally, research in education includes all such assumptions that are based on a large number of samples/units/objects. It would be impractical if not impossible to test or observe each unit of population under controlled conditions in order to arrive at principles having universal validity. A 'population' is any group of individuals/units that have one or more characteristics in common which are of interest to the researcher, for a particular research. A 'sample' is a small percentage of the larger group who are selected for research. A sample can be statistically explained as being a subset of a population. The sample will be able to give an idea of the characteristics of the larger group from where

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it has been drawn. It is possible to make deductions about the larger population on the basis of the sample.

For selecting a sample, it is necessary to have a sampling frame. After defining a population and listing all the units, a researcher selects a sample of units from the sampling frame. Sampling design refers to a definite plan for obtaining a sample from the sampling frame. It refers to the technique or procedure, which a researcher adopts in selecting some sampling units from where inferences about population are drawn. An error in statistics is the difference between the value of a statistic and that of the corresponding parameter. These errors arise due to chance differences between the members of population included in the sample and those not included. This unit discusses the concept of research design, sample, methods of sampling, sampling design and sampling errors.

3.1 UNIT OBJECTIVES

After going through this unit, you will be able to:

- Discuss the concept of research design and its features
- Explain the important concepts related to a research design
- Evaluate the types of research design
- Assess the sampling method of samples in research
- Explain the types of sampling
- Analyse the concept of sampling errors and the effect of biasness on a research programme

3.2 RESEARCH DESIGN

Research design is a structure that gives an outline of the overall research work. It is the result of better planning and implementation of a good strategy. Different authors have given different definitions of a research design. According to Kerlinger, research design is the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to control variance. Bernard Phillips defines research design as the blueprint for collection, measurement and analysis of data.

The decisions that you need to take to formulate a research design should be based on the following questions:

- What is the research all about?
- Why is the research being conducted ?
- What kind of data is required for the research?
- From where can the data be obtained?
- How much time will the research take?
- What is a sample research design?
- How should the data be analysed?
- What is the style of report preparation?

A research design helps a researcher to organize ideas and check for flaws and inadequacies in the collected data. It involves the following elements:

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- A statement that clearly defines the problem for which the research is being done.
- Procedures and techniques for gathering the information required for research design.
- Methods that need to be implemented for processing and analysing the data required for research design.

The overall research design can be divided into the following four parts:

(i) **Sampling part:** It includes the method of selecting items that are to be observed for the research study.

(ii) **Observational part:** It includes the conditions under which you need to make observations.

(iii) **Statistical part:** It is based on the number of items that need to be observed and the analysis technique to be used for the analysis of gathered data.

(iv) **Operational part:** It involves the techniques that help to implement the items specified in the sampling, statistical and observational designs.

Need for a Research Design

Before starting the research process, the formulation of an efficient and appropriate research design is important. A research design is significant as it has the following advantages:

- It helps in the smooth functioning of various research operations.
- It requires less effort, time and money.
- It helps to decide the methods and techniques to be used for collecting and analysing data.

The researcher needs to consider the following factors before creating a research design:

- Source of the information
- Skills of the researcher and his coordinating staff
- Problem objectives
- Nature of the problem
- Availability of time and money for the research work

Features of a Good Research Design

A good research design is characterized by flexibility, efficiency and low cost, but it has many other features too. On the basis of the description of the design, a research design has the following features:

- It states the sources and types of information required for solving the problem for which the research is being carried out.
- It is a strategy for indicating the approach to be adopted for gathering and analysing data.
- It includes performing research work according to time and budget constraints.
- It minimizes preconception and maximizes the reliability of collected and analysed data.
- It minimizes experimental errors in an investigation.
- It provides various aspects for dealing with a problem.

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A research design depends to a large extent on the type of research study that you are conducting. If the research study is exploratory, then major emphasis is on the discovery of ideas. So, a research design should be flexible to implement the different aspects of a phenomenon. However, when the purpose is to obtain an accurate description of a research study, the design that maximizes reliability of the collected data is considered to be a good design. The availability of time, money, skills of the research staff and the method of obtaining information must be considered while creating experimental design, survey design and sample design.

Steps in Research Designing

The steps in a research design primarily depend on the type of research being conducted. The steps involved in a research process are as follows:

- Preparing the research question or problem
- Assessing the available literature
- Creating hypotheses
- Constructing the research design
- Collecting data
- Analysing the data
- Interpreting the results
- Writing the research report

The fourth step, i.e., constructing the research design, involves three subordinate steps, which include the process of creating a research design. The three subordinate steps can further be explained as follows:

- **Identifying variables:** This involves identifying the variables to be studied and determining their types. The most common types of variables are dependent, independent, controlled and other variables. Dependent variables are items such as responses of subjects and outcomes of survey or criterion variables. Independent variables, on the other hand, are those, which are explanatory or predictor variables.
- **Formulating functional definitions:** Here, the researcher explores the possibilities and the ways in which the variables can be operationalized.
- **Selecting design for data analysis:** This is the preliminary step of data collection, and hence, involves determination of what design option to choose for analysing the data being collected.

3.2.1 Important Concepts Related to a Research Design

There are several important concepts related to research design that helps in understanding the use and control of the variables involved in the research. The various concepts related to research design are:

- **Dependent and independent variables:** Variables involved in research can take different quantitative values. For example, variables like weight, height, income can take different quantitative values. A dependent variable depends on other variables or is the result of some variable. Whereas, the variable that is antecedent to the dependent variable is known as an independent variable. For example, if weight is dependent on age, then weight is a dependent variable and age is an independent variable.

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- **Extraneous variables:** Independent variables that are not a part of research, but still affect the dependent variables are known as extraneous variables. For example, if a researcher identified that a relationship exists between a student's self-concept and achieved marks in a particular subject, then self-concept is an independent variable and achieved marks is a dependent variable. Intelligence may affect the achieved marks in a particular subject, however it is not related with the study undertaken. So, intelligence may be termed as an extraneous variable.
- **Control:** It is used to minimize the effect of extraneous variables, and in experimental research, it is used to restrain the experimental conditions. A good research design should minimise the effect of extraneous variables.
- **Confounded relationship:** When extraneous variables affect dependent variables, the relationship between the dependent and independent variables is known to be confounded by the extraneous variable.
- **Research hypothesis:** When scientific methods are used to test a prediction or hypothesised relationship, then it is known as research hypothesis. This study must contain at least one dependent and one independent variable.
- **Experimental and non-experimental hypothesis-testing research:** When testing the research hypothesis is the main purpose of research, then it is known as hypothesis-testing research. Research done for independent variables is known as experimental hypothesis-testing research, and research in which dependent variables are used is known as non-experimental hypothesis-testing research.
- **Experimental and control groups:** In an experimental hypothesis-testing research, when a group is represented for standard conditions of research design, then it is known as control group. Whereas, when a group is represented for some specific conditions, it is known as the experimental group.
- **Treatments:** When the experimental and control groups are tested under different conditions, then it is known as treatments. For example, if you need to check the quality and impact of three fertilizers on the yield of a crop, then the fertilizers will be referred to as three treatments.
- **Experiment:** Experimentation is the process of examining and verifying the hypothesis related to some research problem. An experiment can be absolute experimentation or comparative experimentation. For example, if you need to test the impact of fertilizers on the yield of a crop, then it is absolute experimentation, whereas when you need to test the impact of one fertilizer as compared to other fertilizer, then it is known as comparative experiment.
- **Experimental unit:** It is the pre-determined block where different treatments are used for research. Therefore, experimental units should be selected carefully.

3.2.2 Basic Principles of Research Design

A research design is always based on some principle. Ronald A. Fisher has classified three basic principles of research design, which are:

- Replication
- Randomization
- Local control

1. **Replication principle:** In this principle, an experiment is repeated more than once, thereby, applying each action in more than one experimental unit. For example, to examine two varieties of flowers, one needs to divide the varieties of flowers in two parts. First variety is grown in one part and the second in another part, and then a conclusion is drawn. This application can be done repeatedly in several parts of the field. The result obtained after applying this principle is more reliable than without applying the replication principle. Thus, this principle increases the accuracy with which its main effects and interactions can be estimated. The main disadvantage of the replication principle is the computational problem.
2. **Randomization principle:** The randomization principle protects the research design from extraneous factors while conducting an experiment. It indicates that the experiment must be designed or planned in such a way that unrelated factors can be included as possibilities. For example, if we grow one variety of flowers in the first part of a field and another variety in the second part, then there is a possibility that soil fertility of both parts of the field may be different. In such a situation, the result may not be realistic, therefore, the randomization principle should be applied, by giving the result based on some random sampling technique. This principle estimates the experimental errors in the research work in a better way.
3. **Local control principle:** It is also an important principle in which extraneous factors are measured and then eliminated from the experimental error. The experiment is planned in such a manner that a two-way analysis of variance can be performed. For example, to apply the control principle, the field should be divided into several blocks. Each block is first divided into parts equal to the number of treatments and then the treatments are randomly assigned to these parts. In each block, the extraneous factors are fixed to measure the variability, which is caused in the two-way analysis of variance. The variability due to extraneous factors can be eliminated from the experimental error using the local control principle.

3.3 TYPES OF RESEARCH DESIGN

Several research designs are classified on the basis of the study performed in the research. These research designs can be listed as follows:

- Research design in exploratory research studies
- Research design in descriptive studies
- Research design in quantitative studies
- Research design in qualitative studies
- Research design in experimental research studies

3.3.1 Exploratory Research Design

Exploratory research design is also known as formulative research design. In this research design, a specific subject is investigated. It helps in generating a set of hypotheses or research-based questions that can be used at a later stage. The three methods that are applied for explorative research studies are as follows:

- **Surveying the literature:** It is the simplest method for formulating the research problem in which along with new literature, previous hypotheses are reviewed and evaluated for future research.
- **Experience survey:** It is a type of research that involves practically experienced persons in the research work. For such a survey, people with more innovative ideas are carefully selected as respondents and then the investigators interview the respondents. Thus, experience survey enables the researcher to concisely define the problem. This survey also provides information about the practical possibilities for different research works.
- **Analysis of insight-stimulating examples:** It includes an intensive study of selected instances of a phenomenon. In this method, the attitude of the investigator, intensity of study and ability of the researcher are required to unify the diverse information of the problem.

Thus, in exploratory research study, the applied method needs to be flexible, regardless of the type of the method, so that the different aspects of the problem can be considered. In exploratory research design, the following considerations are kept in mind:

- A small sample size is used.
- The data requirements are unclear.
- General objectives are considered, rather than specific objectives.
- No definite suggestions are made after research analysis.

3.3.2 Descriptive Research Design

A descriptive research study describes the characteristics of a particular problem or an individual or a group. Descriptive studies include specific predictions concerned with the study, facts and characteristics of an individual, a group or situations. Most of the social research is based on descriptive research studies. In descriptive studies, the questions related to 'what', 'why', 'where' and 'who' needs to be answered.

The following steps must be followed while designing a descriptive study:

- **Formulating the objectives of the study:** This step specifies the objectives to ensure that the collected data is related to the study, otherwise the research will not provide the desired result.
- **Designing the data collection methods:** This step helps to select the method, that is, observation, questionnaires, interview or examination of records, for collecting the data.
- **Processing and analysing the data:** The data collected for research study must be processed and analysed. This includes analysing the data collected through interviews and observations, tabulating the data and performing statistical computations.
- **Reporting the researched data:** For reporting the findings, the layout should be well planned, and presented in a simple and effective style.

In descriptive studies, the following considerations should be kept in mind:

- The phenomenon under study should be described.
- The data may be related to the behavioural variables of the respondent.
- The recommendations are definite.
- The objectives should be specific, data requirements should be clear and large samples should be used.

3.3.3 Diagnostic/Conclusive Research Design

A conclusive research design is more structured and formal than an exploratory research design. It is based on large representative samples, and the data obtained is subjected

Check Your Progress

1. What is a research design?
2. List the advantages of a research design.
3. How has Fisher classified the principles of research design?

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to quantitative analysis. The aim of conclusive research is to examine specific relationships and test specific hypotheses. To achieve these objectives, the researcher needs to clearly specify the required information. In this research, the findings are considered to be conclusive in nature as they are used as inputs for managerial decision-making. The two categories of conclusive research designs are descriptive and causal. Descriptive research designs can further be either cross-sectional or longitudinal.

This design requires a clear specification of 'when', 'where', 'who', 'what', 'why', and 'how' of the research. Its main purpose is to describe the characteristics or the function of the research. Some of the conditions in which this research can be recommended are:

- To make a specific forecast
- Discovery of associations among variables
- Estimates of the proportions of a population that have some specific characteristics
- To describe the characteristics of product, group, organization or market.

Unlike exploratory research, the descriptive research design is marked by a specific hypotheses, clear statement of the problem, and detailed information needs. Generally, descriptive research follows surveys, panels, secondary data analysis and observation methods and can be classified into cross-sectional and longitudinal research.

Cross-sectional research: This is the most frequently used research design in business research and involves information collection from a given sample of population elements, and that too only once. They may be either *multiple cross-sectional* or *single cross-sectional*. In single cross-sectional designs, only one sample of respondents is drawn from the target population, and the information from this sample is obtained only once. This design is also referred to as sample survey research design.

In multiple cross-sectional design, there are two or more samples of respondents, and the information from each of the sample is obtained only once. Often, information from different samples is obtained at different times over long intervals. Multiple cross-sectional designs allow comparisons at the aggregate level but not at the individual respondent level. Because a different sample is taken each time a survey is conducted, there is no way to compare the measures on an individual respondent across surveys. One of the special interest, multiple cross-sectional design is cohort analysis, which consists of a series of surveys conducted at appropriate time intervals, where the cohort serves as the basic unit of analysis. A group of respondents who experience the same event within the same time interval is referred to as a 'cohort'.

Longitudinal research design: Unlike cross-sectional research design, a fixed sample(s) of population elements is measured repeatedly on the same variable. In other words, the same objects are studied over time and the same variables are measured. In contrast to the cross-sectional design, which provides a snapshot of the variables of interest at a single point in time, a longitudinal study gives a series of pictures that provide an in-depth view of the situation and the changes that have taken place over time. Sometimes, the term panel is used interchangeably with the term longitudinal design. A panel consists of a sample of respondents who have agreed upon giving information at specific intervals over an extended period.

Causal research design: This research design is used to obtain the evidence of cause-and-effect (causal) relationships. Like descriptive research design, causal research design also requires a plan and structure and is most appropriate for the following purposes:

- To understand cause (independent) variables and effect (dependent) variables of the phenomenon
- To determine the nature of the relationship between cause and effect variables to make predictions about the effect

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In this design, causal (independent) variables are manipulated in a relatively controlled environment, in which the other variables that may affect the dependent variable are controlled or checked as much as possible. The effect of this manipulation on one or more dependent variables is then measured to infer causality. The main method of causal research is experimentation.

3.3.4 Experimental Research Design

Experimental research design is usually applicable when we are determining the cause and effect relationship or deriving the cause and effect inferences in any experimental research study. Experimental research design is instrumental in answering some of the important psychological questions that are based on the concept of what causes what.

The objective of experimental research design is to establish the cause and effect relationship between variables. The four types of variables related to experimental research design are as follows:

- **Independent variables:** These signify conditions or measures in the experimental design that can be changed.
- **Dependent variables:** These variables can be measured and signify the effect or result in the experimental design.
- **Control variables:** Control variables are those which remain constant in the experimental design.
- **Random variables:** Random variables are those which can vary their values in different conditions in the experimental design.

There are many variations in experimental designs, which are created to achieve different results and resolve different problems. We can define the simplest form of experimental design by creating two similar groups, which are equivalent to each other in all respects, except for the fact that one group will receive the treatment and another group will not receive the treatment. The group that receives the treatment can be termed as the treatment group and the group that does not receive the treatment can be termed as the comparison or control group.

The formation of two similar groups that are equivalent to each other is ensured by randomly assigning people or participants into two groups from a common pool of people or participants. The success of the experiment is based on the concept of random assignment of people into two groups. However, as two people can never be exactly similar, in the experimental design, we refer to the idea of probability and say that two groups are probabilistically equivalent or equivalent in the probabilistic ranges.

The randomized assignment of participants in an experiment helps in validating the experimental design. Validating the experimental design ensures that the outcome of an experiment is accurate and right. Validating an experimental design includes two factors:

- Internal validity of experimental design
- External validity of experimental design

Prior to validating the experimental design, the reliability of the experimental design should also be established. The reliability of an experiment can be verified by checking if the same result is obtained by repeating the experiment a few more times.

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Internal validity of experimental design: Internal validity refers to the accurate or true value in an experimental design. It helps in checking if the change in the values of independent variables affects the value of dependent variable. This means, checking whether the alternative hypotheses have been removed. Internal validation also answers whether the experimental research design leads to the true statements or not. Internal validity is the focal point for the cause and effect relationships in the experimental designs. It is useful to determine if a research method will lead to an output or the condition where an output would occur. This can be explained by the following proposition:

- If *X* is given, then *Y* will happen or
- If the treatment is introduced, then the outcome will occur

As there may be other factors other than the treatment, which might have led to the occurrence of outcome, it has to be ensured that the occurrence of output is dependent on the introduction of the treatment and not on any external factors present in the experimental design. Therefore, a cause and effect relationship can be shown with the following two propositions:

- If *X* is given, then *Y* will happen or
  If the treatment is introduced, then the outcome will occur
- If *X* is not given, then *Y* will not happen or
  If the treatment is not introduced, then the outcome will not occur.

With these two propositions, the programme can be isolated in an experimental design from any external factor that might cause the output. This validation ensures the causal effectiveness of the experimental design, which implies that if the treatment is introduced, outcome occurs and if it is not introduced, outcome will not occur.

External validity of experimental design: External validity refers to the assessment of the generalized manner of the experimental design. This means, validating the common applicability of result or outcome of the experimental design in the real world. Generally, the experimental designs are difficult to carry out in the real world, as they tend to invade the personal lives of people. Due to this, artificial conditions are set up so that the reliability and validity of the causal relationships can be determined. Therefore, to ensure internal validity in an experimental design, the general application of the result in the context of real world has to be limited. This implies that the external validity has to be minimised to attain internal validity in an experimental design.

Feasibility of Experimental Design

The success of any experimental design is based on its feasibility or viability, which will prove the outcome of research study to be powerful and accurate. However, in most of the scenarios, the research study involves the subjects related to human behaviour or social sciences, which might hamper the progress of research study. Also, other factors like time and conditions should be taken care of while gathering information, as they contribute to less than perfect situation for the research study.

The feasibility of an experimental design can be ensured by the following two approaches:

- The confounding variables, as many as possible, should be controlled to remove or lower the errors that might occur while making the assumptions.
- All the possible threats to external or internal validity should be neutralized.

Controlling the confounding variables

The confounding variables should be addressed and controlled in any experimental research and experimental design to ensure accurate information. The confounding variables can be controlled by using the randomization technique or by implementing the pre-testing and post-testing methods on both the treatment and control groups. This controlling process helps in ensuring valid results, both internally and externally.

Controlling the threats to external and internal validity

External validity applies to such situations, where the outcome of the research and experimental designs are observed in the real world in a generalized manner. Whereas, internal validity applies to the experimental situations. The importance of external and internal validity can be understood by the concept of the common saying—garbage in, garbage out. This implies that if we start working on a design with errors, the result of the design will also contain errors. Therefore, the threats to the external and internal validity should be controlled to ensure accurate and desired results.

The feasibility of an experimental design is essential for its success. The success of an experimental design mainly includes generalization of experimental design in the real world. However, the level of controlling of the confounding variables and threats to external and internal validity may affect the generalized nature of the experimental design. As the level of controlling increases for any design, the level of difficulty for performing the research study on that design also increases.

Hypothesis of Experimental Design

While working on an experimental design, various hypotheses are considered at different stages of the experimental research study. The experimental research begins with identifying the outcome of the experimental research, which is called 'research hypothesis'. This implies that there is an effect and this effect is due to the independent variables. You may also consider the possibility that there is no effect of independent variables on the dependent variables and that the variations in the result are due to the unknown and uncontrollable factors. The first step in the experimental research is to eliminate the unknown and uncontrollable factors or null hypothesis. This will help in gaining confidence in the research hypothesis.

If there is a change in the result of experimental research and that change is not due to the unknown and uncontrollable factors, then the change may be due to the independent variables or the factors like, confounding variables. However, these changes or effects may be caused by many other factors such as alternative hypotheses.

Following are the types of hypotheses that are used in the experimental design:

- **Research hypothesis:** According to this hypothesis, the results in an experimental design are due to the independent variables.
- **Null hypothesis:** According to this hypothesis, the variations in the results in an experimental design are due to the unknown and uncontrollable factors and there are no variations in the given treatment or input.
- **Alternative hypothesis:** According to this hypothesis, the results in an experimental design are not due to the independent variables, but due to other factors. Various types of alternative hypothesis are as follows:
  - **Subject effect, selection effect:** This hypothesis states that the results coming from an experimental design are due to the systematic variations in

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the research participants or research subjects, which are assigned different conditions. This problem can be resolved by randomly assigning the participants to the respective groups in the experimental research setting.

- **History effect:** This hypothesis states that the results in an experimental design are due to the factors outside the scope of the experimental research. This problem can be resolved by exposing the participants to similar situations every time the experiment is performed.
- **Maturation effect:** This hypothesis states that the results of an experimental research occur due to the changes within the subject by the time of completion of the experimental research. The maturation effect comes in any research method that identify the dependent variable over a period of time or in a research method where the independent variables are used repeatedly. This problem can be resolved by performing the experimental research with the participants over the same period of time.
- **Experimenter expectancy effect or experimenter bias:** This hypothesis states that the results in an experimental research design are influenced by the expectations and actions of the experimenter. This means that while working on any research methodology, the researchers tend to produce results they have thought of. This results in overlooking any drawbacks, minor tempering with the data collection or any influence on the research participants. This problem can be resolved by assigning independent experimenters or by having objective measurements.
- **Demand characteristics or Hawthorne effect:** This hypothesis states that the results in an experimental design are due to the expectations of the participants in the research setting and resultant actions of their expectations. According to this hypothesis, the researcher communicates their expectations to the participants, which in turn influences the participants' performance. It is called 'Hawthorne effect' as the series of experiments were performed in a manufacturing plant in Hawthorne, Ohio. It was found that the performance of workers in the manufacturing plant increased, when the desired changes were made in their unit. The workers perceived these changes as expectations of the management for a better performance from them. Also, these changes convinced the workers that they are being monitored closely.
- **Testing effect or reactivity:** This hypothesis states that the results in an experimental design are due to the processes of data collection. This involves performing an experiment based on the knowledge and output of the previous experiment. In this case, the performance of the current experiment will not be based on the desired actions but on the previous collected data. This problem can be resolved by using a control group, which can be used for comparison.
- **Regression artifact or regression-to-the-mean:** This hypothesis states that the results in an experimental research design are due to the extreme scores progressing towards the mean over a period of time. This problem can be resolved by using a control group, which has similar traits.
- **Instrumentation:** This hypothesis states that the results in an experimental design are due to the deviation in the test or a defect in the measuring instruments. This problem can be resolved by developing or selecting a better measuring technique.

- **Halo effect:** This hypothesis states that the results in an experimental research design are due to the expectations of the researcher about a particular participant, based on the characteristics of the participant. This problem can be resolved by employing independent judges, random assignment of participants into the research experiment and by using objective measurement techniques.
- **Attrition or mortality effect:** This hypothesis states that the results can get biased if the participants leave the experiment, as this leads to non-equivalent groups. This problem can be resolved by identifying the reasons why the participants leave the experiment and then implementing actions to check the attrition effect.

In addition to these hypotheses, other alternative hypotheses and non-specific factors may occur in an experimental research. The basic purpose of the experimental design is to eliminate the alternative hypotheses. Solutions of any experimental research are specific to the research study and the particular alternative hypothesis.

With the presence of various variables and hypotheses, the experimental designs may not be accurate or perfect, however, some good experimental designs can be set as a standard to base conclusions on.

Types of Experimental Designs

The experimental designs are grouped under three categories, based on how the experimental designs eliminate various alternative hypotheses. Each experimental design contains subsets with specific strengths and weaknesses. The various types of experimental designs are as follows:

- Pre-experimental design
- Quasi-experimental design
- True experimental design

1. Pre-experimental Design

Pre-experimental designs follow basic experimental steps, in which only a single group is studied or only a single group gets the treatment. Pre-experimental design does not include a control group and no comparison is made between the group receiving the treatment and its equivalent group that does not receive the treatment. The pre-experimental design may include pre-test, post-test or only the post-test and may eliminate the unknown and uncontrollable factors like, independent variables or confounding variables. However, this design does not eliminate the alternative hypotheses. Therefore, no conclusion can be derived from this experimental design regarding the success of the experimental research. The pre-experimental design should be considered as a pilot test and followed up by a better experimental design. There are three types of pre-experimental designs which are explained below.

- **One-shot case study:** In this type of experiment, one group of participants are given the same type of treatment and their outcome is measured. The objective of all the experimental designs is to determine if the treatment has any effect on the outcome. Since, there is no comparison made with an equivalent non-treatment group and there is no pre-test in this type of experiment, the conclusion cannot be drawn regarding the performance. That is, the researchers will not be

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able to identify if the outcome would have been better if no treatment were given. Also, without any pre-test scores, the researcher will not be able to determine if any variation has taken place in the group participating in the experimental research. For example, in an organization, one group of participants are subjected to a treatment and after six months their variation in performance is measured. Without the comparison group, it cannot be determined if the variation in the performance would have taken place without giving the treatment and without the pre-test scores, it cannot be determined if any variation from the past performance has taken place.

- **One group pre-test or post-test study:** In this type of experiment, one group of participants are given similar treatment along with the inclusion of pre-test study. The advantage of one group pre-test or post-test study over the one-shot case study is the consideration of pre-test scores, which helps in determining the baseline scores. For example, in an organization, one group of participants are subjected to a treatment and after six months their variation in performance is measured. With the help of pre-test scores, we can compare if any variation from the past performance has taken place. This will help us determine, if any change in the outcome or the dependent variable has taken place. However, we cannot determine if the variation in the performance would have taken place without giving the treatment or without the independent variables, as the change might be due to the external factors.
- **Static group comparison study:** In this type of experiment, two equivalent groups of participants are included and one group is given the treatment. After the experiment, the post-test score is derived to measure the difference in the outcome of the two groups. This experiment does not include any pre-test, so it cannot be determined if any variation from the past performance has taken place. Therefore, this experiment has the advantage of including a control group; however, it fails to show the results if a change has occurred. Figure 3.1 shows the diagrammatic representation of pre-experimental designs.

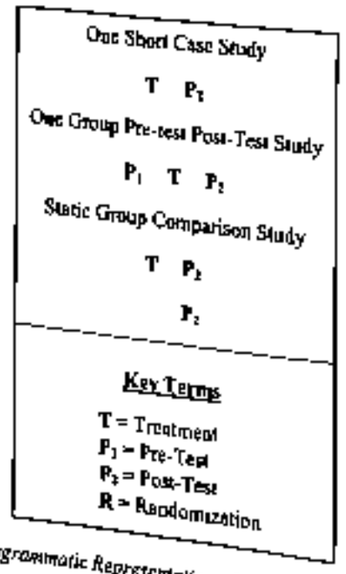

Fig. 3.1 Diagrammatic Representation of Pre-experimental Designs

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2. Quasi-experimental Design

The term 'Quasi' in quasi-experimental design refers to 'as if' or 'almost', so quasi-experimental design means almost a true experiment. Quasi-experimental designs are helpful in eliminating some of the alternative hypotheses.

Quasi-experimental designs are better than the pre-experimental designs, because in these experimental designs, some method to compare the outcome of the two groups is introduced. In quasi-experiment research, various causes or trends in research settings are identified. The major trends are then developed into syndromes or cycles and minor trends are referred to as normal or abnormal events. One of the basic purpose of implementing quasi-experimental design is to confine longer time periods and number of factors to control various threats to validity and reliability of the research experimental method. This will lead to a stable and reliable outcome of the experiment.

These designs are instrumental in applied settings for experimental research, wherein the factors or constraints present in the real world confound the experimental research settings. In this experimental design, we can choose the application of generalization or relevance to the real world (external validity) over the control or internal validity. However, in this experiment, the concept of randomization is ignored, which is an important element of the experimental research method. In any experimental research method, quasi-experimental design should be paired with other experimental designs to obtain strong or accurate results. There are three types of quasi-experimental designs which are explained as follows:

- **Pre-test, post-test, non-equivalent groups or static groups design:** In this type of experiment, two equivalent groups are chosen, which are not randomly assigned and are usually matched to the conditions of the experimental settings. In this experiment, the participants are assigned the groups according to the choice of the researcher. Different treatments are given to both static group and control or comparison group. This experiment is helpful in eliminating the effect of past account on the experiment setting, however, the effect of participants on the experiment setting is not eliminated. Moreover, the score of performance is compared prior to the experiment and after the experiment. For example, while studying the effectiveness of a new policy programme in a locality, another locality similar to the first one or static group is chosen. This second locality is more of a comparison group and less of control group and is termed as the non-equivalent group. After the introduction of the policy programme, if the static group improves more than the comparison group, we can be confident about the new policy programme.
- **Time series designs:** In this type of experiment, one group of participants are subjected to the pre-tests and post-tests at different intervals of time and the number of pre-tests and post-tests can vary from one test for each participant or for many participants. The subsequent tests are then performed to determine the long-term effect of the treatment on the result of the experimental research. A gap can be introduced between the tests to determine the strength of treatments given over a period of time. In this type of experiment, the post-test is referred to as a follow-up test. A time series design is the most common type of over time or longitudinal research in justice system. This design can be interrupted or

non-interrupted and both the types determine the changes in the dependent variable over a period of time. Interrupted time series design includes pre-tests and post-tests measurements. Non-interrupted time series design includes time as an independent variable, itself. The time series design is most often used to evaluate the public policy changes, which affect large group of people. Therefore, time series design is also known as impact analysis or policy analysis. For example, to evaluate the effectiveness of a new public policy, at first the current policies and the current problem being faced by the society are identified. After the problem is identified, an action is taken or a reforming programme is introduced to the group of participants. The condition of the participants is appraised every month for several months. To determine the effectiveness of the reforming programme, the occurrence of number of incidents of a problem or the dependent variable may be obtained from the public records before and after the implementation of the programme. If the improvement in the conditions of system is noticed after the introduction of the reforming programme, and not before, then we can be confident about the newly introduced reforming programmes This experiment is helpful in eliminating the effect of participants on the experiment setting, however, the effect of past accounts on the experiment setting is not eliminated.

- **Multiple time series or non-equivalent before–after design:** This design is considered as a strong quasi-experimental design. In this type of experiment, two or more groups are chosen that are likely to be different, as the participants are not randomly assigned. These participants receive several pre-treatment measures and at least one post-treatment measure. This experimental design is used to compare the performance of two groups that are likely to be different. This experiment can eliminate the effect of past accounts on the experiment setting and can also eliminate most of the effects of participants on the experiment setting. Similar to the time series design, this design is also helpful in evaluating the public policy changes, which affects large group of people. For example, to evaluate the effectiveness of a new public policy for the welfare of the society, the new reforming programme is implemented on one section of the society and then data is collected from that section of the community where the reforming programme was not implemented. If we derive that the rate of problems have reduced in the community only after receiving the reforming programme, the treatment or the programme can be said to be effective.

The only drawback of quasi-experimental design is that the participants for the experiment are not taken through randomization but through the choice of the researcher. This leads to the inclusion of different participants in the experiment and also the difference cannot be stated in terms of accurate measurement, as the differences might be due to education, work experience or other confounding variables. This prevents us from deriving the accurate difference and accurate results of the treatment between the two groups before and after the experiment. Therefore, whenever the participants are chosen based on the convenience of the researcher and not through the randomization, the reason for inclusion of participants in the experiment confounds the result. Figure 3.2 shows the diagrammatic representation of quasi-experimental designs.

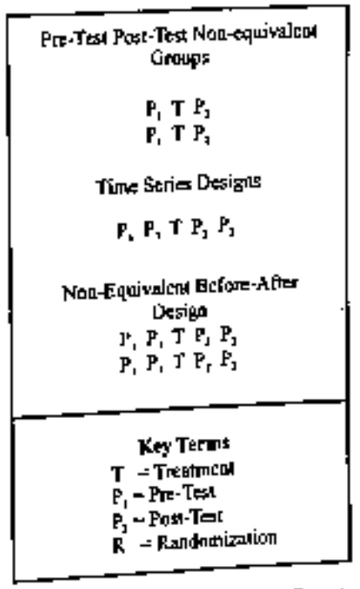

Fig 3.2 Diagrammatic Representation of Quasi-Experimental Designs

3. True Experimental Design

The true experimental design covers up the shortcomings of pre-experimental and quasi-experimental designs. This design includes the control group and a means to measure the changes that occur in the two groups participating in an experiment. The objective of this design is to control all the confounding variables or the impact of confounding variables on the experimental research and its result. The true experimental design is considered as the only research method which adequately measures the cause and effect relationship. This design eliminates most alternative hypotheses, mostly those hypotheses that are related to time and formation of participant groups. This elimination can also result in deviating the research setting from natural setting to the artificial setting. There are two types of true experimental designs which are explained as follows:

- **Post-test equivalent groups:** In this type of experiment, the comparison and randomization of both the experimental and control groups are considered. Each group chosen for the experiment is given either some treatment or type of control. To identify the difference in the outcome of the two groups in the experiment, post-tests are provided to each participant of the research experiment. However, this design does not include pre-test measures. Therefore, it is difficult to arrive at the conclusion that the difference in the outcome of an experiment between the two groups is actually a change from the difference in the beginning of the experimental research. This means that the participants in both the groups are equivalent by the process of randomization, however, this process cannot completely ensure that equivalency is created between the two groups.
- **Pre-test Post-test equivalent groups:** In this type of experiment, the control group and a measure of change are provided in the experimental design. Also, it provides a pre-test to assess the difference between the performances of the two groups prior to the experimental research. This design is most

effective in implementing a cause and effect relationship and is also the most difficult to perform. The application of this design in the real world involves selection of participants at random and placing them in two groups using random assignment. Using pre-test scores, the previous record of performance can be measured and thus the mean measure of each participant can be derived. After this, the treatment will be given to one group and control will be applied to another group. It is necessary that the two groups be treated in a similar manner to control variables. At the end of the experiment, the result will be collected and will be compared along with the pre-test scores. If we derive that there is a variation in the result obtained at the end of the experiment from the pre-test result and also between the outcomes of both the groups, we can conclude that the treatment given to one group is effective. Figure 3.3 shows the diagrammatic representation of true experimental designs.

Post-Test Equivalent Groups R T P_2 R T P_2 Pre-Test Post-Equivalent Groups R P_1 T P_2 R P_1 T P_2
Key Terms T = Treatment P_1 = Pre-Test P_2 = Post-Test R = Randomization

Fig. 3.3 Diagrammatic Representation of True Experimental Designs

Before working on an experimental design, the following conditions should be considered:

- The possibility of categorising people, places or things in the experiment.
- The possibility of selecting random people, place or things in the experiment.
- The process of random selection to create experimental and control groups to be ethical.

The participants included in the experimental designs are divided into two groups and one group gets the benefit of receiving the treatment and the other group (control group) is deprived of the treatment. If there is any harm in providing or preventing the treatment for anyone, the experimental design should not be used.

Check Your Progress

4. What is exploratory research design?
5. Name the two categories of conclusive research designs.
6. How can the confounding variables be controlled?
7. What are the conditions to be considered before working on an experimental design?

3.4 SAMPLING

All research in the field of behavioural sciences involves drawing inferences from a specified, identifiable group on the basis of a selected sample. The clearly identifiable and specified group is known as the population or universe. The selected group of persons or objects is called the sample. The conclusions are drawn from the sample, which are deemed to be valid to the entire population. Such conclusions are known as the statistical inferences.

A population can be finite or infinite. A finite population is one where all the members can be counted. An infinite population is one where all the members cannot be counted (e.g., stars in the sky). A population can be imaginary or real.

A measure based on the entire population is called a parameter. A measure based on the sample is called a statistic.

A sample is limited number or set of persons or elements that are chosen from a population, according to some plan. It is thought to represent the population. Samples are based on probabilities. Probability is a form of relative frequency. For example, the probability of a seeing a head when coin is tossed once is 1/2 or 0.5. Probability is expressed as a fraction or in decimal numbers.

Need for Sampling

Sampling is needed for several reasons:

- Sampling is economical in terms of time and money. It saves time as well as cost because only a limited sample is involved, not the entire population.
- Sampling is carried out by trained personnel, so it has considerable accuracy in measurement and testing.
- Sampling errors can be easily determined from the sampling process. This yields valid information about the population characteristics.
- Sampling is the only available procedure when the population is infinite.
- Sampling enables fairly accurate generalizations about the population from the study of the sample.

Factors influencing decisions while drawing a sample are:

- **Size of the population:** When the population size is large, the selection of a sample becomes necessary.
- **Costs involved in obtaining the elements:** If the cost is reasonable, the sampling inquiry is facilitated.
- **Convenience of availability of the elements:** Each of these factors is important for deciding to select a sample, for study.

Implications of sample design: A sample is obtained according to a 'plan". A sample design is a technique for selecting the items for a sample. The size of the sample means the number of items to be included in the sample. Sample design should be determined before data collection and the sample should be designed to suit the study.

Sampling is a process of selecting a few from a bigger group for estimating or predicting the prevalence of some outcome/factor regarding the bigger groups. So, a sample is a sub-group of the population, one is interested in. This is the concept of sampling (Figure 3.4).

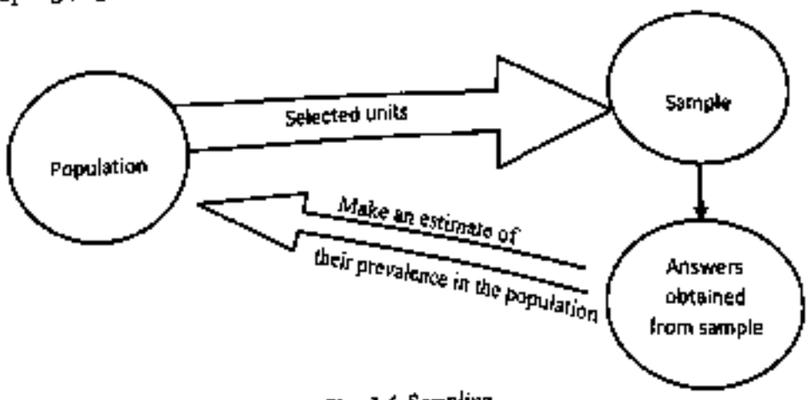

Fig. 3.4 Sampling

Check Your Progress

8. "A population can be finite or infinite." What are finite and infinite population?
9. How can samples be categorized?

NOTES

3.4.1 Size of the Sample

Size refers to the number of items selected from the universe to constitute a sample.

The size of the sample should be neither too large, nor too small. An optimum sample size should be:

- Efficient
- Representative
- Reliable
- Flexible

The sample size should be decided by the level of precision needed and the estimate of the confidence level desired. The size of the population variance is an important determiner. If the population variance is large, then a larger sample size is indicated. The size of the population is another factor to be kept in mind. This limits the size of the sample

Other aspects to be considered for determining sample size:

(i) The parameters of interest

- Estimation of some characteristics or some proportion of persons in a population
- Knowing some average measure of a population
- Knowing about some sub-groups of a population

All these types of estimates have a bearing on the sample size.

(ii) Budgetary constraint

From a purely practical point of view, the size of the budget is bound to influence the size of the sample.

(iii) Sampling procedure

The choice of the method in selecting the sample would have to provide a balance between the cost involved and the least possible sampling error that would result from the sample size.

3.4.2 Types of Sampling

Strategies for sampling can be categorized as:

- Probability sampling
- Non-probability sampling
- Mixed sampling

1. Probability (or random) Sampling

For a random sampling design, it is imperative that each element is included in the sample. Equal element means the probability of each element in the population is the same and is not influenced by other considerations. The notion of independence means that the choice of one element is not dependent upon the choice of another element in the sample. Only if both these conditions are met would the sample be a random/probability sampling. If not, bias would be introduced. As this sample represents the total population, the inferences drawn from such samples can be generalized to the total population.

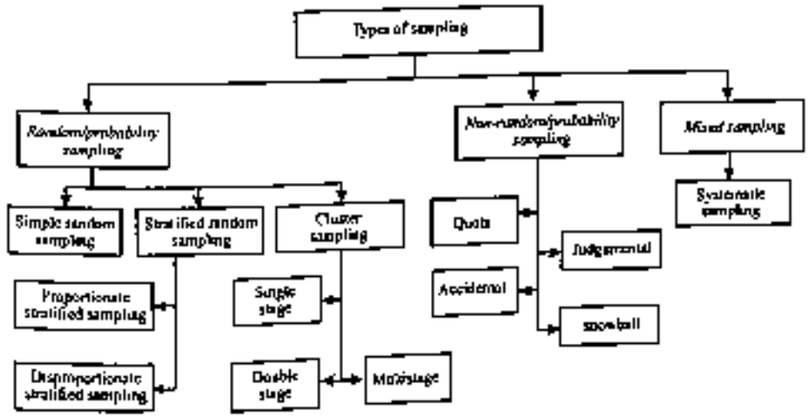

Fig. 3.5 Types of Sampling

Source: Kothari, C.R. Research Methodology Methods and Techniques. 1995.

Methods of Drawing a Random Sample

The three most common methods are

- **The Fish bowl method:** This method is useful when the total population size is small. Here, each element is numbered on a small slip of paper and put into a box or bowl. After the slips are mixed thoroughly, the investigator selects one number at a time, until the desired sample size is reached.
- **Using table of random numbers:** Most research methodology and statistic tools have a table of randomly generated numbers in their appendices. The sample can be selected from these tables by following the procedures described below. The principle of random table of numbers is that the column-row numbers do not appear in any particular sequence, nor does any number appear more frequently than the other one.

The random sample selection process:

- o Specify the number of elements in the study population
- o Number them from 1 to N (N is the total number of elements in the population). Example, if the population size is 500 and one intends to choose 50 cases from the population, now enter the random table at any point.
- o Then move systematically to the right, left, up, down or diagonally skipping the numbers that are too large and also those that have already been drawn.
- o Keep moving through the table and fill until the selected sample has 50 elements.

A random selection of 30 cases from a population serially numbered from 1 to 80 is illustrated here; 12 numbers have been omitted. Numbers 85, 84, 97 and 95 have been omitted because they exceed 80 and numbers 03, 74 and 12 have been omitted because they have duplicated the previous selections. The number 00 has been left out because the population number starts from 01.

The following is a sample random number table:

64755	83885	84122	25920	17696
10302	52289	77436	34430	38112
71017	98495	51308	50374	66591
60012	55605	88410	34879	79655

Sample (N = 30 has been taken from a serially numbered population of 80).

64	59	28	12	85	55
75	20	97	71	03	60
58	17	74	01	74	
38	69	36	79	66	
85	61	34	84	59	
84	03	43	95	16	
12	02	03	51	00	
22	52	81	30	12	

The advantage of using the table of random numbers is that it is easily accessible to the researchers and requires no formal training for using it. However, the disadvantage is that it cannot be easily and constructively used when the size of the population exceeds 5 digits.

- **Method of computer-determined randomness:** This method is useful when the population size is large. The data are fed into the computer to obtain a random number of elements corresponding to the elements in the population. This method is easy and fast and therefore is increasingly in use. The only limitation is imposed by the need to have a computer.

(i) Simple Random Sample

A simple random sample (also known as an unrestricted random sample) may be defined as one in which each and every individual of the population has an equal chance of being included in the sample and also the selection of one individual is in no way dependent upon the selection of another person. For example, if we are to select a sample of ten students from the seventh grade consisting of 40 students, we can write the name (or roll number) of each of the 40 students on separate slips of all equal in size and colour and fold them in a similar way. Subsequently, they may be placed in a box and reshuffled thoroughly. A blindfolded person, then, may be asked to pick up one slip. Here, the probability of each slip being selected is 1/40. Subsequently, after selecting the slip and noting the name written on the slip, he again returns it to the box. In this case, the probability of the second slip being selected is again 1/40. But if he does not return the first slip to the box, the probability of the second slip becomes 1/39. When an element of the population is returned to the population after being selected, it is called sampling with replacement and when it is not returned, it is called sampling without replacement. Sampling with replacement is wholly feasible except in certain situations where it is seldom used (Cochran, 1963). If sampling with replacement is used, the chance of the same case being selected more than once is increased. In such a situation, the repeated cases may be ignored as is done if a table of random numbers is used in making a selection of cases. Thus, random sampling may be defined as one in which all possible combinations of samples of fixed size have an equal probability of being selected.

The major difference between sampling with replacement and sampling without replacement can be illustrated though an example. Suppose the size of a population consists of four persons, who are named as A, B, C and D. Suppose that the investigator wants to select samples of size 2 through the procedure of sampling without replacement. In such a situation, the investigator can maximally draw six samples of size 2 from the population of 4. This could be accomplished with the help of the following equation.

$$\binom{N}{n} = \frac{N!}{(N-n)!n!}$$

where

N = the size of parent population

n = the size of the sample

! = factorial

In the above example where $N = 4$ and $n = 2$, the maximum number of sample size of 2 would be 6 as under.

$${}^4C_2 = \frac{4!}{(4-2)!2!} = \frac{4\times3\times2\times1}{2\times1\times2\times1} = \frac{24}{4} = 6$$

Similarly, where $N = 5$, we can have 10 samples of size 2 as under.

$${}^5C_2 = \frac{5!}{(5-2)!2!} = \frac{5\times4\times3\times2\times1}{3\times2\times1\times2\times1} = \frac{120}{12} = 10$$

But from the same population, we can have 5 samples of size 4 as under:

$${}^5C_4 = \frac{5!}{(5-4)!4!} = \frac{5\times4\times3\times2\times1}{1\times4\times3\times2\times1} = \frac{120}{24} = 5$$

But if the investigator has decided to proceed with the technique of sampling with replacement, he can derive the likely number of samples from the given population with the help of the following equation.

$$N^n$$

where N and n are again population and the sample size. Suppose the size of the population is 4 and the size of sample is 2. In such a situation the investigator, following the technique of sampling with replacement, can maximally draw 16 samples, that is, $4^2 = 4\times4 = 16$. If the four members of population are named as A, B, C and D, the sixteen samples of size 2 would be

AA	AB	AC	AD
BA	BB	BC	BD
CA	CB	CC	CD
DA	DB	DC	DD

The case of AA, BB, CC and DD combinations reflects the fact that in sampling with replacement, an element or individual once drawn can be drawn again. In actual practice, such cases are ignored.

NOTES

There are some advantages and disadvantages of simple random sampling are as given below:

Advantages of simple random sampling

- It is a representative sample.
- It is assumed that all the characteristics of the population are reflected in the sample.
- This is the easiest and simplest of all probability sampling methods.
- This random sampling can be applied in conjunction with many other probability sampling methods.
- The sampling error can be easily estimated.

Disadvantages of simple random sampling

- It is difficult to ensure that the smaller elements that exist in a population are included in the sample. For example, in a population of 500 persons, only 12 people are dialectic. The sample size is only 50. The chance that they would be included is very slim.
- The simple random sampling method cannot fully avail certain information available in the sample. For example, if one knows that there is a population of children who are bright, dull, and artistic, all these elements cannot be brought into the sample.
- Sampling error is greater in the simple random sample than in a stratified random sample. To minimize the error, stratified random sample is used.

2. Non-probability Sampling

The different types of non-probability sampling are:

(i) Quota Sampling

This is an important non-probability sampling method. The population is seen as made up of strata of the population and from each stratum, individuals are chosen randomly, e.g., if the population of students in a school is 5,000 made up of high and low socio-economic classes. From this, 500 students can be chosen with 250 from the higher and 250 from the lower class. This is the quota sample.

Advantages of the quota sampling method

- Is quick and easy for gross estimates
- Is a convenient procedure
- Elements from the desired strata get included

Disadvantages of the quota sampling method

- Randomness cannot be established
- Generalizing ability is poor
- Since most credible elements are included, it may not be typical of the population
- Possibility of classification error is high.
- Other variables of significance cannot be controlled

This method does have some appeal, despite limitations.

NOTES

(ii) Purposive Sample

Purposive sample, which is a handpicked sample, is typical of the population. It is also called judgmental sample, because the choice is determined by the judgments of the researcher, e.g., attitudes towards corruption would be ascertained by interviewing professionals, academicians, tainted people and politicians. The investigator selects the persons from these selected people.

Advantages of purposive sample

- It is cost effective and easily accessible
- Is very convenient
- Only relevant individuals get included

Disadvantages of purposive sample

- In purposive sampling, randomness representatives are not ensured
- Generalizing ability is poor
- Sampling is highly subjective
- An inability to apply inferential statistics to acceptable levels exists

(iii) Accidental Sampling

Accidental sampling is also called incidental sampling. It is based on a non-probability sampling plan. Here, the investigator chooses the sample according to his/her convenience. Convenience and economy guide this method, as a useful option.

Advantages of accidental sampling

- Accidental sampling is the most convenient method of sampling.
- Economical in terms of time, money, effort and cost.

Disadvantages of accidental sampling

- Accidental sampling has poor generalizing ability.
- Biases and prejudices bound to exist.
- There is a high probability of high sampling error .

Accidental sampling is used in psycho-social research due to the convenience factor.

(iv) Systematic Sampling

This is another method of the non-probability sampling plan. Here, every *n*th person is drawn from a predetermined list for study, e.g., every 5th roll number from a class of 50 students or every 10th name from the telephone directory and so on. It is systematic in view of the fact that the selection is made according to a pre-determined plan. The first element selected is random and has non-probability characteristics.

Advantages of systematic sampling

- Quick and easy to obtain the sample
- Easy to select, say, every fifth name
- Easy to use (simpler than random table chart)

Disadvantages of systematic sampling

- Not a probability sampling plan

NOTES

- High sampling error possibility creeps in
- Bias could invade into the sample

This method still finds favour in psycho-social research.

(v) Snow Ball Sampling

Snow ball sampling is a non-probability sampling method. It is basically a socio-metric method. Here, all the persons of a group or sample are identified by friends or other acquaintances. The snow ball effect is how one person's contact leads to the others and from there moves further. The information gathered is through patterns of friendship, e.g., how rumours spread and how advertisements influence friends, etc. It is useful for small *N* samples, below 100. It is a method to study social change.

Advantages of snow ball sampling

- Is a systematic sampling technique helpful in studying small informal networked social groups
- Helps in community studies, decision-making
- Lends itself to computer-determined use of random numbers

Disadvantages of snow ball sampling

- Not feasible with large numbers
- No use of statistical methods possible
- Bias could enter the sample
- Largely useful for information dissemination, saturation sampling and dense sampling

(vi) Saturation Sampling

Saturation sampling involves drawing all elements or individuals having characteristics that are of interest to the researcher, e.g., all psychiatrists below the age of 45 years. Dense sampling is a method that lies between simple random sampling and saturation sampling. Here, the researcher selects 50 per cent or more from the population and takes a majority of individuals having specific characteristics that are of significance, e.g., 500–600 students from a class of 1000 students. These two methods are convenient. But it is not useful when the *N* exceeds 1000.

(vii) Double Sampling

Double sampling means drawing a sample of individuals from a sample that has already been drawn, e.g., from a population of 10,000 people, a sampling of 1000 is drawn. Again from this 1000, a further sample of 200 is drawn, for the study, e.g., a questionnaire is sent to 1000 people on the issue of pollution. Say, 50 per cent (or 500) of them respond. From these 500 persons, a sample of 100 is drawn for an in-depth interview. This is double sampling.

If this method is meaningful for research, then the representativeness of the sample must be increased. It is a time-consuming and labour intensive method.

Pre-requisites for a sample to be good are as follows:

- It must be representative.
- It must be of a sufficient size.

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(a) **Representativeness:** The sample must have approximately all the characteristics of the population that are relevant for the investigation. The relevant characteristics of the population must exist in the same proportion in the sample also, e.g., if the population has an education level ratio of 60:40 for men and women, the sample should also have a similar ratio to be representative. The population should be clearly defined and the observations to be made should be specified. This can reduce biases.

(b) **Sample size should be adequate:** This implies that the size should be sufficient. A larger sample is better for reducing the error. This is the difference between the population value and the sample value. The larger the size of the sample, the lesser is the error. However, too large a sample may not yield better results, as a large sample creates other problems.

Advantages of sampling methods in general are follows:

- Using sampling methods increases accuracy. Examining a sample becomes both efficient and involves lesser work, so the purpose of a sample is to get maximum accuracy with minimal effort, time, money, etc.
- It reduces the cost as the data is from a smaller number of cases. Statistical calculations for accidental errors are also reduced.
- Since the sample and not the universe is studied, work proceeds faster. This is a great advantage for research.

3. Mixed (probability and non-probability) Sampling Methods

The different types of mixed sampling methods are discussed below:

(i) Stratification (also called convenience) Sampling Method

Stratified random sampling is of two types:

- Proportionate stratified random sampling
- Disproportionate stratified random sampling

(a) Proportionate Stratified Random Sampling

Here the population is first stratified. Then the sample is drawn randomly from the stratum. The proportion of persons belonging to each strata of the total population is useful in applied research, e.g., the rank of army officers of one strata in the defence force and so on. Number of cardiologists in the total population of darters, etc., there proportional representation in the sample is a valuable index, for determining further studies.

In a stratified random sample, the population is first divided into two or more strata, e.g., on the basis of age-groups of say 30–40, 40–50, 50–60, etc., or as male and female. These divided populations are termed sub-populations. These are non-overlapping parts of the whole population. They are thought to be homogeneous. Then sample elements are selected from each stratum using simple random sample.

Advantage of stratified random sampling is :

- In stratified random sampling even those elements that exist in smaller numbers, get pieced up, and sampling error is minimized because the sample has all the characteristics of the population.

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Disadvantages of stratified random sampling

- It is a difficult method to start with in terms of assumptions of knowledge of the composition of the population.
- It is a time consuming method.
- It is could give rise to classification error.
- It could give rise to disproportionate stratified random sampling.
- It is similar to the earlier one, but is different in that the substrata are not necessarily distributed according to their proportionate weight in the population from which they were randomly selected. There could be over representation or under representation of a strata in a population.

(b) Disproportionate stratified Sampling Means

- The investigator would give equal weight to each of the substrata
- Will give greater representation to some substrata and not enough weight to other substrate in the sample to be brawn.

Advantages of disproportionate stratified random sampling

- It is comparatively less time consuming than propitiate stratified random sampling.
- It is possible to give weight to particular elements that are not represented frequently in the population, as compared to other elements.

Disadvantages of disproportionate stratified random sampling

- The samples drawn might suffer from certain stratum being under or over represented.
- Assumption that the knowledge of the composition of the original population limited the use in conditions, where this information is not available.
- Possibility of misclassifying elements into a sub-strata, that they do not belong, legitimately, e.g., element *X* may be put into strata *Y*, but it may belong to strata *Z*.
- This method is common in the social sciences, despite these limitations.

(c) Area or Cluster Sampling

This is another important method of probability sampling. This is used often in field research. Here, geographical divisions in terms of territory, zone cities, towns, districts, etc., are made and a number is assigned to each area. Then the random sample is drawn from this area. This method is also called cluster sampling. For example, one wants to study the prevalence of HIV in a state. Then the state is divided into districts, towns and villages, etc. identified. Then finally even households in locality could be identified for studying. This is also called multi-stage sampling.

Advantages of area or cluster sampling

- This is useful for large scale study of areas, regions where specific lists are useful for pubic opinion polls.
- It saves time and money.
- The respondents can easily be substituted. It is a flexible method.

Disadvantages of area or cluster sampling

- Sampling errors rarely come to light

- Little control over the size of the cluster
- Could result in bias in samples

However this method is used in large behaviour studies.

NOTES

3.4.3 Steps in Sampling Designing

The following points should be kept in mind before designing a sample:

- **Type of universe:** Define the universe or set of objects to be studied. The universe can be finite or infinite. In the finite universe, the number of items is certain, while in the infinite universe, it is uncertain. An example of the former is the number of industrialists in a country, and the latter, the number of stars in the sky.
- **Sampling unit:** This is the group from which the sample is to be drawn. For example, a population unit can be in terms of people's age, gender, and a housing unit like bungalow, flat, or an educational unit like university, college or school.
- **Service list:** The sampling from a list index or other population records from which the sample is to be drawn, e.g., prepare all the items in the universe from which the selection of the sample can be made. It should be comprehensive, correct and reliable, so that the sample becomes representative.
- **Size of the sample:** This refers to the number of items to be selected from the population, to constitute the sample. An optimum sample size should be reliable, flexible and representative. The size can be determined by the precision with which estimations are needed. Cost considerations also come into play, here.
- **Parameters of interest:** This involves the type of measures needed from the sample. For example, the factors you want to study.
- **Budgetary constraints:** This refers to the practical problems about the size of the sample and costs associated with the collection of data from the sample.

3.4.4 Principles for Selecting a Sampling Procedure

There are three principles which guide sampling theory:

- In majority of cases of sampling there will be a difference between the sample statistics and the true population mean, which is attributable to the selection of the units in the sample.
- The greater the sample size, the more accurate will be the estimate of the true population mean.
- The greater the difference in the variable of the study in a population for a given sample size, the greater will be the difference between the sample statistics and the true population mean.

3.4.5 Types and Criteria of Sampling Designs

For selecting elements on the representation basis, the sample may be obtained using either probability sampling or non-probability sampling. Probability sampling is based on random selection, whereas non-probability sampling is based on non-random sampling.

On element selection basis, the sample may be either restricted or unrestricted. When each sample element is drawn individually from the population at large, the sample

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is known as unrestricted sample. All the other forms of sampling are covered under the term restricted sample.

Table 3.1 Basic Sampling Designs

Element selection technique ↓	Representative basis ⟷	
	Probability sampling	Non-probability sampling
Unrestricted sampling	Simple random sampling	Haphazard or convenience sampling
Restricted sampling	Complex random sampling, e.g., cluster sampling, systematic sampling, stratified sampling etc.	Purposive sampling, e.g., quota sampling, judgment sampling

Source: Singh, A.K. Tests, Measurements and Research Methods in Behavioural Sciences. 2008.

Criteria of Good Sample Design

The following are the criteria of a good sample design:

- Sample design should yield the best possible sampling error.
- Sample design should be chosen judiciously, keeping costs in mind.
- Sample design must attempt to control systematic bias in the best possible way.
- Sample findings should be applied with a reasonable level of confidence.

3.5 SAMPLING ERROR

Even if utmost care has been taken in selecting a sample, the results derived from a sample study may not be exactly equal to the true value in the population. The reason is that the estimate is based on a part and not on the whole and samples are seldom, if ever, perfect miniature of the population. Hence, sampling gives rise to certain errors known as 'sampling errors' or sampling fluctuations.

In other words, a sample survey requires study in small portions of population as there can be certain amount of inaccuracy in the information collected during sampling analysis. This inaccuracy is called sampling error or error variance. Sampling errors are those errors, which arise on account of sampling and generally happen to be random variations in the sample estimates of the actual population values. Figure 3.6 shows sampling error.

Sampling errors occur randomly and are equally likely to be in either direction and the magnitude of sampling error depends on the nature of the universe. The more uniform the universe is, the smaller is the sampling error. Sampling error is inversely proportional to the size of the sample and vice-versa. In addition, sampling error is the product of the critical value at a certain level of significance and the standard error.

Sampling Error = Frame Error + Chance Error + Response Error

Sampling errors would not be present in a complete enumeration survey. However, the errors can be controlled. The modern sampling theory helps in designing the survey in such a manner that the sampling errors can be made insignificant. Sampling errors are of two types: (i) biased and (ii) unbiased.

Check Your Progress

10. Define population.
11. List the advantages of quota sampling.

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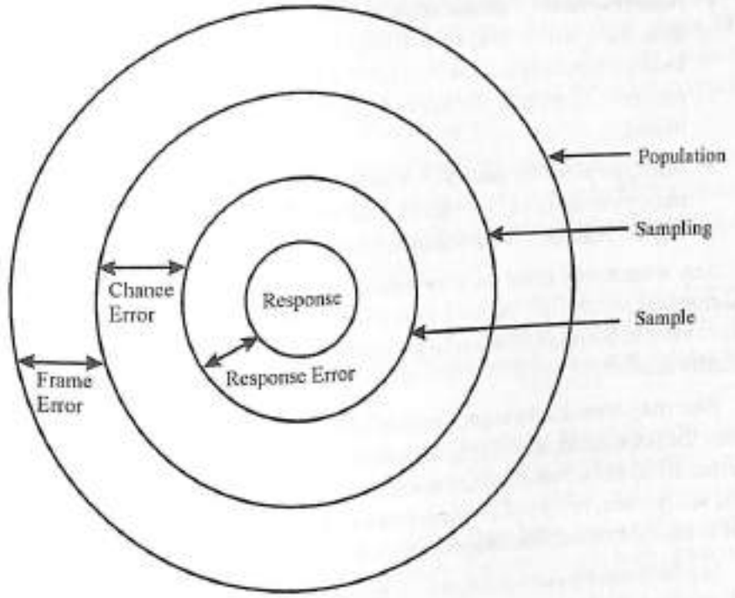

Fig. 3.6 Sampling Error

These errors arise from any bias in selection, estimation, etc. For example, if in place of simple random sampling, deliberate sampling has been used in a particular case; some bias is introduced in the result, and hence such errors are called 'biased sampling errors'.

An error in statistics is the difference between the value of a statistic and that of the corresponding parameter. These errors arise due to chance differences between the members of population included in the sample and those not included.

Thus, the total sampling error is made up of errors due to bias, if any, and the random sampling error. The essence of bias is that it forms a constant component of error that does not decrease in a large population as the number in the sample increases. Such error is, therefore, also known as 'cumulative/non-compensating error'. The random sampling error, on the other hand, decrease at an average as the size of the sample increases. Such error is, therefore, also known as 'non-cumulative/compensating error'.

Bias may arise due to: (i) faulty process of selection, (ii) faulty work during the collection, and (iii) faulty methods of analysis.

Faulty selection of the sample may give rise to bias in a number of ways. Some of which are discussed below:

- **Deliberate selection:** The deliberate selection of a 'representative' sample.
- **Conscious/Unconscious bias in the selection of 'random' sample:** The randomness of selection may not really exist, even though investigators claim that they had a random sample if they allow their desire to obtain a certain result to influence their selection.
- **Substitution:** Substitution of an item in place of one chosen in random sample sometimes leads to bias. Thus, if it were decided to interview every 50th household in a colony, it would be inappropriate to interview the 51st or any other number in its place as the characteristics possessed by it will differ from those which were originally to be included in the sample.

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- **Non-response:** If all the items to be included in the sample are not covered then, there will be bias even though no substitution has been attempted. This fault particularly occurs in mailed questionnaires, which are incompletely returned. Moreover, the information supplied by the informants may also be biased.
- **An appeal to the vanity:** An appeal to the vanity of the person questioned may give rise to yet another kind of bias. For example, the question 'Are you a good student?' is such that most of the students would answer 'yes'.

Any consistent error in measurement will give rise to bias whether the measurements are carried out on a sample or on all the units of the population. The danger of error is, however, likely to be greater in sampling work, since the units measured are usually smaller.

Bias may arise due to improper formulation of the decision problem or wrongly defining the population, specifying the wrong decision, securing an inadequate frame, and so on. Biased observations may result from a poorly designed questionnaire, an ill-trained interviewer, failure of a respondent's memory, etc. Bias in the flow of data may be due to unorganized collection procedure, faulty editing or coding of responses.

In addition to bias which arises from faulty process of selection and faulty collection of information, faulty methods of analysis may also introduce bias. Such bias can be avoided by adopting proper methods of analysis.

If possibilities of bias exist, fully objective conclusions cannot be drawn. The first essential of any sampling or census procedure must, therefore, be the elimination of all sources of bias. The simplest and the only certain way of avoiding bias in the selection process is for the sample to be drawn either entirely at random or subject to restrictions, which while improving the accuracy are of such a nature that they do not introduce bias in the results. In certain cases, systematic selection may also be permissible.

Once the absence of bias has been ensured, attention should be given to the random sampling errors. Such errors must be reduced to the minimum so as to attain the desired accuracy.

Apart from reducing errors of bias, the simplest way of increasing the accuracy of a sample is to increase its size. The sampling error usually decreases with increase in sample size and in fact in many situations the decrease is inversely proportional to the square root of the sample size. Figure 3.7 illustrates the increase and decrease proportion between sampling error and sample size.

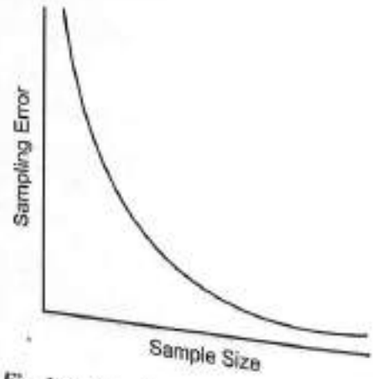

Fig. 3.7 Sampling Error and Sample Size

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From Figure 3.7, it is clear that though the reduction in sampling error is substantial for initial increases in sample size, it becomes marginal after a certain stage. In other words, considerably great effort is needed after a certain stage to decrease the sampling error than in the initial instances. Hence, after that stage, sizable reduction in cost can be achieved by lowering even slightly the precision required.

From this point of view, there is a strong case for resorting to a sample survey to provide estimates within permissible margins of error instead of a complete enumeration survey, as in the latter the effort and the cost needed will be substantially higher due to the attempt to reduce the sampling error to zero.

As regards non-sampling error, they are likely to be more in case of complete enumeration survey than in case of a sample survey, since it is possible to reduce the non-sampling errors to a greater extent by using better organization and suitably trained personnel at the field and tabulation stages.

The behaviour of the non-sampling errors with increase in sample size is likely to be opposite of that of sampling error, that is, the non-sampling error is likely to increase with increase in sample size. In many situations, it is quite possible that the non-sampling error in a complete enumeration survey is greater than both the sampling and non-sampling errors taken together in a sample survey, and naturally in such situations the latter is preferred to the former.

When a complete enumeration of units in the universe is made, one would expect that it would give rise to data free from errors. However, in practice it is not so. For example, it is difficult to completely avoid errors of observation or ascertainment. So also in the processing of data tabulation errors may be committed affecting the results. Errors arising in this manner are termed as non-sampling errors, as they are due to factors other than the inductive process of inferring about the population from a sample.

Thus, the data obtained in an investigation by complete enumeration, although free from sampling error, would still be subject to non-sampling error, whereas the results of a sample survey would be subject to sampling error as well as non-sampling error.

Non-sampling errors can occur at every stage of planning and execution of the census or survey. Such errors can arise due to a number of causes, such as defective methods of data collection and tabulation, faulty definition, incomplete coverage of the population or sample, etc. More specifically, non-sampling errors may arise from one or more of the following factors:

- Data specification being inadequate and inconsistent with respect to the objective of the census or survey
- Inappropriate statistical unit
- Inaccurate/Inappropriate methods of interview, observation or measurement with inadequate or ambiguous schedules, definitions or instructions
- Lack of trained and experienced investigators
- Lack of adequate inspection and supervision of primary staff
- Errors due to non-response, i.e., incomplete coverage in respect of units
- Errors in data processing operations, such as coding, punching, verification.
- Errors committed during presentation and printing of tabulated results.

These sources are not exhaustive, but are given to indicate some of the possible sources of error. In a sample survey, non-sampling errors may also arise due to defective frame and faulty selection of sampling units.

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In some situations, the non-sampling errors may be large and deserve greater attention than the sampling errors. While, in general sampling, errors decrease with increase in sample size, non-sampling errors tend to increase with the sample size.

In the case of complete enumeration, non-sampling errors and in the case of sample surveys, both sampling and non-sampling errors are required to be controlled and reduced to a level at which their presence does not vitiate the use of final results.

The reliability of samples can be tested in the following ways:

- More samples of the same size should be taken from the same universe and their results be compared. If results are similar, the sample will be reliable.
- If the measurements of the universe are known then they should be compared with the measurements of the sample. In case of similarity of measurement, the sample will be reliable.
- Sub-samples should be taken from the samples and studied. If the results of sample and sub-sample study show similarity, the sample should be considered reliable.

3.6 SUMMARY

In this unit, you have learnt that:

- Research design is a structure that gives an outline of the overall research work. It is the result of better planning and implementation of a good strategy.
- According to Kerlinger, research design is the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to control variance. Bernard Phillips defines research design as the blueprint for collection, measurement and analysis of data.
- Before starting the research process, the formulation of an efficient and appropriate research design is important.
- A research design depends to a large extent on the type of research study that you are conducting. If the research study is exploratory, then major emphasis is on the discovery of ideas.
- Experimentation is the process of examining and verifying the hypothesis related to some research problem.
- Ronald A. Fisher has classified three basic principles of research design, which are:
  - Replication
  - Randomization
  - Local control
- The randomization principle protects the research design from extraneous factors while conducting an experiment. It indicates that the experiment must be designed or planned in such a way that unrelated factors can be included as possibilities.
- Exploratory research design is also known as formulative research design. In this research design, a specific subject is investigated. It helps to generate a set of hypotheses or research-based questions that can be used at a later stage.

Check Your Progress

12. What is a sampling error?
13. How are sampling errors and sample size related?
14. Why do non-sampling errors arise?

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- A conclusive research design is more structured and formal than an exploratory research design. It is based on large representative samples, and the data obtained is subjected to quantitative analysis.
- The two categories of conclusive research designs are descriptive and causal. Descriptive research designs can further be either cross-sectional or longitudinal.
- In contrast to the cross-sectional design, which provides a snapshot of the variables of interest at a single point in time, a longitudinal study gives a series of pictures that provide an in-depth view of the situation and the changes that have taken place over time.
- Experimental research design is usually applicable when we are determining the cause and effect relationship or deriving the cause and effect inferences in any experimental research study.
- Validating the experimental design ensures that the outcome of an experiment is accurate and right. Validating an experimental design includes two factors:
  - Internal validity of experimental design
  - External validity of experimental design
- External validity refers to the assessment of the generalized manner of the experimental design. This means, validating the common applicability of result or outcome of the experimental design in the real world.
- The various types of experimental designs are as follows:
  - Pre-experimental design
  - Quasi-experimental design
  - True experimental design
- The term 'Quasi' in quasi-experimental design refers to 'as if' or 'almost', so quasi-experimental design means almost a true experiment.
- The true experimental design covers up the shortcomings of pre-experimental and quasi-experimental designs. This design includes the control group and a means to measure the changes that occur in two groups participating in an experiment.
- Before working on an experimental design, the following conditions should be considered:
  - The possibility of categorizing people, places or things in the experiment
  - The possibility of selecting random people, place or things in the experiment
  - The process of random selection to create experimental and control groups to be ethical
- All research in the field of behavioural sciences involves drawing inferences from a specified, identifiable group on the basis of a selected sample. The clearly identifiable and specified group is known as the population or universe. The selected group of persons or objects is called the sample.
- Most samples can be categorized into two types:
  - Probability sampling
  - Non-probability sampling

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- A population is the aggregate of all the cases that conform to the researcher's designated set of specifications.
- For a random sampling design it is imperative that each element is included in the sample. Equal element means the probability of each element in the population is the same and is not influenced by other considerations.
- A simple random sample may be defined as one in which each and every individual of the population has an equal chance of being included in the sample and also the selection of one individual is in no way dependent upon the selection of another person.
- Accidental sampling is also called incidental sampling. It is based on a non-probability sampling plan. Here, the investigator chooses the sample according to convenience.
- Double sampling means drawing a sample of individuals from a sample that has already been drawn, e.g., from a population of 10,000 people, a sampling of 1000 is drawn.
- A sample survey requires study in small portions of population as there can be certain amount of inaccuracy in the information collected during sampling analysis. This inaccuracy is called sampling error or error variance.
- Biased observations may result from a poorly designed questionnaire, an ill-trained interviewer, failure of a respondent's memory, etc. Bias in the flow of data may be due to unorganized collection procedure, faulty editing or coding of responses.
- Non-sampling errors can occur at every stage of planning and execution of the census or survey. Such errors can arise due to a number of causes, such as defective methods of data collection and tabulation, faulty definition, incomplete coverage of the population or sample, etc.

3.7 KEY TERMS

- **Research design:** It is the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to control variance.
- **Extraneous variables:** Independent variables that are not a part of research, but still affect the dependent variables are known as extraneous variables.
- **Experimentation:** It is the process of examining and verifying the hypothesis related to some research problem.
- **Cohort:** A group of respondents who experience the same event within the same time interval is referred to as a 'cohort'.
- **Parameter:** A measure based on the entire population is called a parameter.
- **Statistic:** A measure based on the sample is called a statistic.
- **Size:** It refers to the number of items selected from the universe to constitute a sample.
- **Population:** It is the aggregate of all the cases that conform to the researcher's designated set of specifications.

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3.8 ANSWERS TO 'CHECK YOUR PROGRESS'

1. Research design is a structure that gives an outline of the overall research work. It is the result of better planning and implementation of a good strategy.
2. A research design is significant as it has the following advantages:
   - It helps in the smooth functioning of various research operations.
   - It requires less effort, time and money.
   - It helps to decide the methods and techniques to be used for collecting and analysing data.
3. Ronald A. Fisher has classified three basic principles of research design, which are:
   - Replication
   - Randomization
   - Local control
4. Exploratory research design is also known as formulative research design. In this research design, a specific subject is investigated. It helps to generate a set of hypotheses or research-based questions that can be used at a later stage.
5. The two categories of conclusive research designs are descriptive and causal.
6. The confounding variables can be controlled by using the randomization technique or by implementing the pre-testing and post-testing methods on both the treatment and control groups. This controlling process helps in ensuring valid results, both internally and externally.
7. Before working on an experimental design, the following conditions should be considered:
   - The possibility of categorizing people, places or things in the experiment
   - The possibility of selecting random people, place or things in the experiment
   - The process of random selection to create experimental and control groups to be ethical
8. A population can be finite or infinite. A finite population is one where all the members can be counted. An infinite population is one where all the members cannot be counted (e.g., stars in the sky).
9. Most samples can be categorized into two types:
   (i) Probability sampling
   (ii) Non-probability sampling
10. A population is the aggregate of all the cases that conform to the researcher's designated set of specifications.
11. Advantages of the quota sampling method are:
    - Quota sampling method is quick and easy for gross estimates
    - It is a convenient procedure
    - Elements from the desired strata get included

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12. A sample survey requires study in small portions of population as there can be certain amount of inaccuracy in the information collected during sampling analysis. This inaccuracy is called sampling error or error variance.
13. Apart from reducing errors of bias, the simplest way of increasing the accuracy of a sample is to increase its size. The sampling error usually decreases with increase in sample size and in fact in many situations the decrease is inversely proportional to the square root of the sample size.
14. Non-sampling errors can occur at every stage of planning and execution of the census or survey. Such errors can arise due to a number of causes, such as defective methods of data collection and tabulation, faulty definition, incomplete coverage of the population or sample, etc.

3.9 QUESTIONS AND EXERCISES

Short-Answer Questions

1. What is the need of a research design?
2. List the features of a good research design.
3. Define experimentation. When can an experiment be absolute or comparative experimentation?
4. What are the three methods that are applied for explorative research studies?
5. Differentiate between cross-sectional and longitudinal research design.
6. 'Validating an experimental design includes two factors.' What are the two factors?
7. What is the basic purpose of implementing quasi-experimental design?
8. What are the two types of true experimental designs?
9. What is sampling? Write a note on the types of sampling.
10. List the different systems of drawing a random sample.
11. Why does sampling give rise to sampling errors? What are the types of sampling errors?

Long-Answer Questions

1. Discuss in detail the concept of research design and its features.
2. What are the important concepts related to a research design?
3. Evaluate the types of research design.
4. Describe in detail the experimental research design and its types.
5. Assess the sampling method of samples in research.
6. Explain the different types of sampling.
7. Critically analyse the concept of sampling errors and the effect of biasness on a research programme.
8. What is double sampling? Illustrate with an example.

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3.10 FURTHER READING

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UNIT 4 METHODS OF DATA COLLECTION

Structure

4.0 INTRODUCTION

To understand the multitude of choices available to a researcher for collecting the project/study-specific information, one needs to be fully cognizant of the resources available for the study and the level of accuracy required. To appreciate the truth of this statement, one needs to examine the gamut of methods available to the researcher. The data sources could be either contextual and primary or historical and secondary in nature.

Primary data as the name suggests is original, problem- or project-specific and collected for the specific objectives and needs spelt out by the researcher. The authenticity and relevance is reasonably high. The monetary and resource implications of this are quite high and sometimes a researcher might not have the resources or the time or both to go ahead with this method. In this case, the researcher can look at alternative sources

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of data which are economical and authentic enough to take the study forward. These include the second category of data sources—namely the secondary data.

Secondary data as the name implies is that information which is not topical or research specific and has been collected and compiled by some other researcher or investigative body. The said information is recorded and published in a structured format, and thus, is quicker to access and manage. Secondly, in most instances, unless it is a data product, it is not too expensive to collect. As suggested in the opening vignette, the data to track consumer preferences is readily available and the information required is readily available as a data product or as the audit information which the researcher or the organization can procure and use it for arriving at quick decisions. In comparison to the original research-centric data, secondary data can be economically and quickly collected by the decision maker in a short span of time. Also the information collected is contextual; what is primary and original for one researcher would essentially become secondary and historical for someone else.

Qualitative research, thus, is presumed to go beyond the obvious of constructs and variables that are not visible or measurable; rather they have to be deduced by various methods like observation, schedule, questionnaire, interview, projective, case study, focus groups and content analysis. There are a variety of such methods which will be discussed in detail in this unit. However, common premise of all these are that they are relatively loosely structured and require a closer dialogue or interaction between the investigator and the respondent. The information collected is more in-depth and intensive and results in rich insights and perspectives than those delivered through a more formal and structured method. However, since the element of subjectivity is high, they require a lot of objectivity on the part of the investigator while collecting and interpreting the data. Conducting a qualitative research is an extremely skillful task and requires both aptitude and adequate training in order to result in valuable and applicable data.

4.1 UNIT OBJECTIVES

After going through this unit, you will be able to:

- Explain observation schedule as a tool of data collection
- Discuss the concept of questionnaire as a method of data collection
- Assess schedule as a method of data collection
- Describe how conducting interviews are an important source of data collection
- Explain projective method as a tool of data collection
- Discuss how case studies and content analysis are important sources of data collection

4.2 OBSERVATION

Observations have led to some of the most important scientific discoveries in human history. Charles Darwin used his observations of animal and marine life at the Galapagos Islands to help him formulate his theory of evolution which he described in *On the Origin of Species*. Today, social scientists, natural scientists, engineers, computer scientists, educational researchers and many others use observation as a primary research method.

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The kind of observations one makes depends on the subject being researched. Traffic or parking patterns on a campus can be observed to ascertain what kind of improvements can be made. Clouds, plants or other natural phenomena can be observed as can people, though in the case of the latter, one may often have to ask for permission so as to not violate any privacy issue.

Observation may be defined as '*a process in which one or more persons monitor some real-life situation and record pertinent occurrences*'. It is used to evaluate the overt behaviour of the individual in controlled and uncontrolled situations.

According to Marie Jahoda: 'Observation method is a scientific technique to the extent that it (a) serves a formulated research purpose, (b) is planned systematically rather than occurring haphazardly, (c) is systematically recorded and related to more general propositions than presented as a set of interesting curious, and (d) is subjected to checks and controls with respect to validity, reliability, and precision much as is all other scientific evidence.'

According to Good and Hatt: 'Observation may take many forms and is at once the most primitive and the most modern of research techniques. It includes the most casual, uncontrolled experiences as well as the most exact film records of laboratory experimentation.'

4.2.1 Types of Observation

Observation can be of the following types:

1. **Participant observation:** In the process of 'participant observation', the observer becomes more or less one of the group members and may actually participate in some activity or the other of the group. The observer may play any one of the several roles in observation, with varying degrees of participation, as a visitor, an attentive listener, an eager learner or as a participant observer.
2. **Non-participant observation:** In the process of 'non-participant observation', the observer takes a position where his/her presence is not felt by the group. He/She may follow the behaviour of an individual or characteristics of one or more groups closely. In this type of observation, a one-way 'vision screen' permits the observer to see the subject but prevents the subject from seeing the observer.

Observation may also be classified into the following categories:

- ***Natural observation:*** Natural observation involves observing the behaviour in a normal setting and in this type of observation, no efforts are made to bring any type of change in the behaviour of the observed. Improvement in the collection of information can be done with the help of natural observation.
- ***Subjective and objective observation:*** All observations consist of two main components, the subject and the object. The subject refers to the observer, whereas the object refers to the activity or any type of operation that is being observed. Subjective observation involves the observation of one's own immediate experience, whereas the observation involving an observer as an entity apart from the thing being observed is referred to as 'objective observation'. Objective observation is also known as 'retrospection'.
- ***Direct and Indirect observation:*** With the help of the direct method of observation, one comes to know how the observer is physically present, in which type of situation he/she present and then this type of observation

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monitors what takes place. Indirect method of observation involves studies of mechanical recording or recording by some other means like photographic or electronic. Direct observation is relatively straightforward as compared to indirect observation.

- ***Structured and unstructured observation:*** Structured observation works according to a plan and involves specific information of the units that are to be observed and also about the information that is to be recorded. The operations that are to be observed and the various features that are to be noted or recorded are decided well in advance. Such observations involve the use of special instruments for the purpose of data collection that are also structured in nature. But in the case of unstructured observation, its basics are diametrically against the structured observation. In such observations, the observer has the freedom to note down what he/she feels is correct and unlike point of study. This approach of observation is very suitable for exploratory research.
- ***Controlled and non-controlled observation*:** Controlled observations are the observations made under the influence of some external forces. Such observations rarely lead to improvement in the precision of the research results. However, these observations can be very effective if these are made to work in coordination with mechanical synchronizing devices, film recordings, etc. Non-controlled observations are made in the natural environment, and reverse to the controlled observation these observations involve no influence or guidance of any type of external force.

4.2.2 Recording Techniques of Observation

Many different techniques may be employed to study and document a subject's behaviour. The data collection techniques are all accurate but may be suitable for different purposes. While certain methods help gather detailed descriptions of behaviour, certain others facilitate documenting behaviour promptly with bare minimum description.

- **Anecdotal records:** Anecdotal records refer to a few sentences jotted down in a notebook. These sentences pertain to what the subject is engaged in at a particular moment. Only those behaviours that can be seen or heard and that can be counted are documented while creating an anecdotal record.
- **Narrative description:** Narrative description is also known as running behaviour record and specimen record, and is a formal method of observation. When following this technique, one is supposed to record continuously in as detail as possible,like what the subject is doing and saying when alone or when interacting with other people. In its methodology, it is similar to anecdotal record but is definitely more detailed. The researcher studies the context setting, the behaviour patterns, and the order in which they take place. The main aim of this technique is to gain an objective description of a subject's behaviour without conjecture, analysis, or assessment.
- **Checklists:** Checklists are usually standardized forms which list specific skills and behaviours based on standard levels or are specifically compiled by the researcher for a particular research study.
- **Interviewing:** In this observation technique, the researching team tries to identify the feelings and beliefs of the subjects, that are not visible through simple

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observation. During the process of interviewing, everything that the subject says must be recorded exactly as it is. The interviewer should avoid any kind of editing of the interview subscript.

- **Time sampling:** This method is distinct from others in two ways—it monitors and keeps an account of a few chosen samples of subject's behaviour, and is carried out only during prearranged periods of time. When a behaviour pattern is seen during the specified time interval, it is recorded. This technique therefore helps to gather representative examples of behaviour.
- **Frequency counts:** In some cases, a researcher may be more interested in studying the frequency of an occurrence or behaviour or another pattern, such as how often a consumer buys a particular product or how often an individual started a conversation with a colleague. To get this data, the researcher will have to keep a count of the frequency of the particular behaviour and study how long the behaviour lasts. This is usually done by simply marking an occurrence on a chart each time the behaviour is repeated.
- **Event sampling:** This technique is focused on observing specific behaviours or events in a subject's behaviour pattern. However, it does not take into account the frequency or the length of the recording interval.

4.2.3 Advantages and Disadvantages of Observation

The advantages of observation are as follows:

- This technique is employed to observe characteristics of various designs of school buildings and equipment.
- For coaching purposes, an observation of various skills in games and athletics is made.
- A study of the significant aspects of personality which express themselves in behaviours can be made.
- The behaviour of the children in a classroom situation can be effectively analysed.
- The behaviour of those who cannot read, write or speak can be observed.
- Observation of skills in a workshop is made directly.
- Observation of pupils' behaviour as recorded in the cumulative records of pupils could serve as an anecdotal evidence and supply data for research studies.

The disadvantages of observation are as follows:

- It is very difficult to establish the validity of observations.
- Many items of observation cannot be defined.
- The problem of subjectivity is involved.
- Observation may give undue stress to aspects of limited significance simply because they can be recorded easily, accurately and objectively.
- Various observers observing the same event may concentrate on different aspects of a situation.
- The observers have little control over the physical situation.

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- Children being observed become conscious and begin to behave in an unnatural manner.
- Many children try to pose and exhibit at the time of observation.
- There are certain situations which observers are not allowed to observe, and are expected to produce an accurate account.
- It may not be feasible to classify all the events to be observed.
- Observation is a slow and laborious process.
- There may be lack of agreement among the observers.
- The data to be observed may be unmanageable.
- Observation needs competent observers and it may be difficult to find them.
- Observation is a costly affair. It involves lot of expenses on travelling, staying at the places where the events are taking place and purchasing sophisticated equipment to help in observation.

4.2.4 Characteristics of Observation for Research

The characteristics of observation for research are as follows:

- Observation schedule should be specific.
- The steps should be systematic.
- It should be quantitative.
- It should be recorded immediately.
- It should be made by experts.
- Schedule should be scientific. We should be able to check and substantiate the results.

Jennifer Symonds gives a list of nine essential characteristics of good observation, which are as follows;

- Good eyesight
- Alertness
- Ability to estimate
- Ability to discriminate
- Good physical condition
- An immediate record
- Good perception
- Freedom from preconceptions
- Emotional disinterest

Planning Administration Aspect of Observation

This includes the following:

- Securing an appropriate group of persons to observe
- Deciding and arranging any special conditions for the group
- Determining the length of each observation period, the interval between periods and the number of periods

Points to be Considered while Defining the Activities

These are as follows:

- Inclusion of those activities which are true representatives of the general category one is studying
- Defining those activities very carefully.

While arranging for the record, the following points should receive attention:

- Deciding the form for recording so as to make note-making easy and rapid
- Deciding the use of appropriate symbols, abbreviations and some use of shorthand

One can train oneself by:

- Training oneself to observe others as perception improves with practice
- Studying manuals that list observation techniques

Planning Effective Observation

This includes the following:

- Sampling to be observed should be adequate; appropriate group of subjects should be there
- Units of behaviour should be defined as accurately as possible
- Method of recording should be simplified
- Detailed instructions may be given to observers to eliminate the difference in the perspectives of observers
- Too many variables may not be observed simultaneously
- Excessively long periods of observation without interspersed rest periods should be avoided
- Observers should be fully trained
- Observers should be well equipped
- Conditions of observation should remain constant
- Number of observations should be adequate
- Records of observation must be comprehensive
- Length of each observation period, interval between periods, and number of periods should be clearly stated
- Interpretations should be carefully made

4.3 QUESTIONNAIRE TOOLS

A questionnaire is 'a tool for research, comprising a list of questions whose answers provide information about the target group, individual or event'. Although they are often designed for statistical analysis of the responses, this is not always the case. This method was the invention of Sir Francis Galton. Questionnaire is used when factual information is desired. When opinion rather than facts are desired, an opinionative or attitude scale is

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Check Your Progress

1. Define observation.
2. What are the main components of the observation method?
3. List two disadvantages of observation method of data collection.

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used. Of course, these two purposes can be combined into one form that is usually referred to as 'questionnaire'.

Questionnaire may be regarded as a form of interview on paper. The procedure for the construction of a questionnaire follows a pattern similar to that of the interview schedule. However, because the questionnaire is impersonal, it is all the more important to take care of its construction.

A questionnaire is a list of questions arranged in a specific way or randomly, generally in print or typed and having spaces for recording answers to the questions. It is a form which is prepared and distributed for the purpose of securing responses. Thus, a questionnaire relies heavily on the validity of the verbal reports.

According to Goode and Hatt, '*in general, the word questionnaire refers to a device for securing answers to questions by using a form which the respondent fills himself.*'

Barr, Davis and Johnson define questionnaire as, '*questionnaire is a systematic compilation of questions that are submitted to a sampling of population from which information is desired'* and Lundberg says, *'fundamentally, questionnaire is a set of stimuli to which literate people are exposed in order to observe their verbal behaviour under these stimuli.*'

4.3.1 Types of Questionnaire

Figure 4.1 depicts the types of questionnaires that are used by researchers.

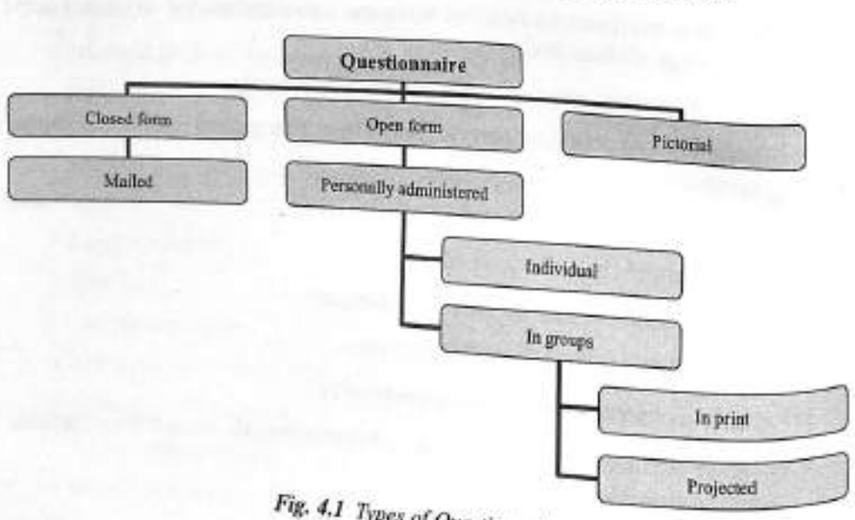

Fig. 4.1 Types of Questionnaires

Commonly used questionnaires are:

1. **Closed form:** Questionnaire that calls for short, check-mark responses are known as closed form type or restricted type. They have highly structured answers like mark a 'yes' or 'no', write a short response or check an item from a list of suggested responses. For certain types of information, the closed form questionnaire is entirely satisfactory. It is easy to fill out, takes little time, keeps the respondent on the subject, is relatively objective and is fairly easy to tabulate and analyse.

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For example, How did you obtain your Bachelors' degree? (Put a tick mark against your answer)

a. As a regular student
b. As a private student
c. By distance mode

These types of questionnaires are very suitable for research purposes. However, construction of such a type of questionnaire requires a lot of labour and thought. It is generally lengthy as all possible alternative answers are given under each question.

2. **Open form:** The open form or unrestricted questionnaire requires the respondent to answer the question in their own words. The responses have greater depth as the respondents have to give reasons for their choices. The drawback of this type of questionnaire is that not many people take the time to fill these out as they are more time consuming and require more effort, and it is also more difficult to analyse the information obtained.

Example: Why did you choose to obtain your graduation degree through correspondence?

No alternative or plausible answers are provided. The open form questionnaire is good for depth studies and gives freedom to the respondents to answer the questions without any restriction.

Limitations of open questionnaire are as follows:

- Difficult to fill out
- Respondents may never be aware of all the possible answers
- Takes longer to fill
- Returns are often few
- Information is too unwieldy and unstructured, and hence difficult to analyse, tabulate and interpret

Some investigators combine the approaches and the questionnaires carry both the closed and open form items. In the close ended questions, the last alternative is kept open for the respondents to provide their optimum response. For example, 'Why did you prefer to join B.Ed. programme?

(a) Interest in teaching
(b) Parents' wish
(c) For securing a government job
(d) Other friends opted for this and
(e) Any other.'

3. **Pictorial form:** Pictorial questionnaires contain drawings, photographs or other such material rather than written statements and the respondents are to choose answers in terms of the pictorial material. Instructions or directions can be given orally. This form is useful in working with illiterate persons, young children and persons who do not know a specific language. It keeps up the interest of the respondent and decreases subjects' resistance to answer.

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4.3.2 Questionnaire Administration Modes

Main modes of questionnaire administration are as follows:

- **Through mail:** Mailed questionnaires are the most widely used and also perhaps the most criticized tool of research. They have been referred to as a 'lazy person's way of gaining information'. The mailed questionnaire has a written and signed request as a covering letter and is accompanied by a self-addressed, written and stamped envelope for the return by post. The method of mailing out the questionnaire is less expensive in terms of time, funds required; it provides freedom to the respondent to work at his/her own convenience and enables coverage of a large population.
- **Personal contact/face-to-face:** Personally administered questionnaires both in individual and group situations are helpful in some cases and have the following advantages over the mailed questionnaire: (i) the investigator can establish a rapport with the respondents; (ii) the purpose of the questionnaire can be explained; (iii) the meaning of the difficult terms and items can be explained to the respondents; (iv) group administration when the respondents are available at one place is more economical in time and expense; (v) the proportion of non-response is cut down to almost zero; and (vi) the proportion of usable responses becomes larger. However, it is more difficult to obtain respondents in groups and may involve administrative permission which may not be forthcoming.
- **Computerized questionnaire:** It is a mode of questionnaire administration where the questions need to be answered on the computer.
- **Adaptive computerized questionnaire:** It is a mode of questionnaire administration presented on the computer where the next questions are adjusted automatically according to the responses given as the computer is able to gauge the respondent's ability or traits.

4.3.3 Appropriateness of Questionnaire

The qualities and features which make questionnaires an effective instrument of research and help to elicit maximum information are discussed below:

- **Type of information required:** The usefulness and effectiveness of a questionnaire is determined by the kind of information sought. Not every type of questionnaire can be elicited through it. A questionnaire which will consume more than 10–20 minutes is unlikely to get good response. Also, the questions should be explicit and capable of clear-cut replies.
- **Type of respondent reached:** A good deal depends upon the types of respondents covered by the questionnaire. All types of individuals cannot be good respondents. Only literate and socially conscious individuals would give any consideration to a questionnaire. Also, the respondent must be competent to answer the kind of questions contained in a particular questionnaire.
- **Accessibility of respondents:** Questionnaires sent by e-mail can help to survey the opinion of the people living in far-flung places.
- **Precision of the hypothesis:** Appropriateness of the questionnaire also depends upon how realistic is the hypothesis in the mind of the researcher. The researcher must frame questions in such a manner that they elicit responses needed to verify the hypothesis.

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4.3.4 Types of Questions

There are many types of questions that can be asked, but the way to get to the correct answer is to know which is the right question. It requires knowledge and expertise to design the correct type of questionnaire.

The following is a list of the different types of questions which can be included in a questionnaire design:

- **Open format questions:** Open format questions are those which give the respondent a chance to communicate their individual opinions. There are no set answers to choose from. Responses from open format questionnaires are insightful and even unexpected. Qualitative questions are an example of open format questions. An ideal questionnaire is one which ends with an open format question giving the respondents the chance to state their opinion or ask for their suggestions.
  Example: 'State your opinion about the grading system in education.'
  A respondent's answer to an open-ended question is coded into a response scale afterwards. An example of an open-ended question is a question where the person being tested has to complete a sentence (sentence completion item).
- **Closed format questions:** Multiple choice questions are the best example of closed format questions. Closed format questions generate responses that can be statistics or percentages in nature. Preliminary analysis can also be performed with ease. Closed format questions have the added advantage of being able to monitor opinions over a period of time as they can be put to different groups at different intervals.
  Example: 'Who is not an educationist among the following?'
  (i) Prof Yashpal (ii) John Dewy (iii) Milkha Singh (iv) Rabindranath Tagore
- **Leading questions:** These types of questions force the audience to give a particular type of answer.
  Example: 'How would you rate the grading system in India?'
  (i) Fair (ii) Good (iii) Excellent (iv) Superb.
- **Likert questions:** Likert questions can help you ascertain how strongly your respondent agrees with a particular statement. Likert questions can also help to assess liking and disliking.
  Example: 'Are you punctual in attending your classes?'
  (i) Always (ii) Mostly (iii) Normally (iv) Sometimes (v) Never
- **Rating scale questions:** In rating scale questions, the respondent is asked to rate a particular issue on a scale that may range from poor to good. Rating scale questions usually have an even number of choices, so that respondents are not given the choice of a middle option.
  Example: 'How was the food at the restaurant?'
  (i) Good (ii) Fair (iii) Poor (iv) Very Poor

Questions to be Avoided during Preparation of a Questionnaire

The following questions should be avoided when preparing a questionnaire:

- **Embarrassing questions:** Embarrassing questions are those that ask respondents about their personal and private life. Embarrassing questions are mostly avoided.

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- **Positive/Negative connotation questions:** While defining a question, strong negative or positive overtones must be avoided. Depending on the positive or negative association of our question, we will get different data. Ideal questions should have neutral or subtle overtones.
- **Hypothetical questions:** Hypothetical questions are questions that are based on assumption and hope. An example of a hypothetical question would be 'If you were a director in the education department, what changes would you bring about?' These types of questions force the respondents to give their ideas on a particular subject. However, these kinds of questions do not give consistent or clear data.

4.3.5 Steps for Preparing and Administering the Questionnaire

The steps involved in preparing and administering the questionnaire are as follows:

- **Planning the questionnaire:** One should get all the help possible in planning and constructing the questionnaire. Other questionnaires should be studied and items should be submitted for criticism to other members of the class or faculty.
- **Modifying questions:** Items can be refined, revised or replaced by better items. If a computer is not readily available for easily modifying questions and rearranging the items, it is advisable to use a separate card or slip for each item. This procedure also provides flexibility in arranging items in the most appropriate psychological order before the instrument is finalized.
- **Validity and reliability of questionnaire:** Questionnaire designers rarely deal with the degree of validity and reliability of their instrument. There are ways to improve both validity and reliability of questionnaires. Basic to the validity of a questionnaire is asking questions in the least ambiguous way. The meaning of all terms must be clearly defined so that they have the same meaning to all respondents. The panel of experts may rate the instrument in terms of how effectively it samples significant aspects of content validity. The reliability of the questionnaire may be tested by a second administration of the instrument with a small sub-sample, comparing the responses with those of the first. Reliability may also be estimated by comparing the responses of an alternate form with the original from.
- **Try out or pilot testing:** The questionnaire should be tried on a few friends and acquaintances. What may seem perfectly clear to the researcher may be confusing to the other person who does not have the frame of reference that the researcher has gained from living with and thinking about an idea over a long period. It is also a good idea to pilot test the instrument with a small group of persons similar to those who will be used in the study. They may reveal defects that can be corrected before the final form is printed.
- **Information level of respondents:** It is important that the questionnaire be sent only to those who possess the desired information and are likely to be sufficiently interested to respond objectively and conscientiously. A preliminary card asking whether the individual would respond is recommended by some research authorities.
- **Getting permission:** If the questionnaire is to be used in a public school, it is essential that approval for the project is secured from the Principal. Students should be informed that participation is voluntary. If the desired information is delicate or intimate in nature, the possibility of providing for anonymous responses should be considered. The anonymous instrument is most likely to produce objective and honest responses.
- **Cover letter:** A courteous, carefully constructed cover letter should be included to explain the purpose of the study. The cover letter should assure the respondent that all information will be held in strict confidence. The letter should promise some sort of inducement to the respondent for compliance with the request. In educational circles, a summary of questionnaire results is considered an appropriate reward, a promise that should be scrupulously honoured after the study has been completed.
- **Follow-up procedures:** Recipients are often slow to return completed questionnaires. To increase the numbers of returns, a vigorous follow-up procedure may be necessary. A courteous postcard reminding the recipient may bring in some additional responds. A further step in follow-up may involve a personal letter or reminder. In extreme cases, it may be appropriate to send the copy of questionnaire with a follow-up letter.
- **Analysing and interpreting questionnaire responder:** Data obtained by the questionnaire is generally achieved through calculation and counting. The total is converted into proportion or percentages. Calculation of contingency coefficient of correlation is often made in order to suggest probability of relation among data. Computation of chi-square statistics in it is also advisable.

Improving the Validity of a Questionnaire

The validity of the information collected through a questionnaire can be improved by using the following techniques:

- The questions should be relevant to the subject or problem.
- The questions should be perfectly clear and unambiguous.
- The questions should be retroactive and not repulsive.
- Check whether the information has been collected from a reasonably good proportion of respondents.
- The information should show a reasonable range of variety.
- The information should be consistent with what is already known or is expected.
- Use another external criterion like consultation of documents or interview with a small group of respondents to cross check the truthfulness of the information given through the questionnaire.

Question sequence should be the following:

- Questions should flow logically from one to the next.
- The researcher must make sure that the answer to a specific question is not prejudiced by earlier questions.
- Questions should flow from the more general to the more specific.
- Questions should follow an order which starts from the least sensitive to the most sensitive.
- Questions should flow from factual and behavioural questions to attitudinal and opinion questions.
- Questions should flow from unaided to aided questions.

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The three stages theory (also known as the sandwich theory) should be applied when sequencing questions. The order to be followed should be first, screening and rapport questions; second, the product specific questions; and third, demographic questions.

Questionnaire Construction Issues

The following problems are faced by a researcher while constructing a questionnaire.

- It is very important to know exactly how you are going to use the information received from the research conducted. If the research or information cannot be implemented or acted upon, then the research would just have been a waste of time, money and effort.
- Clear parameters regarding the research's aims and scope should be drawn before starting the research. This would include the questionnaire's time frame, budget, manpower, intrusion and privacy.
- The target audience selected will depend on how arbitrarily one has chosen the respondents and what the selection criteria are.
- The framework of expected responses should be clearly defined so that the responses received are not random.
- Only relevant questions should be included in the questionnaire as unrelated questions are a burden on the researcher and respondent.
- If you have formed a hypothesis which you want to study then you will know what questions need to be asked.
- The respondents' background and education should not influence the way they answer the questions.
- The type of scale, index, or typology to be used shall be determined.
- The questions asked (closed, multiple-choice, and open) should adhere to the statistical data analysis techniques available and the goals of the study.
- Questions and prepared responses to choose from should not be biased. A biased question or questionnaire influences the responses given.
- The order in which the questions are presented or asked is also important as the earlier questions and their responses may influence the later ones.
- The language should be kept simple to avoid ambiguity. Ambiguous words may cause misunderstanding, possibly invalidating questionnaire results. Double negatives should also be avoided.
- Questions should address only one issue at a time so that the respondent is not confused as to what response is required.
- The list of possible responses should be comprehensive so that respondents should not find themselves without a suitable response. A solution to this would be to add the category of 'other' in the options.
- Categories in the questionnaire should be kept separate. For example, in both the 'married' category and the 'single' category—there may be a need for separate questions on marital status and living situation.
- Writing style should be informal yet to the point and suitable for the target audience.
- Personal questions about age, income, marital status, etc., should be placed at the end of the survey so that even if the respondent is hesitant to give out personal information, they would still have answered the other questions.

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- Questions which try to trick the respondent may end in inaccurate responses.
- Presentation which is pleasing to the eye with the use of colours and images can end up distracting the respondent.
- Numbering the questions would be helpful.
- Whoever administers the questionnaire, be it research staff, volunteers or whether self-administered by the respondents, it should have clear, detailed instructions.

Factors Affecting Reliability of Answers

Factors affecting reliability of answers are as follows:

- **Confusing questions:** If the questions are not easily understood or they are capable of being interpreted in more than one way, the answers might be unreliable because the answer may be the result of misinterpretation of the questions not intended by the researcher.
- **Prejudice regarding sample:** The responses received from the sample may not be true representations of the sample.
- **Lack of coverage to illiterates:** This method is inapplicable to illiterates and semi-illiterates as they will be unable to read the questions.
- **Response selectivity:** The respondents of a questionnaire may belong to a selected group. Therefore, the conclusions lack the kind of objectivity and representativeness essential for its validity.

4.3.6 Importance and Limitations of Questionnaire Method

As a matter of fact, this method can be applied in a very narrow field. It can be used only if the respondents are educated and willing to cooperate. However, it is still widely used, owing to the following merits:

- **Economical:** The questionnaire requires paper, printing and postage only. There is no need to visit the respondents personally or continue the study over a long period.
- **Time saving:** Besides saving money, the questionnaire also saves time. Data can be collected from a large number of people within a small time frame.
- **Most reliable in special cases:** It is a perfect technique of research in some cases.
- **Research in wide area:** Mailed questionnaire comes very handy if the sample comprises people living at great distances.
- **Suitable in specific type of responses:** The information about certain problems can be best obtained through the questionnaire method.

Limitations of the Questionnaire Method

Like all other methods, the questionnaire is also limited in value and application. This means that it cannot be used in every situation and that its conclusions are not always reliable. Key limitations of the method are as follows:

- **Limited response:** As noted earlier, this method cannot be used with illiterate or semi-illiterate groups. The number of persons who cooperate and respond to the questionnaire is very small.

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- **Lack of personal contact:** There is very little scope of personal contact in this method. In the absence of personal contact, very little can be done to persuade the respondents to fill up the questionnaire.
- **Useless in-depth problems:** If a problem requires deep and long study, it is obvious that it cannot be studied by the questionnaire method.
- **Possibility of wrong answers:** A respondent may not really understand a question or may give the answer in a casual manner. In both cases, there is a strong likelihood of misleading information being given.
- **Illegibility:** Some persons write so badly that it is difficult to read their handwriting.
- **Incomplete response:** There are people who give answers which are so brief that the full meaning is incomprehensible.

4.4 SCHEDULES

A schedule is a questionnaire containing a set of questions that are required to be answered to collect data about a particular item. A schedule is generally used in a face-to-face situation. The following are the objectives for which a schedule is created:

- It is created for a definite item of inquiry. A schedule sets the boundaries for the subject under study.
- It acts as an aid to memorize the information being collected by the interviewer from various respondents. It helps to avoid being confused while analysing and tabulating the data.
- It helps in tabulating and analysing the data in a systematic and standardized manner.

Characteristics of a Good Schedule

The essential characteristics of a good schedule are as follows:

- The information or questions included in the schedule should be accurate and should enable the respondent to understand properly the context in which the questions are being asked.
- The schedule should be pre-arranged and structured in such a manner that the information gathered or collected should be accurate and tenable. For this, the following points must be considered:
  - o The size of the schedule should be accurate.
  - o The questions in the schedule should be understandable and definite.
  - o The questions should not contain any biased evaluation.
  - o All the questions of the schedule should be properly interlinked.
  - o The information gathered should be organized in a table so that it can be easily used for statistical analysis.

Suitability of the Schedule Method

The schedule method is mostly applied in the following situations:

- When the field of investigation is wide and dispersed
- When the researcher requires quick results at lesser cost
- When the respondents are well-trained and educated

Check Your Progress

4. What is a questionnaire?
5. What are the limitations of open form questionnaire?
6. What is the three stages theory when sequencing questions?
7. List two limitations of the questionnaire method.

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4.4.1 Types of Schedules

There are five types of schedules, which are as follows:

- **Observation schedule**: This schedule is used to observe all the activities and record the responses of the respondents under some predefined conditions. The main idea behind examining the activities is to verify the required information.
- **Rating schedule**: It is used to measure and rate the thoughts, preferences, self-consciousness, perceptions and other similar characteristics of the respondent.
- **Document schedule**: It is used for collecting important data and preparing a source list. This schedule is mostly used to attain data from autobiographies, diaries or government records regarding written facts and case histories.
- **Institution survey schedule**: It is used for studying the problems of institutions.
- **Interview schedule**: It is used to ask the interviewee questions and record the responses in the space provided in the questionnaire itself.

Merits and Limitations of the Schedule Method

The merits of the schedule method are as follows:

- In this method, the researcher is always there to help the respondents. So, the response rate is high as compared to other methods of data collection.
- The presence of the researcher not only removes doubts present in the mind of the respondent, but also avoids false replies from the respondent due to fear of cross-checking.
- In this method, there is personal contact between the researcher and the respondent. Thus, the data can be collected easily and can also be relied upon.
- This method helps to better understand the personality, living conditions and values of the respondents.
- It is easy for the researcher to detect and rectify defects in the schedule during sampling.

Limitations of the Schedule Method

The limitations of this method are as follows:

- It is a costly and time-consuming method.
- It requires well-trained and experienced field workers for conducting interviews
- Sometimes, the respondent may not be able to speak out due to the physical presence of the researcher.
- If the field of research is dispersed, it becomes difficult to organize the various activities of the research.

4.4.2 Organization of the Schedule

The schedule is prepared by performing the following steps:

- **Selection of respondents**: Usually, the sampling method is used for the selection of respondents. The sample should be representative of the respondents and should contain all the relevant information about the respondents.

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- **Selection and training of field workers**: Since the field workers interview the respondents and collect the required data, this should be done carefully and proper training should be provided to them.
- **Conducting interviews**: For a successful interview and correct results, the following points must be kept in mind:
  - **Follow correct approach**: The field worker should go to the respondent with the correct approach so that the respondent can clearly understand the purpose of the interview.
  - **Generating accurate responses**: For proper and accurate response from the respondents, the respondents should not be misunderstood in their perspective and context.

4.4.3 Difference between Questionnaire and Schedule

When you work with questionnaires and schedules, you will observe that there are several similarities between the two. However, there are prominent differences also, which are as follows:

- A questionnaire is mostly sent by the interviewer to the interviewee by mail and is filled by the interviewee, whereas a schedule is filled by the interviewer at the time of interview.
- Data collection through a questionnaire is cheaper as compared to a schedule, as money is spent only in preparing the schedules and mailing them. In the schedule method, extra money is spent on appointing interviewers and imparting training to them.
- In the case of a questionnaire, response is generally low because many people do not respond. On the other hand, response is high in the case of schedules since the interviewer fills them at the time of the interview.
- The identity of the respondent is not always clear in the case of a questionnaire, whereas in the case of schedules, the identity of the interviewee or respondent is known.
- The questionnaire method is time consuming as the respondent may not return the questionnaire in time. There is no such problem with the schedule method because the schedule is filled at the time of the interview.
- The questionnaire method does not allow personal contact with the respondent but the schedule method does.
- The questionnaire method is useful only if the respondent is literate, while in the case of a schedule, it is not necessary for the interviewee to be literate.
- The risk of incomplete and incorrect information is more in a questionnaire, while in a schedule, the information collected is complete and more accurate.

4.5 INTERVIEW

One of the main methods of data collection is conducting interviews. It takes place as a two-way conversation between the researcher and the respondent, whereby information is gathered by asking topic related questions.

Check Your Progress

8. What is a schedule?
9. When is the interview schedule used?

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We learn not only from the respondents' responses but also his/her gestures, facial expressions and pauses. Interviewing can be conducted either face-to-face or over the telephone by skilled personnel by using a structured schedule or an unstructured guide.

According to Rummel J. Francis: '*The interview method of collecting data requires the actual physical proximity of two or more persons, and generally requires that all the normal channels of communication be open to their use. It is necessary to see one another, to hear each other's voices, to understand one another's language, and to use all that is psychologically inherent in physical proximity. It usually entails a non-reciprocal relation between the individuals concerned. One party desires to get information from another—one party interviews the other—for a particular purpose.*'

Theodore L. Torgerson has stated that the interview method of study extends certain aspects of the observational technique.

Thus, the interview method permits the gathering of development data to supplement the cross-sectional data obtained from observations. The interviewer can probe into casual factors, determine attitudes, discover when the problem started, enlist the interviewee in an analysis of his own problem and secure his support of the therapy to be applied.

4.5.1 Types of Interviews

The different types of interviews are as follows:

- **Group interview:** A proper setting for group interviews requires a group of not more than 10 to 12 persons with some social, intellectual, and educational homogeneity, which ensures effective participation by all. For a full spontaneous participation of all, it is better to arrange a circular seating arrangement.
- **Diagnostic interview:** Its purpose is to locate the possible causes of an individual's problems, getting information about his past history, family relations and personal adjustment problem.
- **Clinical interview:** Such an interview follows after the diagnostic interview. It is a means of introducing the patient to therapy.
- **Research interview**: Research interview is aimed at getting information required by the investigator to test his/her hypothesis or solve his/her problems of historical, experimental, survey or clinical type.
- **Single interview or panel interviews:** For the purpose of research, a single interviewer is usually present. In case of selection and treatment purposes, panel interviews are held.
- **Directed interview:** It is structured, includes questions of the closed type and is conducted in a prepared manner.
- **Non-directive interview:** It includes questions of the open-ended form and allows much freedom to the interviewee to talk freely about the problem under-study.
- **Focused interview:** It aims at finding out the responses of individuals to exact events or experiences rather than on general lines of enquiry.

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- **Depth interview:** It is an intensive and searching kind of interview. It emphasizes certain psychological and social factors relating to attitudes, emotions or convictions.

It may be observed that on occasions several types are used to obtain the needed information.

Other classifications of interviews are as follows:

- Intake interview, as the initial stage in clinic and guidance centres
- Brief talk contacts as in schools and recreation centres
- Single hour interview
- Clinical psychological interview, stressing psychotherapeutic counselling and utilizing case history data and active participation by the counsellor in the re-education of the client
- Psychiatric interviews, similar to psychological counselling, but varying with the personality and philosophical orientation of the individual worker and with the setting in which used
- Psychoanalytic interviews
- Interview form of test
- Group interviews for selecting applicants for special course
- Research interview

4.5.2 Important Elements of Research Interview

The important elements of research interview are as follows:

1. Preparation for Research Interview

- Decide the category and number of persons that you would like to interview.
- Have a clear conception of the purpose and the information required.
- Prepare a clear outline, a schedule or a checklist of the best sequence of questions that will systematically bring out the desired information.
- Decide the type of interview that you are going to use, i.e., structured or non-structured interview.
- Have a well thought-out plan for recording responses.
- Fix up the time well in advance.
- Procure the tools to be used in recording responses.

2. Executing an Interview

- Be friendly and courteous and put the respondent at ease so that he talks freely.
- Listen patiently to all opinions and never show surprise or disapproval to a respondent's answer.
- Assume an interested manner towards the respondent's opinion, and as far as possible do not divulge your own.
- Keep the direction of the interview in your own hands and avoid irrelevant conversation and try to keep the respondent on track.
- Repeat your questions slowly and with proper emphasis in case respondent shows signs of failing to understand a particular question.

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3. Obtaining the Response

Perhaps the most difficult part of the job of an interviewer is to obtain a specific, complete response. People can often be evasive and answer 'do not know' if they do not want to make an effort of thinking. They can also misunderstand the question and answer incorrectly in which case the interviewer would have to probe more deeply.

An interviewer should be skilled in the technique as only then can the interviewer gauge whether the answers are incomplete or non-specific. Each interviewer must fully understand the motive behind asking particular questions and whether the answer is giving the information required. The interviewer should form the habit of asking himself/ herself, 'Does that completely answer the question that I just asked?'

Throughout, the interviewer must be extremely careful as to not suggest a possible reply. The interviewer should always content himself with mere repetition (if the question is not understood to answer).

4. Reporting the Response

There are two chief means of recording opinion during an interview. If the question is preceded, the interviewer only needs check a box or circle or code, or otherwise indicate which code comes closest to the respondent's opinion. If the question is not preceded, the interviewer is expected to record the response verbatim.

The following points may be kept in view in this respect:

- Quote the respondents directly, just as if the interviewers were newspaper reporters taking down the statement of an important official without paraphrasing the reply, summarizing it in the interviewer's own words, 'polishing up' any slang or correcting bad grammar that distorts the respondent's meaning and emphasis.
- Ask the respondent to wait until the interviewer gets down 'that last thought'.
- Do not write as soon as you have asked the question and do not write while the respondent talks. Wait until the response is completed.
- Use common abbreviations.
- Do not record and evaluate the responses simultaneously.

5. Closing the Interview

It should be accompanied by an expression of thanks giving recognition to the respondent's generosity in sparing time and effort.

6. Use of Tape Recorder in Interview

- It reduces the tendency of the interviewer to make an unconscious selection of data favouring the interviewer's biases.
- The tape recorded data can be played more than once, and thus it permits a thorough study of the data.
- Tape recorder speeds up the interview process.
- Tape recorder permits the recording of some gestures.
- The tape recorder permits the interviewer to devote full attention to the respondent.
- No verbal productions are lost in a tape recorded interview.
- Other things being equal, the interviewer who uses a tape recorder is able to obtain more interviews during a given time period than an interviewer who takes

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notes or attempts to reconstruct the interview from memory after the interview has been completed.

4.5.3 Indifferent Attitude of the Respondent and the Role of the Research Worker

It is observed that the research worker is likely to encounter several problems arising out of the apathy of the respondents. In such a situation, the following points may be kept in view:

- When the respondent is really busy and has no time, the field worker may request for a more convenient time.
- When the respondent simply wants to avoid the interview and is not inclined to be bothered about it, the field worker should try to explain to the respondent the importance of the study, and how the respondent's own response is of material value in the case.
- When the respondent is afraid to give the interview as it affects his boss or the party to which he belongs or any other cause which is likely to harm his interest, the field worker must assure the respondent that absolute secrecy would be maintained by the researcher and the organization.
- When the respondent does not hold a high opinion about the outcome of such interviews in general, or has a poor opinion about the research organization or institution conducting it, it is the duty of the research worker at such times to explain to the respondent the importance of the problem, and convince the respondent regarding the status of the research body.
- When the respondent is suspicious and he thinks that the enquiry is either from the income tax department or some other secret agency, at such times he may generally ask such questions. Who are you? Who told you our name? Have you interviewed the neighbour? etc. The research worker should try to eliminate the respondent suspicion. A letter of authority, the letter head or the seal of the research body would prove to be useful on such occasions.
- When the respondent is unsocial or otherwise confined to his own family (such a tendency is mostly found in the case of newly married couples), the research worker at such times will try to create the respondent's interest in the subject of investigation.
- When the respondent is too haughty and thinks it below his dignity to grant an interview to petty research workers, the investigator should get a letter of introduction from an influential person.

4.5.4 Advantages and Disadvantages of Interview Method

The advantages of interview method over other techniques are as follows:

- A well-trained interviewer can obtain more data and greater clarity by altering the interview situation. This cannot be done in a questionnaire.
- An interview permits the research worker to follow-up leads as contrasted with the questionnaire.
- Questionnaires are often shallow and they fail to dig deeply enough to provide a true picture of opinions and feelings. The interview situation usually permits much greater depth.

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- It is possible for a skilled interviewer to obtain significant information through motivating the subject and maintaining rapport, other methods do not permit such a situation.
- The respondents when interviewed may reveal information of a confidential nature which they would not like to record in a questionnaire.
- Interview technique can be used in the case of children and illiterate persons who cannot express themselves in writing. This is not possible in a questionnaire.
- The percentage of response is much higher than in case of a mailed questionnaire.
- The field worker is personally present to remove any doubt or suspicion regarding the nature of enquiry or meaning of any question or term used. The answers are, therefore, not biased because of any misunderstanding.
- The field worker may create a friendly atmosphere for proper response. The field worker may start a discussion, and develop the interest of the respondent before showing the schedule. A right atmosphere is very conducive for getting correct replies.
- The interviewee may disclose personal and confidential information which the interviewee would not ordinarily place in writing on paper. The interviewee may need the stimulation of personal contacts in order to be drawn out.
- The interview enables the investigator to follow-up leads and to take advantage of small clues, in dealing with complex topics and questions.
- The interview permits an exchange of ideas and information. It permits 'give and take'.
- It is useful in the case of some categories of persons. The interview enables the interviewee to deal with young children, illiterates and those with limited intelligence or who's state of mind is not quite normal.
- Interviews are also used for pupil counselling, for selection of candidates for instructional purposes, for employment, for psychiatric work, etc.
- The respondent does not feel tired or bored. Supplementary questions may be put to enliven the whole discussion.
- The difficulties of bad handwriting of the respondent, use of pencil, etc., are also avoided as every schedule is filled in by the interviewer.
- A probe into life pattern is possible. The personal contact with the respondent enables the field worker to probe more deeply into the character, living conditions and general life pattern of the respondent. These factors have a great bearing in understanding the background of any reply.
- The information gathered through interviews has been found to be fairly reliable.
- It is possible for the interviewer to probe into attitudes, discover the origin of the problem, etc.
- Interview technique is very close to the teacher. It is generally accepted that no research technique is as close to the teacher's work as the interview.
- Sometimes interviews can be held at suitable intervals to trace the development of behaviour and attitudes.
- Interviews can be used for student counselling, occupational adjustment, selection of candidates for educational courses, etc.

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- Interviews can be used for all kinds of research methods—normative, historical, experimental, case studies and clinical studies.
- Interview techniques provide scope for cross questioning.
- This technique allows the interviewer to remain in command of the situation throughout the investigation.
- Through the respondent's incidental comments, facial expression, bodily movements, gestures, etc., an interviewer can acquire information that could not be obtained easily by other means.
- Cross questioning by the interviewer can enable him/her to judge the sincerity, frankness and insight of the interviewee.

Disadvantages of Interview Method

The method of interview, in spite of its numerous advantages has the following limitations:

- **Very costly:** It is a very costly affair. The cost per case is much higher in this method than in case of mailed questionnaires. Generally speaking, the cost per questionnaire is much less than the cost per interview. A large number of field workers may have to be engaged and trained in the work of collection of data. All this entails a lot of expenditure and a research worker with limited financial means finds it very difficult to adopt this method.
- **Biased information:** The presence of the field worker while encouraging the respondent to reply, may also introduce a source of bias in the interview. At times the opinion of the respondent is influenced by the field worker and his replies may not be based on what he thinks to be correct but what he thinks the investigator wants.
- **Time consuming:** It is a time consuming technique as there is no guarantee how much time each interview can take, since the questions have to be explained, interviewees have to assured and the information extracted.
- **Expertness required:** It requires a high level of expertise to extract information from the interviewee who may be hesitant to part with this knowledge.

Among the important qualities to be possessed by an interviewer are objectivity, insight and sensitivity.

4.6 PROJECTIVE TECHNIQUES

The idea of projecting oneself or one's feelings on ambiguous objects is the basic assumption in projective techniques. The 19 century saw the origin of these techniques in clinical and developmental psychology. However, it was after second World War that these techniques were adopted for use in advertising agencies and market research firms. Ernest Dichter (1960) was one of the pioneers who used these techniques in consumer and motivational research. Consumer surveys and research were considered incomplete if they did not make use of projective techniques (Henry, 1956; Rogers and Beal, 1958; Newman, 1957). However, with the advent of technology and computer-aided analysis, these subjective methods were generally forgotten.

It was only in the 1990s that work done on semiotics, in-depth interviews and renewed interest in human emotions and needs, especially the latent needs and brand personalities led to resurgence of these methods (Belk et al., 1997 and Zaltman, 1997).

Check Your Progress

10. What is the interview method of collecting data according to Rummel J. Francis?
11. What does research interview emphasize?
12. State the significance of a tape recorder while conducting an interview.

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Unlike the other approaches discussed in the unit, these methods involve indirect questioning. Instead of asking direct questions, the method involves a relatively ambiguous stimuli and indirect questions related to imaginary situations or people. The purpose of the research is to present a situation to the respondents to project their underlying needs, emotions, beliefs and attitudes. The ambiguity of the situation is non-threatening and thus a person has no hesitation in revealing his/her true inner motivations and emotions. The more the degree of ambiguity, the more is the range of responses one gets from the respondents. In the theoretical sense, projective techniques unearth beliefs, attitudes and feelings that might underlie certain behaviour or interaction situations. Thus, the respondents' attitudes are uncovered by analysing their responses to the scenarios that are deliberately constructed to stimulate responses from the right side of the brain, which is stated to be the affective side. The second premise of projective techniques is to uncover the different levels of consciousness (Freud, 1911). Generally, the structured methods look at primary motivations; however, it is the underlying latent needs which might drive the individual to behave in a certain manner. The third is to reveal data that is inhibited by socially-desirable and correct responses. Sometimes individuals hesitate to express their prejudices or feelings towards other individuals, groups or objects. Indirect and ambiguous stimuli might reveal startling results in such cases. In psychology, there are a wide variety of techniques available. These can be categorized on the basis of the conduction process. Some of these techniques are briefly discussed below.

1. **Association techniques:** These are the most frequently used methods in management research. They essentially involve presenting a stimulus to the respondent and he needs to respond with the first thing that comes to his mind. The method is essentially borrowed from clinical psychology, the most well-known being the Rorschach Inkblot test. The set of inkblots are ambiguous in nature, however, these are standardized blots symmetrical in nature. The first few are in shades of black and white and the others are coloured. Each of these is presented in a sequence to the consumer. The responses, time taken, the direction in which the blot is turned, are noted. There are norms and scores available for evaluating the personality of the individual. They require a considerable amount of training in conduction and interpretation and, thus, are not commonly used. A technique based on the same principle is called the word association test. This found its earliest uses in 1936 by Houghton for advertising evaluations. The technique involves presenting a group of words and the respondent needs to respond instantly with the first thing that comes to his mind. The critical words are disguised and come after a few neutral or mundane words. The idea is that the element of surprise will reveal associations that lie in the subconscious or the unconscious mind. The words which are selected to address the objectives of the study are called test words and the others are called fillers.

   For example, to attest the extent of eco-friendly attitude of a community, one could have a number of words like 'environment', 'plastic', 'water', 'earth', 'tigers', 'clean', etc. These would be embedded in the fillers to see the extent to which the consumer is aware. The person's exact response is either noted or recorded; in case one is doing this manually, it is critical to note the reaction time of the person, as hesitating would mean that there was a latent response which the person was not comfortable about revealing. In this case, the response needs to be discarded or evaluated through other responses. Another variation

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of the test used in individual and brand personality is to ask the person to think of an animal/object that one associates with a brand or a person.

For example, the word 'wall' is associated with a famous Indian cricketer.

The obtained answers are measured in terms of:

- Similarity of responses given to a test word by a number of respondents
- Unique responses
- Time taken for a response
- Non-response

In case a person does not respond at all, it is assumed that there is emotional block hampering. A person's attitudes and feelings related to the topic can be measured by this technique.

Illustration: Talking to elders: A popular pharmaceutical firm produces a range of expensive products meant for old age consumers. The company plans to use television advertising to create awareness about the products. Word association was used to study old people's attitudes towards medication and supportive therapy. Six men and six women were selected to administer the test; they were matched on income, class, age, education and current status of living with their married sons/daughters. The test words used and the responses obtained are in Table 4.1.

Table 4.1 Test Word Used and Responses Obtained

Test words	Responses		
Health	Care (3)	Bad (2)	Good (1)
Life	Difficult (2)	Relaxed (3)	Good (1)
Medicines	Necessity (4)	Prevention (2)	Avoid (1)
Walking stick	Support (3)	Avoid (2)	Carved ivory (1)
Adult diapers	Embarrassment (4)	Necessity (2)	
Treatment	In time (2)	Expensive (4)	
Bones	Weak (3)	Brittle (3)	
Death	The end (1)	Inevitable (5)	

The major responses are highlighted and reveal that the seniors are not afraid of dying, are realistic about failing health and supportive medicines or walking stick. However, they have clearly stated that they do not want to be embarrassed. Thus, talking about their health problems on a public platform and offering solutions would not be welcome. They are conscious and positive about medicines being essential, however, their dignity must be kept intact.

This research was taken as a reflection of the attitude of the elderly at large and the company does not use television advertising at all, rather it relies on doctors and chemists to push the product.

An extension of the association technique is the completion technique.

2. **Completion techniques:** These techniques involve presenting an incomplete object to the respondent, which can be completed by the respondent in any way.

   Old age is ....

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Sentence completion is the most popular of all projective techniques and is inevitably used in almost all measuring instruments as an open-ended question. However, the incomplete sentence of a typical projective test needs to be more ambiguous than a typical open-ended question. Generally, they are given a single word or phrase and asked to fill it in, for example:

Working at IBM is. Or ....

McDonald is. ....

Another extension of the technique is story completion. Here, the individual is given an incomplete story or idea. One provides a backdrop and a background for a possible topic. However, the possible end is left open-ended. The subject is supposed to complete the story and provide a conclusion. The theoretical assumption is that the completion of the story/sentence reflects the underlying attitude and personality traits of the person.

3. **Construction techniques:** These techniques might appear similar to completion technique, however here, the focus is on the completed object, which could be a story, a picture, a dialogue or a description. Here again, the level of ambiguity and scope for letting loose the respondents' imagination is vast.

   Clinical psychology has a whole range of construction techniques, but here we will refer only to the ones which are actively used in business research. These are:

   - **Story construction tests:** The most often used test is the Thematic Apperception Test (TAT) developed by Henry (1956). There are a total of 20 pictures, most of them having the profile of a man, woman or child either clearly visible or diffused. The pictures are given to the respondent and he is asked about what is happening here? What happened or led to this? What do you think is going to happen now? The assumption is, that in most instances the person puts himself into the shoes of the protagonist and actually indicates how he would respond in the given situation. The story gives an indication of the person's personality and need structure. For example, an individual may be characterized as extroverted, or a pessimistic or high on creativity or high on dogmatism, and so on. The TAT is used extensively, in parts (a few selected pictures) or in totality in a number of organizations, including the armed forces. The usage is majorly done for selection and recruitment process.
   - **Cartoon tests:** The tests make use of animated characters in a particular situation (Masling, 1952). They are considered ambiguous as the figures bear no resemblance to a living being and thus are considered non-threatening. The cartoon usually has a picture that has two or more characters talking to each other; usually the statement/question by one character is denoted and one needs to fill in the response made by the other character. The picture has a direct relation with the topic under study and is assumed to reveal the respondent's attitude, feelings or intended behaviour. They are one of the easiest to administer, analyse and score.

4. **Choice or ordering techniques:** These techniques involve presenting the respondents with an assortment of stimuli—in the form of pictures or

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statements—related to the study topic. The subject is supposed to sort them into categories, based on the study instructions given. For example, in a study on measuring desired supervisor–subordinate relations, a set of Tom and Jerry cartoon pictures were used, some in which Tom is overpowering Jerry, some neutral pictures where they are carrying out their respective tasks and others where Jerry, the mouse outwits Tom. The respondent needs to sort them into good, neutral and bad picture piles.

These sets are not similar to cartoon tests as they do not require completion or closure. These require sorting, in order to measure any stereotyped or typical behaviour of the respondent. The pictures that have been given to the person carry an expert score (that is they have been categorized on a rating scale to reveal different degrees of the attitude). The higher the selection of pictures with extreme scores, the more rigid is the respondent's attitude and in case modification or enhancement is required, the task would be more difficult. The test is used to measure attitudes and the strength of the existing attitude.

5. **Expressive techniques:** The focus on the other five techniques was on the end result or the output. However, in expressive techniques, the method or means or expressions used in attempting the exercise are significant. The subject needs to express not his/her own feelings and opinions but those of the protagonist(s) in a given verbal or visual situation. Again the presumption is that people are uncomfortable giving personal opinion on a sensitive issue, but, do not mind or are less inhibitive when it is in the third person. There are many examples: Clay modelling—here the emphasis is on the manner in which the person uses or works with clay and not on the end result.

Psychodrama (Dichter, 1964)—here the person needs to take on the roles of living or inanimate object, like a brand(s) and carry out a dialogue.

Object personification (Vicary, 1951)—here the person personifies an inanimate object/brand/organization and assigns it human traits.

Role playing is another technique that is used in business research. The respondents are asked to play the role or assume the behaviour of someone else. The details about the setting are given to the subject(s) and they are asked to take on different roles and enact the situation.

The third-person technique is again considered harmless as here, the respondent is presented with a verbal or visual situation and needs to express what might be the person's beliefs and attitudes. The person may be a friend, neighbour, colleague, or a 'typical' person. Asking the individual to respond in the third person reduces the social pressure, especially when the discussion or study is about a sensitive issue. For example, no respondent even when assured of anonymity, would own up to being open to an extra-marital affair; however, if asked whether a colleague/friend/person in his/her age group might show an inclination for the same, the answers might be starkly different.

4.6.1 Evaluating Projective Techniques

As can be seen from the description of the techniques available to the researcher, the projective techniques are unsurpassed in revealing latent yet significant responses. These would not surface through a more structured or standardized techniques like focus group discussions or interviews. The ambiguity and the third-person setting give the respondent a sufficient camouflage and confidence to feel comfortable about revealing attitudes, interests and beliefs about sensitive issues. There might also be instances where the

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respondent is unaware of his underlying motivations, beliefs and attitudes that are operating at a subconscious level. Projective techniques are helpful in unearthing these with considerable ease and expertise.

However, this richness of data also has its disadvantages. The conduction and analysis of the technique requires specialists and trained professionals. This is also the reason why the tests are expensive and time consuming in usage. Most of the techniques require varying degrees of ambiguity and the higher the ambiguity, the richer is the response. But, at the same time, it makes the analysis and interpretation difficult and subjective. Role playing and psychodrama require interaction and participation by the subject, thus the person who volunteers to participate in the study, might be unusual in some way. Therefore, generalizing the results of the analysis might be subject to error.

4.7 CASE STUDY AND CONTENT ANALYSIS

Case studies are discussions of individual cases under topics of discussion which help researchers to corroborate known facts proved previously through research. Social scientists, in particular, used the case study method to conduct research for many years. A variety of disciplines used this method of research to corroborate their findings in real life situations. Researcher Robert K. Yin defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used (Yin, 1984, p. 23).

However, critics feel that the case study method is not reliable enough for establishing a rule or principle as it portrays only a minuscule population which forms not even a part of the entire population. Some feel that this method is only a reliable exploratory tool. Literature supports reports of carefully planned and crafted studies of the case study method. Robert E. Stake, Helen Simmons, and Robert Yin are renowned researchers who have written about the utility of case studies in social sciences. They have prescribed six steps that should be used when utilizing the case study method. These are:

- Determine and define the research questions
- Select the cases and determine data gathering and analysis techniques
- Prepare to collect the data
- Collect data in the field
- Evaluate and analyse the data
- Prepare the report

1. Determine and define the research questions

Before a case study research is undertaken, cementing a research focus is important so that the researcher can refer to it during the course of study. The research object is often a person, an organizational policy, a group of people, etc. A number of data gathering methods are used by the researcher who studies every case study in depth. The researcher reads the available literature to understand where the topic stands in terms of prior research and undertakes a thorough planning before embarking on the actual case study. Literature and previous studies help him to decide where to look for evidence to corroborate his findings on the concerned topic. These help in designing the blueprint for the current study.

Check Your Progress

13. Which century saw the origin of projective techniques in clinical and developmental psychology?
14. Why is the cartoon test considered to be ambiguous in nature?

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2. Select the cases and determine data gathering and analysis techniques

While designing the study, researchers finalize the approaches, methods of data extraction and data gathering for real-life cases that they need to study. While using multiple cases, each case is treated as a single case. The conclusions of these cases can then be utilized for underlining various facets of their study. The researchers need to discriminate positively for the case study that they want to utilize for corroborating their findings. Researchers should decide whether they want to study cases that are conventional or extraordinary while conducting the study. In case they are hesitant, they may go back to the purpose of the study that they had enumerated before beginning the research. The decision to choose a single or multiple case studies is an important one, while a single case study may be examined for analysing more than one inherent principle. These types of case studies involve two different levels of analysis which increases the complexity of data collected. Multiple sources and techniques in the data collecting process is a key strength of the case study method. Researchers need to determine what data they would wish to gather by examining a case and how to analyse the data collection. The tools they may use are interviews, surveys, documentation review, observation and collection of physical artifacts. During the design phase of the research, researchers should make sure that the study ensures construct validity, external validity, internal validity and reliability. Researchers need to use the correct measures for ensuring construct validity. Internal validity is ensured when the conditions may be used over and over again to prove validity of the case. External validity is ensured when the findings may be generalized beyond the case or cases. A case study is said to be more externally valid when it can withstand more people, places and procedures. Techniques known as within-case examination and cross-case examination and literature review help ensure the validity of the case.

3. Prepare to collect the data

Researchers using the case study method generally gather a large amount of data from a number of sources. Organizing this data in a systematic manner is a challenge in itself. Researchers should plan ahead to prevent getting overwhelmed by this data. They might even lose sight of the original purpose of gathering the data. Researchers sort, categorize, store and retrieve data for analysis with the help of databases. Extraordinary cases help researchers by providing an efficient training programme, establishing proper protocols and conducting a pilot study before entering fieldwork. The training programme covers the concept to be studied, terminology, processes, methods, etc. The researchers also learn the application of techniques used in the study. In order to gather data from the interviewed population, researchers have to be skilled enough to retain or record the interviews without the gadget coming in the interviewee's way. Researchers should know how to steer conversation towards the questions they intend to ask next. They should be trained in analysing body language and interpret answers not expected by them. Researchers need to read between the lines and in case the topic is sensitive, understand a respondent's hesitation and silence. Researchers should not feel threatened by missed appointments and lack of space for holding the interview or unexpected turns of events during the interview; for example, a respondent may break down while answering a sensitive question. Researchers should be humane, understanding and flexible in approach. They should revisit the research design that they had created before starting the case studies and make changes as and when required.

4. Collect data in the field

Researchers should be trained to collect and store multiple sources of evidence in various formats while going about studying the case. Though case study research is flexible, any

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change that comes up needs to be documented carefully. The multiple storing of data is required so that converging lines of enquiry and patterns may be discovered. Field notes may be used for recording intuitions, hunches, feelings, and also for documenting the work in progress. Illustrations, anecdotes and special records may be written in the field notes so that the researcher may refer to it when making case study reports. The data and the field notes should be kept separately for analysis. The researcher needs to document, classify and cross-refer all evidence so that these could be efficiently recalled for examination and sorting as and when required.

5. Evaluate and analyse the data

The raw data gathered by the researchers need to be interpreted at different levels to find linkages between the objectives of the research and the outcome of studying the case. Researchers must remain open to new insights and opportunities throughout the evaluation and analysis process. They can triangulate data with the help of different techniques and collection methods inherent to the case study method. Researchers will be provided with new insights and conflicting data by case studies which are extraordinary. They would need to categorize, tabulate and combine data to address the purpose of the study. In order to cross-check data collected, short, repeated interviews need to be conducted. Placing information into arrays, creating matrices of categories, making flow charts or other displays, etc., may be used by the researcher as specific techniques. The quantitative data collected may be used to corroborate the qualitative data collected during interviews. Many research organizations may also use multiple researchers to verify the data collected. When these multiple observations converge, researchers may become more confident of their findings. Conflicting observations need in-depth study of the findings. The cross-case search technique requires that researchers look at data from different angles and do not reach a premature conclusion. Across all cases investigated, the cross-case search divides data by type. When a pattern from one data is vouched for by another data, the finding is stronger. When these evidences do not form a data, a further probe is essential.

6. Prepare the report

An exemplary case study report transforms the manner in which a complex issue is presented. Case study reports are often published so that readers may apply the experience in their real-life situations. Case studies mostly display evidences to gain the confidence of the readers. Researchers also underline the boundaries of the case and draw the attention of the readers to conflicting propositions. Many researchers present case study reports in the form of a chronological account. Some may treat a case as a fresh chapter. Once a report is completed, the researcher should always edit and examine it for loopholes. Representative audience group is used for comments and criticisms and the valid criticisms are incorporated in the next draft. Since case studies involve multiple sources of data, or may include more than one case within a study, they often become complex. The case study method is generally used by researchers from various disciplines to build upon a theory, to produce a new theory, to challenge or dispute a theory, to explore new horizons, to apply solutions to situations, to describe a phenomenon, etc. There are a number of advantages of the case-study method. These are: applicability to real life situations, to contemporary social situations and easy accessibility to its published reports. Case studies help common man understand a complex theory through easy, real-life situations that are used to exemplify the principle being discussed.

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Some examples of case studies are given below.

Case Study 4.1

Danish International (C)

Shameem was returning back after an exhaustive session with P&Y consultants. The lady consultant had reviewed the information that he had provided about the working atmosphere at Danish.

The consultant had also conducted a couple of visits to the office and had submitted her report. She had pointed out clearly that the indifference she had observed was a matter of serious concern. No benchmarked data would help as the problem was peculiar to the unit. She had advised that the attitude and emotions of the members would have to be analysed. She had told Shameen that they had a couple of standardized tests that she could administer and prepare an action plan.

Shameem was not convinced as he knew that the issue needed to be handled at a different level. Then he remembered the lady he had met from Transcend, the research beyond group, who had made a presentation yesterday about seeking the latent to work on the manifest. He recalled the book that he had read by Sigmund Freud and how it had made a lot of sense about why people reacted in a certain way. Yes, there was merit in the surreal. But this was business, should he go for the subjective?

He reached office, read the P& Y report, thought about what he believed and picked up his phone and made the call .....

1. Who do you think he called? Why?
2. Are there any alternative technique(s) he could use? Explain by providing a template for collecting the information.

Case Study 4.2

What's in a Car?

Shridhar from Bengaluru, had developed an electric car—VERVE (It is a fully automatic, no clutch, no gears), two-door hatchback, easily seating two adults and two children with a small turning radius of just 3.5 metres. It runs on batteries and as compared to other electric vehicles, has an onboard charger to facilitate easy charging which can be carried out by plugging into any 15 amp socket at home or work. A full battery charge takes less than seven hours and gives a range of 80 km. In a quick-charge mode (two-and-a-half hours) 80 per cent charge is attained which is good enough for 65 km. A full charge consumes just about 9 units of electricity. Somehow the product did not take off the way he expected. He is contemplating about repositioning the car. As he stood looking at the prototype, he knew that there were a couple of questions to which he must find answers before he undertook the repositioning exercise. Who should be the target segment—old people, young students just going to college, housewives, or .....? What should be the positioning stance?What kind of image would these customers relate to? Was a new name or punch-line required? How should the promotions be undertaken? Hyundai had done it with Shah Rukh Khan, should he also consider a celebrity? If yes who?

1. What kind of research study should Shridhar undertake? Define the objectives of his research.
2. Do the stated objectives have scope for a qualitative research?
3. Which method(s) would you recommend and why?
4. Can you construct a template for conducting the study? What element would you advice Shridhar to keep in mind, and why?

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Case Study 4.3

Candy-Ho! (A)

The evening sky was overcast. Looking out from the window of his office on the 12th floor, Sagar Ahuja could still see the etched out skyline of New Delhi. Sighing wearily, he turned his thoughts back to his comfortable job at Indore where he was marketing spicy Gujarati namkeen, and wondered what on earth he was doing in an alien city whose complexities and multiplicities seemed to defy any description to his simple mind. Having been a star performer at his regional office, and responsible for the launch of two revolutionary products for his company, he had been approached by head hunters to join Nefertiti—the famous global confectionary company in India. As his first assignment he had been given the job of swimming in deep waters and launch a new bubblegum that had been developed.

The Product

It was a sugar-coated, round-shaped, centre-filled liquid gel bubblegum in two flavours—strawberry and blueberry. The product was packed in mono pillow packs and was going to be priced at ₹1.00 per piece. The name of the product was to be *Moondrops.*

He had in front of him the results of a research conducted by Offspring Research Agency—a market research company specializing in child research studies.

Research Objectives

- To understand the meaning of a candy/bubblegum in a child's life.
- To analyse the response to two advertisements that had been created to market the bubblegum.
- To arrive at a decision on how to position and market the gum, and the advertisement that would be more suitable for the purpose.

Weighted base: Those whose favourite category is bubblegum and chewing gum	771
Like the taste/like to eat it	87
Soft to chew	26
Easily available everywhere	18
Helps in passing time/kills boredom/overcomes feeling of restlessness	18
Freshens breath	17
Taste you never get tired of/can keep eating repeatedly	11
Has variety of flavours	11
Not costly/Does not cost much	11
Improves taste of mouth/removes bad taste in mouth	10
Can be had any time of the day	10
Makes me feel happy/fun to have	9
Liked by my friends	7
Worth the price I pay for it/value for money	6

Data Source: Primary Research carried out by Nefertiti Company. Random Interviews with SEC A and B consumers equally split between male and female respondents, in the top eight cities, total sample size was 1,000 respondents.

FGD Analysis

The result of 24 focus groups across age groups and metros revealed the following data from a projective technique that involved personifying the bubblegum. The responses are across age groups and are in the decreasing order of most stated.

- *I want to play with my bubblegum*
- *The bubblegum has lots of friends— lot of names*
- *The bubblegum is very naughty—no one can catch him*

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- *The bubblegum is my friend and helps me fight the older kids*
- *If all bubblegums were to fight, my bubblegum would win*
- *If I am feeling sad, my bubblegum would make me laugh*
- *My bubblegum is the bravest*

Post the FGC. Select respondents (children) were shown two advertisements. reaction to these are listed below:

(a) The Race Ad

The storyboard was that at a school annual function race, where the 'hero' of the story deliberately loses the race and comes third instead of first to get the third prize of two big jars of Moondrops. Followed by the punchline '*Moondrops ke liye kuch bhi ho sakta hai*'.

Reactions (With loud laughter)

All the kids were involved with the ad while viewing it and liked the storyboard with comments such as:

- '*It was interesting*'.
- '*Main soch raha tha ki yeh ladka ruk kyon gaya*'. (I was wondering why the boy stopped.)

The children enjoyed when the kid smiles with two big Moondrop jars in his hand.

- '*Jab who ladka race mein finish line ke pas aake ruk jata hai*'. (When the boy stops near the finish line.)
- '*Jab use third prize Moondrops milta hai aur use doorse do first and second prize wale ladke ghoor ke dekhte hain*'. (When he gets Moondrops as the third prize and the first and second prize winners stare at him.)
- *We feel proud to win a race even if we do not get any prize.'*
- '*If I win the race then Mummy and Daddy will anyway buy me Moondrops*'.
- '*Mein sirf Moondrops ke liye race nahin haroonga'*. (I'll never lose a race just for Moondrops.)
- '*Woh ladka buddhoo tha, kyonki usne jeeti hui race har di.'* (That boy was a fool, as he lost a race that he was winning.)

The kids were surprised when the child stops just near the finish line and when the other two children are surprised and shocked that he is getting the Moondrops as the third prize.

Empathy/Relatability

Not many of the kids could relate to the ad. They did not see themselves doing the same just for getting two jars of Moondrops, the underlying reason being that they had to lose (If they could finish first, then why finish third).

(b) Kitty Party Ad

The story starts with a child returning from school to see a kitty party in progress at home (lots of fat aunties chatting and eating samosas and pakoras). One fat aunty pulls his cheek affectionately and much to his disgust, kisses him. He then feels happy when his reward is a Moondrop from the fat aunty. Seeing that he gets a Moondrop when the aunty kisses him, he plays a prank on all the aunties by jumping on the table and the sofa and kissing all the aunties there. His reward is lots of Moondrops. Followed by the punchline, '*Moondrops ke liye kuch bhi ho sakta hai*'.

Reactions

The scene where the fat aunty kisses the boy and they show her fat lips. The boy kissing the aunties by jumping on the sofa, on the table and by hugging an aunty.

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- '*Jab who moti aunty ke lips dikhate hain*'. (When they show the fat aunty's lips.)
- '*Jab who moti aunty use kiss karti hain*'. (When the fat aunty kisses him.)
- '*Jab who sari aunties ko kiss karta hai aur aunties hairan ho jati hain*'. (When he surprises all the aunties by kissing them.)

Likeability

- '*Dekhne mein maza aaya*' (It was fun to watch.)
- '*Jab usne aunties ko kiss kiya to bahut accha laga*' (It was really good to see him kissing the aunties.)
- '*Aunty ka face itna funny tha, unko dekh ke hasi aayi*' (Aunty's face was so funny that we felt like laughing.)

Empathy/Relatability

- '*Chii, hum naughty nahin hain*' (Ugh, we are not naughty.)
- '*Aunty ko kiss nahin karenge, beizzati hoti hai.*' (Will not kiss the aunty, it is insulting.)
- '*Ganda lagta hai*'. (Don't like it.)
- '*Aunty ko kis karenge to manjan karna padega'*. (Will have to brush teeth if we kiss aunty.)

1. Can you help Mr Ahuja arrive at a decision?

4.7.1 Content Analysis

This technique involves studying a previously recorded or reported communication and systematically and objectively breaking it up into more manageable units that are related to the topic under study. It is peculiar in its nature that it is classified as a primary data collection technique and yet makes use of previously produced or secondary data. However, since the analysis is original, first hand and problem specific, it is categorized under primary methods. Some researchers classify it under observation methods, the reason being that in this, one is also analysing the communication in order to measure or infer about variables. The only difference being that one analyses communication that is ex-post facto rather than live. One can content-analyse letters, diaries, minutes of meetings, articles, audio and video recordings. The method is structured and systematic and thus of considerable credibility.

The first step involves defining U, or the *universe of content*. For example, in the case of Ritu, who wants to know what makes the young Indian tick, she could make use of the blogs written by youngsters, essays and reality shows featuring the age group. She decides that she wants to assess value systems, attitudes towards others/elders, clarity of life goal and peer influences. This step is extremely critical as this indicates the assumptions or hypotheses the researcher might have formulated.

This universe can be reported in any of five different formats (Berelson, 1954). The smallest reported unit could be a *word*. This is especially useful as it can be easily subjected to a computer analysis. In Ritu's case, the values that she wants to evaluate are individualistic or collectivistic, aggressive or compliant. Thus, she can sift the communication and place words such as 'I' or 'we' under the respective heads. Words like 'hate' 'dislike' go under aggression and 'alright' 'fine' 'maybe not so good' for complacency. Then counts and frequencies are calculated to arrive at certain conclusions.

The next level is a *theme*. This is very useful but, a little difficult to quantify as this involves reporting the propositions and sentences or events as representing a theme.

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For example, disrespect towards elders is the theme and one picks out the following as a representative: a young teen's blog which says *my old man (father) has gone senile and needs to be sent to the looney bin for expecting me to become a space scientist, just because he could not become one……*

This categorization becomes more complex as the element of observer's bias comes into play. Thus, this kind of analysis could be extremely useful when carried out by an expert. However, in the case of an untrained analyst, the reliability and validity of the findings would be questionable.

The other units are *characters* and *space* and *time measures*. The character refers to the person producing the communication, for example the young teenager writing the blog. Space and time are more related to the physical format, i.e., the number of pages used, the length of the communication and the duration of the communication.

The last unit is the *item*, which is more Gestaltian in nature and refers to categorizing the entire communication as say 'responsible and respectful' or 'aggressive and amoral'. As in the case of theme, this categorization is equally complex as the observer's bias is likely to be high. Thus, to ensure the reliability of the findings, one may ask another coder to evaluate the same data. Cohen (1960) states the measuring of the percentage of agreement between the two analyses by the following formula:

$$K = \frac{\Pr(a) - \Pr(e)}{1 - \Pr(e)}$$

Here, Pr(a) is the relative observed agreement between the two raters. Pr(e) is the probability that this is due to chance. If the two raters are in complete agreement, then Kappa is 1. If there is no agreement, then Kappa = 0, 0.21–0.40 is fair, 0.41–0.80 is good and 0.81–1.00 is considered excellent.

Content analysis of large volumes becomes tedious and prone to error if handled by humans. Thus, there are various computer programmes available that can assist in the process. For computers running on Windows, one can use TEXTPACK, this is a dictionary word approach, where it can tag defined words for word frequency by sorting them alphabetically or by frequencies. Open-ended questions can be sorted by a programme called Verbastat (generally used by corporate users) or Statpac, which has an automatic coding module and is of considerable use to individual researchers.

Content analysis is a very useful technique when one has a large quantity of text as data and it needs to be structured in order to arrive at some definite conclusions about the variables under study. Computer assistance has greatly aided in the active usage of the technique. However, it can appear too simplistic, when one reduces the whole data to counts or frequencies.

Check Your Progress

15. What are case studies?
16. Why do critics feel that the case study method is not reliable enough for establishing a rule or principle?
17. What does content analysis involve?

4.8 SUMMARY

In this unit, you have learnt that:

- Observations have led to some of the most important scientific discoveries in human history. Charles Darwin used his observations of animal and marine life at the Galapagos Islands to help him formulate his theory of evolution which he described in *On the Origin of Species*.
- Observation may be defined as 'a process in which one or more persons monitor some real-life situation and record pertinent occurrences'.

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- In the process of 'participant observation', the observer becomes more or less one of the group members and may actually participate in some activity or the other of the group.
- All observations consist of two main components, the subject and the object. The subject refers to the observer, whereas the object refers to the activity or any type of operation that is being observed.
- Observation is a costly affair. It involves lot of expenses on travelling, staying at the places where the event is taking place and purchase of sophisticated equipment.
- A questionnaire is 'a tool for research, comprising a list of questions whose answers provide information about the target group, individual or event'.
- Questionnaire that calls for short, check-mark responses are known as closed form type or restricted type. They have highly structured answers like mark a 'yes' or 'no', write a short response or check an item from a list of suggested responses.
- The open form or unrestricted questionnaire requires the respondent to answer the question in their own words.
- The three stages theory (also known as the sandwich theory) should be applied when sequencing questions. The order to be followed should be first, screening and rapport questions; second, the product specific questions; and third, demographic questions.
- Whoever administers the questionnaire, be it research staff, volunteers or whether self-administered by the respondents, it should have clear, detailed instructions.
- The respondents of a questionnaire may belong to a selected group. Therefore, the conclusions lack the kind of objectivity and representativeness essential for its validity.
- A schedule is a questionnaire containing a set of questions that are required to be answered to collect data about a particular item. A schedule is generally used in a face-to-face situation.
- Observation schedule is used to observe all the activities and record the responses of the respondents under some predefined conditions. The main idea behind examining the activities is to verify the required information.
- Data collection through a questionnaire is cheaper as compared to a schedule, as money is spent only in preparing the schedules and mailing them. In the schedule method, extra money is spent on appointing interviewers and imparting training to them.
- One of the main methods of data collection is conducting interviews. It takes place as a two-way conversation between the researcher and the respondent, whereby information is gathered by asking topic related questions.
- A proper setting for group interviews requires a group of not more than 10 to 12 persons with some social, intellectual, and educational homogeneity, which ensures effective participation by all.
- There are two chief means of recording opinion during the interview. If the question is preceded, the interviewer need only check a box or circle or code, or otherwise indicate which code comes closest to the respondent's opinion. If the question is not preceded, the interviewer is expected to record the response verbatim.

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- A proper setting for group interviews requires a group of not more than 10 to 12 persons with some social, intellectual, and educational homogeneity, which ensures effective participation by all.
- Research interview is aimed at getting information required by the investigator to test his hypothesis or solve his problems of historical, experimental, survey or clinical type.
- Perhaps the most difficult part of the job of an interviewer is to obtain a specific, complete response. People can often be evasive and answer 'do not know' if they do not want to make the effort of thinking. They can also misunderstand the question and answer incorrectly in which case the interviewer would have to probe more deeply.
- A well-trained interviewer can obtain more data and greater clarity by altering the interview situation. This cannot be done in a questionnaire.
- An interview permits the research worker to follow-up leads as contrasted with the questionnaire.
- The idea of projecting oneself or one's feelings on to ambiguous objects is the basic assumption in projective techniques. The 19th century saw the origin of these techniques in clinical and developmental psychology.
- Ernest Dichter (1960) was one of the pioneers who used these techniques in consumer and motivational research. Consumer surveys and research were considered incomplete if they did not make use of projective techniques.
- In the theoretical sense, projective techniques unearth beliefs, attitudes and feelings that might underlie certain behaviour or interaction situations.
- Cartoon tests make use of animated characters in a particular situation (Masling, 1952). They are considered ambiguous as the figures bear no resemblance to a living being and thus are considered non-threatening.
- Case studies are discussions of individual cases under topics of discussion which help researchers to corroborate known facts proved previously through research.
- Researchers using case study method generally gather a large amount of data from a number of sources. Organizing this data in a systematic manner is a challenge in itself. The researcher should plan ahead to prevent getting overwhelmed by this data.
- An exemplary case study report transforms the manner in which a complex issue is presented. Case study reports are often published so that readers may apply the experience in his or her real-life situations. The case studies mostly display evidences to gain the reader's confidence.
- Content analysis involves studying a previously recorded or reported communication and systematically and objectively breaking it up into more manageable units that are related to the topic under study.
- Content analysis of large volumes becomes tedious and prone to error if handled by humans. Thus, there are various computer programmes available that can assist in the process. For computers running on Windows, one can use TEXTPACK, this is a dictionary word approach, where it can tag defined words for word frequency by sorting them alphabetically or by frequencies.

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- Content analysis is a very useful technique when one has a large quantity of text as data and it needs to be structured in order to arrive at some definite conclusions about the variables under study.

4.9 KEY TERMS

- **Observation:** It may be defined as a process in which one or more persons monitor some real-life situation and record pertinent occurrences.
- **Questionnaire:** It is a tool for research, comprising a list of questions whose answers provide information about the target group, individual or event.
- **Schedule:** It is a questionnaire containing a set of questions that are required to be answered to collect data about a particular item; it is generally used in a face-to-face situation.
- **Case studies:** They are discussions of individual cases under topics of discussion which help researchers to corroborate known facts proved previously through research.

4.10 ANSWERS TO 'CHECK YOUR PROGRESS'

1. Observation may be defined as 'a process in which one or more persons monitor some real-life situation and record pertinent occurrences'.
2. All observations consist of two main components, the subject and the object. The subject refers to the observer, whereas the object refers to the activity or any type of operation that is being observed.
3. The disadvantages of observation are as follows:
   - It is very difficult to establish the validity of observations.
   - Many items of observation cannot be defined.
4. A questionnaire is 'a tool for research, comprising a list of questions whose answers provide information about the target group, individual or event'.
5. Limitations of open questionnaire are as follows:
   - They are difficult to fill out.
   - The respondents may never be aware of all the possible answers.
   - They take longer to fill.
6. The three stages theory (also known as the sandwich theory) should be applied when sequencing questions. The order to be followed should be first, screening and rapport questions; second, the product specific questions; and third, demographic questions.
7. The limitations of the questionnaire method is:
   - **Limited response:** As noted earlier, this method cannot be used with illiterate or semi-illiterate groups. The number of persons who cooperate and respond to the questionnaire is very small.
   - **Lack of personal contact:** There is very little scope of personal contact in this method. In the absence of personal contact, very little can be done to persuade the respondents to fill up the questionnaire.

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8. A schedule is a questionnaire containing a set of questions that are required to be answered to collect data about a particular item. A schedule is generally used in a face-to-face situation.
9. The interview schedule is used to ask the interviewee questions and record the responses in the space provided in the questionnaire itself.
10. According to Rummel J. Francis: 'The interview method of collecting data requires the actual physical proximity of two or more persons, and generally requires that all the normal channels of communication be open to their use. It is necessary to see one another, to hear each other's voices, to understand one another's language, and to use all that is psychologically inherent in physical proximity. It usually entails a non-reciprocal relation between the individuals concerned. One party desires to get information from another—one party interviews the other—for a particular purpose.'
11. Research interview is aimed at getting information required by the investigator to test his hypothesis or solve his problems of historical, experimental, survey or clinical type.
12. A tape recorder is very helpful in an interview because:
    - It reduces the tendency of the interviewer to make an unconscious selection of data favouring his/her biases.
    - The tape recorded data can be played more than once, and thus it permits a thorough study of the data.
13. The 19th century saw the origin of these techniques in clinical and developmental psychology.
14. Cartoon tests make use of animated characters in a particular situation (Masling, 1952). They are considered ambiguous as the figures bear no resemblance to a living being and thus are considered non-threatening.
15. Case studies are discussions of individual cases under topics of discussion which help researchers to corroborate known facts proved previously through research.
16. Critics feel that the case study method is not reliable enough for establishing a rule or principle as it portrays only a minuscule population which forms not even a part of the entire population.
17. Content analysis involves studying a previously recorded or reported communication and systematically and objectively breaking it up into more manageable units that are related to the topic under study.

4.11 QUESTIONS AND EXERCISES

Short-Answer Questions

1. Differentiate between participant and non-participant observation.
2. What are the recording techniques of observation?
3. Enumerate the advantages of observation method of data collection.
4. What are the types of questionnaires?
5. List the questions that should be avoided during the preparation of a questionnaire.
6. State the importance of the questionnaire method of data collection.
7. What are the characteristics of a good schedule?
8. What are the major differences between a schedule and questionnaire?
9. What is the interview method of data collection? What are its types?
10. How is the attitude of a respondent significant for a researcher during an interview?
11. What are projective techniques? How is it different from the other methods of data collection?
12. Write a note on the evaluation of projective techniques.
13. How do case studies help the common man?
14. What is the content analysis technique of data collection?

Long-Answer Questions

1. Explain observation schedule as a tool of data collection.
2. Discuss the concept of questionnaire as a method of data collection.
3. Assess schedule as a method of data collection. Also, assess the difference between a schedule and a questionnaire.
4. List the merits and limitations of the schedule method of data collection.
5. Critically analyse how conducting interviews are an important source of data collection.
6. 'The idea of projecting oneself or one's feelings on to ambiguous objects is the basic assumption in projective techniques.' Explain projective method as a tool of data collection.
7. How are case studies an important source of data collection? What are the steps that should be used when utilizing the case study method?
8. Describe content analysis as a technique of data collection.

4.12 FURTHER READING

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UNIT 5 SCALES AND SCALING TECHNIQUES

Structure

5.0 INTRODUCTION

The term 'measurement' means assigning numbers or some other symbols to the characteristics of certain objects. When numbers are used, the researcher must have a rule for assigning a number to an observation in a way that provides an accurate description. We do not measure the object but some characteristics of it. Therefore, in research, people/consumers are not measured; what is measured only are their perceptions, attitude or any other relevant characteristics. There are two reasons for which numbers are usually assigned. First of all, numbers permit statistical analysis of the resulting data and secondly, they facilitate the communication of measurement results.

As mentioned earlier, the numbering is done based on certain rules. Therefore, the assignment of numbers to the characteristics must be isomorphic, i.e., there must be a one-to-one correspondence between the numbers and the characteristics being measured.

For example, same rupee figures should be assigned to a household with identical annual income. Only then numbers can be associated with specific characteristics of the measured object and vice versa. Further, they must not change over the objects or time. This means that the rules for a given assignment must be invariant over time or the object being measured.

Scaling is an extension of measurement. Scaling involves creating a continuum on which measurements on objects are located. Suppose you want to measure the satisfaction level towards Kingfisher Airlines and a scale of 1 to 11 is used for the said purpose. This scale indicates the degree of dissatisfaction, with 1 = extremely dissatisfied

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and 11 = extremely satisfied. Measurement is the actual assignment of a number from 1 to 11 to each respondent whereas the scaling is the process of placing the respondent on a continuum with respect to their satisfaction towards Kingfisher Airlines. In this unit, you will learn the concept of scales and scaling techniques

5.1 UNIT OBJECTIVES

After going through this unit, you will be able to:

- Define scaling
- Distinguish between the four types of measurement scales
- Describe attitude and its three components
- Discuss the various classifications of scales
- Explain Likert scale and Bogardus scale
- Discuss measurement error and explain the criteria for good measurement

5.2 SCALING AND ITS IMPORTANCE

We quite often face measurement problems in research (since we want a valid measurement but we may not obtain it), especially when the concepts to be measured are complex and abstract and we do not possess the standardized measurement tools. Alternatively, we can say that while measuring attitudes and opinions, we face a problem of their valid measurement. Similar problems may be faced by a researcher, of course in a lesser degree, while measuring physical or institutional concepts. As such, we should study some procedures which may enable us to measure abstract concepts more accurately. This brings us to the study of scaling techniques.

Meaning of Scaling

Scaling describes the procedures of assigning numbers to various degrees of opinion, attitude and other concepts. This can be done into two ways:

- Making a judgment about some characteristics of an individual and then placing him directly on a scale that has been defined in terms of that characteristics.
- Constructing questionnaires in such a way that the score obtained by the individual's responses assigns him a place on a scale.

It may be stated here that a scale is a continuum, consisting of the highest point (in terms of some characteristics e.g. preference) and the lowest point along with several intermediate points between these two extreme points. These scale–point positions are so related to each other that when the first point happens to be the highest point, the second point indicates the higher degree in terms of a given characteristics as compared to the third point and the third point indicates a higher degree as compared to the fourth and so on. Numbers for measuring the distinctions of degree in the attitudes/opinions are, thus, assigned to individuals corresponding to their scale/positions.

5.3 TYPES OF MEASUREMENT SCALES

There are four types of measurement scales—nominal, ordinal, interval and ratio scales. We will discuss each one of them in detail. The choice of the measurement scale has implications for the statistical technique to be used for data analysis.

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5.3.1 Nominal Scale

This is the lowest level of measurement. Here, numbers are assigned for the purpose of identification of the objects. Any object which is assigned a higher number is in no way superior to the one which is assigned a lower number. In the nominal scale there is a strict one-to-one correspondence between the numbers and the objects. Each number is assigned to only one object and each object has only one number assigned to it. It may be noted that the objects are divided into mutually exclusive and collectively exhaustive categories.

Examples of nominal scale:

- What is your religion?
  - (a) Hinduism
  - (b) Sikhism
  - (c) Christianity
  - (d) Islam
  - (e) Any other, (please specify)

A Hindu may be assigned a number 1, a Sikh may be assigned a number 2, a Christian may be assigned a number 3 and so on. Any religion which is assigned a higher number is in no way superior to the one which is assigned a lower number. The assignment of numbers is only for the purpose of identification. We also note that all respondents have been divided into mutually exclusive and collectively exhaustive categories. For example:

- Are you married?
  - (a) Yes
  - (b) No

If a person is married, he or she may be assigned a number 101 and an unmarried person may be assigned a number 102.

- In which of the following departments do you work?
  - (a) Marketing
  - (b) HR
  - (c) Information Technology
  - (d) Operations
  - (e) Finance and Accounting
  - (f) Any other, (please specify)

Here also, a person working for the marketing department may be assigned a number 1, the one working for HR may be assigned a number 2 and so on.

Nominal scale measurements are used for identifying food habits (vegetarian or non-vegetarian), gender (male/female), caste, respondents, brands, attributes, stores, the players of a hockey team and so on.

The assigned numbers cannot be added, subtracted, multiplied or divided. The only arithmetic operations that can be carried out are the count of each category. Therefore, a frequency distribution table can be prepared for the nominal scale variables and mode of the distribution can be worked out. One can also use chi-square test and compute contingency coefficient using nominal scale variables.

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5.3.2 Ordinal Scale

This is the next higher level of measurement than the nominal scale measurement. One of the limitations of the nominal scale measurements is that we cannot say whether the assigned number to an object is higher or lower than the one assigned to another option. The ordinal scale measurement takes care of this limitation. An ordinal scale measurement tells whether an object has more or less of characteristics than some other objects. However, it cannot answer how much more or how much less. An ordinal scale tells us the relative positions of the objects and not the difference between the magnitudes of the objects. Suppose Shashi scores the highest marks in marketing and is ranked no. 1; Mohan scores the second highest marks and is ranked no. 2; and Krishna scores third highest marks and is ranked no. 3. However, from this statement, we cannot say whether the difference in the marks scored by Shashi and Mohan is the same as between Mohan and Krishna. The only statement which can be made under ordinal scale is that Shashi has scored higher than Mohan and Mohan has scored higher than Krishna. The difference between the ranks does not have any meaningful interpretation in the sense that it cannot tell the difference in absolute marks between the three candidates. Another example of the ordinal scale could be the CAT score given in percentile form. Suppose a candidate's score is 95 percentile in the CAT exam. What it means is that 95 per cent of the candidates that appeared in the CAT examination have a score below this candidate, whereas only 5 per cent have scored more than him. The actual score is how much less or more cannot be known from this statement. Examples of the ordinal scale include quality ranking, rankings of the teams in a tournament, ranking of preference for colours, soft drinks, socio-economic class and occupational status, to mention a few. Some of the examples of ordinal scales are listed below:

- Rank the following attributes while choosing a restaurant for dinner. The most important attribute may be ranked one, the next important may be assigned a rank of 2 and so on.

Attribute	Rank
Food quality	
Prices	
Menu variety	
Ambience	
Service	

- Rank the following by placing a 1 beside the attribute you think is the most important, a 2 beside the attribute you think is the second most important and so on while purchasing a two-wheeler.

Attribute	Rank
After sale service	
Prices	
Re-sale value	
Fuel efficiency	
Aesthetic appeal	

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In the ordinal scale, the assigned ranks cannot be added, multiplied, subtracted or divided. One can compute median, percentiles and quartiles of the distribution. The other major statistical analysis which can be carried out is the rank order correlation coefficient, sign test. As the ordinal scale measurement is higher than the nominal scale measurement, all the statistical techniques which are applicable in the case of nominal scale measurement can also be used for the ordinal scale measurement. However, the reverse is not true. This is because ordinal scale data can be converted into nominal scale data but not the other way round.

5.3.3 Interval Scale

The interval scale measurement is the next higher level of measurement. It takes care of the limitation of the ordinal scale measurement where the difference between the score on the ordinal scale does not have any meaningful interpretation. In the interval scale, the difference of the score on the scale has meaningful interpretation. It is assumed that the respondent is able to answer the questions on a continuum scale. The mathematical form of the data on the interval scale may be written as

$$Y = a + bX \qquad \text{Where } a \neq 0$$

The interval scale data has an arbitrary origin (non-zero origin). The most common example of the interval scale data is the relationship between Celsius and Farenheit temperature. It is known that:

$$C° = \frac{5}{9}(F° - 32)$$

Therefore,
$$C° = \frac{160}{9} + \frac{5}{9}F°$$

This is of the form $Y = a + bX$, where $a = \frac{-160}{9}$ and $b = \frac{5}{9}$ and hence it represents the interval scale measurement. In the interval scale, the difference in score has a meaningful interpretation while the ratio of the score on this scale does not have a meaningful interpretation. This can be seen from the following interval scale question:

- How likely are you to buy a new designer carpet in the next six months?

	Very unlikely	Unlikely	Neutral	Likely	Very likely
Scale A	1	2	3	4	5
Scale B	0	1	2	3	4
Scale C	–2	–1	0	1	2

Suppose a respondent ticks the response category 'likely' and another respondent ticks the category 'unlikely'. If we use any of the scales A, B or C, we note that the difference between the scores in each case is 2. Whereas, when the ratio of the scores is taken, it is 2, 3 and –1 for the scales A, B and C respectively. Therefore, the ratio of the scores on the scale does not have a meaningful interpretation. The following are some examples of interval scale data.

- How important is price to you while buying a car?

Least important	Unimportant	Neutral	Important	Most important
1	2	3	4	5

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- How do you rate the work environment of your organization?

Very good	Good	Neither good nor bad	Bad	Very bad
5	4	3	2	1

- The counter-clerks at ICICI Bank, (Vasant Kunj Branch) are very friendly.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	2	3	4	5

- Rate the life of the battery of your inverter.

Low 1 2 3 4 5 High

- Indicate the degree of satisfaction with the overall performance of Wagon R.

Very dissatisfied 1 2 3 4 5 Very satisfied

- How expensive is the restaurant 'Punjabi By Nature'?

Extremely expensive	Definitely expensive	Somewhat expensive	Somewhat inexpensive	Definitely inexpensive	Extremely inexpensive
1	2	3	4	5	6

- How likely are you to buy a new car within the next six months?

Definitely will buy	Probably will buy	Neutral	Probably will not buy	Definitely will not buy
1	2	3	4	5

The numbers on this scale can be added, subtracted, multiplied or divided. One can compute arithmetic mean, standard deviation, correlation coefficient and conduct a t-test, Z-test, regression analysis and factor analysis. As the interval scale data can be converted into the ordinal and the nominal scale data, therefore, all the techniques applicable for the ordinal and the nominal scale data can also be used for interval scale data.

5.3.4 Ratio Scale

This is the highest level of measurement and takes care of the limitations of the interval scale measurement, where the ratio of the measurements on the scale does not have a meaningful interpretation. The ratio scale measurement can be converted into interval, ordinal and nominal scale. But the other way round is not possible. The mathematical form of the ratio scale data is given by $Y = b X$. In this case, there is a natural zero (origin), whereas in the interval scale we had an arbitrary zero. Examples of the ratio scale data are weight, distance travelled, income and sales of a company, to mention a few. Consider the following examples for ratio scale measurements.

- How many chemist shops are there in your locality?
- How many students are there in the MBA programme at IIFT?
- How much distance do you need to travel from your residence to reach the railway station?

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All the mathematical operations can be carried out using the ratio scale data. In addition to the statistical analysis mentioned in the interval, the ordinal and the nominal scale data, one can compute coefficient of variation, geometric mean and harmonic mean using the ratio scale measurement. The basic characteristics, examples and the statistical techniques applicable under each of the four scales are summarized in Table 5.1.

Table 5.1 Types of Scale, Characteristics, Examples, Permissible Statistical Techniques

Scale	Basic Characteristics	Examples	Permissible Statistics
Nominal	Numbers are used to label and classify objects.	Players of Team India, Caste, Religion, Gender, Marital Status, Store Types, Brands, etc.	Percentage, Mode, Chi-square, Contingency coefficient, Binomial test.
Ordinal	Numbers indicate the relative position of the objects, however the difference in the magnitude of the score cannot be known.	Preference Ranking, Image Ranking, Social Class, etc.	Percentile, Quartiles, Median, Rank order correlation. Friedman ANOVA.
Interval	Difference between the objects can be known, however the ratio of the scores has no meaning.	Attitude, Opinion, Index Numbers	Product moment correlation, coefficient, t-test, z-test, ANOVA, Regression Analysis, Factor Analysis
Ratio	Ratios of the score value have a meaningful interpretation.	Age, Income, Market Share, Sales, Cost, etc.	Geometric means, Harmonic Means and Coefficient of Variation

5.3.5 Attitude

An attitude is viewed as an enduring disposition to respond consistently in a given manner to various aspects of the world, including persons, events and objects. A company is able to sell its products or services when its customers have a favourable attitude towards its products/services. In the reverse scenario, the company will not be able to sustain itself for long. It, therefore, becomes very important to measure the attitude of the customers towards the company's products/services. Unfortunately, attitude cannot be measured directly. There are many variables which the researcher wishes to investigate as psychological variables and these cannot be directly observed. For example, we may have a favourable attitude towards a particular brand of toothpaste, but this attitude cannot be observed directly. In order to measure an attitude, we make an inference based on the perceptions the customers have about the product/services. The attitude is derived from the perceptions. If the consumers have a favourable perception towards the products/services, the attitude will be favourable. Therefore, the attitudes are indirectly observed.

Basically, attitude has three components: cognitive, affective and intention (or action) components.

1. **Cognitive component:** This component represents an individual's information and knowledge about an object. This includes awareness of the existence of the object, beliefs about the characteristics or attributes of the object and judgement about the relative importance of each of the attributes. In a survey, if the respondents are asked to name the companies manufacturing plastic products, some respondents may remember names like Tupperware, Modicare

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and Pearl Pet. This is called unaided recall awareness. More names are likely to be remembered when the investigator makes a mention of them. This is aided recall. It may be noted that the knowledge may not be limited only to the awareness. An individual can form beliefs or judgements about the characteristics or attributes of the plastic products manufacturing companies through advertisements, word of mouth, peer groups, etc. The examples of such beliefs could be that the products of Tupperware are of high quality, non-toxic and can be used in parties; a mutton dish can be cooked in a pressure cooker in less than 30 minutes; the Nano car gives a very high mileage as compared to the other small cars.

2. **Affective component:** The affective component summarizes a person's overall feelings or emotions towards the objects. The examples for this component could be: the food cooked in a pressure cooker is tasty, taste of orange juice is good or the taste of bitter gourd is very bad. If there are a number of alternatives to choose from, liking is expressed in terms of preference for one alternative over the other. Among the various soft drinks like Pepsi, Coke, Limca and Sprite, the respondents might have to indicate the most preferred soft drinks, the second preferred one and so on. This is an example of the affective component. The other example could be that the plastic products produced by Pearl Pet are cheaper than Tupperware products; however, the quality of Tupperware products is better than that of Pearl Pet.
3. **Intention or action component:** This component of an aptitude, also called the behavioural component, reflects a predisposition to an action by reflecting the consumer's buying or purchase intention. It also reflects a person's expectations of future behaviour towards an object. How likely a person is to buy a designer carpet may range from most likely to not at all likely, reflecting the purchase intentions. However, when one is talking about the purchase intentions, a time horizon has to be kept in mind as the intentions may undergo a change over time. The intentions incorporate information regarding the respondent's willingness to pay for the product.

5.4 CLASSIFICATION OF SCALES

One of the ways of classifications of scales is in terms of the number of items in the scale. Based on this, the following classification may be proposed:

5.4.1 Single Item vs Multiple Item Scale

Single item scale: In the single item scale, there is only one item to measure a given construct. For example:

Consider the following question:

- How satisfied are you with your current job?
  - Very Dissatisfied
  - Dissatisfied
  - Neutral
  - Satisfied
  - Very satisfied

Check Your Progress

1. What does the term measurement mean?
2. Name the four types of measurement scales.
3. Name the three components of attitude.

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The problem with the above question is that there are many aspects to a job, like pay, work environment, rules and regulations, security of job and communication with the seniors. The respondent may be satisfied on some of the factors but may not on others. By asking a question as stated above, it will be difficult to analyse the problem areas. To overcome this problem, a multiple item scale is proposed.

Multiple item scale: In multiple item scale, there are many items that play a role in forming the underlying construct that the researcher is trying to measure. This is because each item forms some part of the construct (satisfaction) which the researcher is trying to measure. As an example, some of the following questions may be asked in a multiple item scale.

- How satisfied are you with the pay you are getting on your current job?
  - Very dissatisfied
  - Dissatisfied
  - Neutral
  - Satisfied
  - Very satisfied
- How satisfied are you with the rules and regulations of your organization?
  - Very dissatisfied
  - Dissatisfied
  - Neutral
  - Satisfied
  - Very satisfied
- How satisfied are you with the job security in your current job?
  - Very dissatisfied
  - Dissatisfied
  - Neutral
  - Satisfied
  - Very satisfied

5.4.2 Comparative vs Non-Comparative Scales

The scaling techniques used in research can also be classified into comparative and non-comparative scales (Figure 5.1).

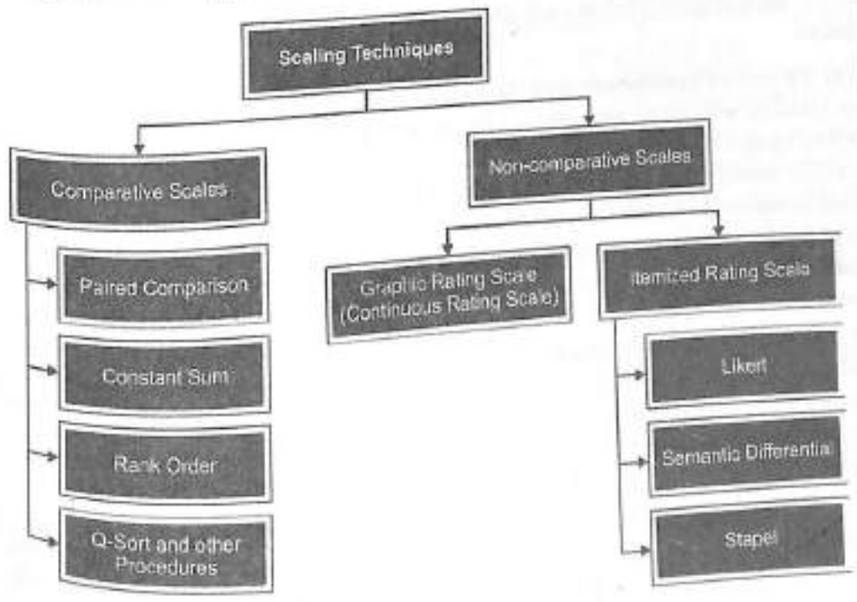

Fig. 5.1 Types of Scaling Techniques

1. Comparative Scales

In comparative scales it is assumed that respondents make use of a standard frame of reference before answering the question. For example:

A question like 'How do you rate Barista in comparison to Cafe Coffee Day on quality of beverages?' is an example of the comparative rating scale. It involves the direct comparison of stimulus objects. For example, respondents may be asked whether they prefer Chinese or Indian food. Consider the following set of questions generally used to compare various attributes of Domino's Pizza and Pizza Hut.

- Please rate Domino's in comparison to Pizza Hut on the basis of your satisfaction level on an 11-point scale, based on the following parameters: (1 = Extremely poor, 6 = Average, 11 = Extremely good). Circle your response:

a	Variety of menu options	1	2	3	4	5	6	7	8	9	10	11
b	Value for money	1	2	3	4	5	6	7	8	9	10	11
c	Speed of service (delivery time)	1	2	3	4	5	6	7	8	9	10	11
d	Promotional offers	1	2	3	4	5	6	7	8	9	10	11
e	Food quality	1	2	3	4	5	6	7	8	9	10	11
f.	Brand name	1	2	3	4	5	6	7	8	9	10	11
g	Quality of service	1	2	3	4	5	6	7	8	9	10	11
h	Convenience in terms of takeaway location	1	2	3	4	5	6	7	8	9	10	11
i.	Friendliness of the salesperson on the phone	1	2	3	4	5	6	7	8	9	10	11
j.	Quality of packaging	1	2	3	4	5	6	7	8	9	10	11
k	Adaptation of Indian taste	1	2	3	4	5	6	7	8	9	10	11
l.	Side orders/appetizers	1	2	3	4	5	6	7	8	9	10	11

Comparative scale data is interpreted generally in a relative kind. The comparative scale includes paired comparison, rank order, constant sum scale and Q-sort technique to mention a few.

We will discuss below each of the scale under comparative rating scales in detail below:

(a) Paired Comparison Scales: Here a respondent is presented with two objects and is asked to select one according to whatever criterion he or she wants to use. The resulting data from this scale is ordinal in nature. As an example, suppose a parent wants to offer one of the four items to a child—chocolate, burger, ice cream and pizza. The child is offered to choose one out of the two from the six possible pairs, i.e., chocolate or burger, chocolate or ice cream, chocolate or pizza, burger or ice cream, burger or pizza and ice cream or pizza. In general, if there are n items, the number of paired comparison would be $(n(n-1)/2)$. Paired comparison technique is useful when the number of items is limited because it requires a direct comparison and overt choice. In case the number of items to be compared is large (say 10), it would result in 45 paired comparisons which would further result in fatigue for the respondents. Further, in reality, a respondent does not make the choice from two items at a time—there are multiple alternatives available to him.

There are many ways of analysing the paired comparison data. The analysis of paired comparison data would result in an ordinal scale and also in an interval scale measurement. This will be shown with the help of an example. Let us assume that there

are five brands—A, B, C, D and E—and a paired comparison with two brands at a time is presented to the respondent with the option to choose one of them. As there are five brands, it will result in 10 paired comparisons. Suppose this is administered to a sample of 250 respondents with the results as presented in Table 5.2.

Table 5.2 Paired Comparison Data

	A	B	C	D	E
A	–	0.60	0.30	0.60	0.35
B	0.40	–	0.28	0.70	0.40
C	0.70	0.72	–	0.65	0.10
D	0.40	0.30	0.35	–	0.42
E	0.65	0.60	0.90	0.58	–

The above table may be interpreted by assuming that the cell entry in the matrix represents the proportion of respondents who believe that 'the column brand is preferred over the row brand'. For example:

In brand A versus brand B comparison, it can be said that 60 per cent of the respondents prefer brand B to brand A. Similarly, 30 per cent of the respondents prefer brand C to brand A and so on.

To develop the ordinal scale from the given paired comparison data in the above table, we can convert the entries in the table to 0 – 1 scores. This is to show whether the column brand dominates the row brand and vice versa. If the proportion is greater than 0.5 in the above table, a number of '1' is assigned to that cell, which means that the column brand is preferred over the row brand. Whenever the proportion is less than 0.5 in the above table, a number of '0' is assigned to that cell, which means column brand does not dominate the row brand. The results are in Table 5.3.

Table 5.3 Conversion of Paired XComparison Data into 0 to 1 Form

	A	B	C	D	E
A	–	1	0	1	0
B	0	–	0	1	0
C	1	1	–	1	0
D	0	0	0	–	0
E	1	1	1	1	–
Total	2	3	1	4	0

To get the ordinal relationship among the brands, we total the columns. Here the ordinal scale of brands is D > B > A > C > E. This means brand D is the most preferred brand, followed by B, A, C and E.

In order to obtain the interval scale data from the paired comparison data as presented above, the entries in the table can be analysed by using a technique called Thurston's law of comparative judgement, which converts the ordinal judgements into the interval data. Here the proportions are assumed as probabilities and using the assumption of normality, Z-scores can be computed. Z-value has symmetric distribution with a mean of '0' and variance of '1'. If the proportion is less than 0.5, the corresponding Z-value has a negative sign and for the proportion that is greater than 0.5, the Z-score takes a positive value. The Z-scores for the paired comparison data is given in Table 5.4.

Table 5.4 Z-scores for Paired Comparison Data

	A	B	C	D	E
A	0	0.255	–0.525	0.255	–0.38
B	–0.255	0	–0.58	0.525	–0.255
C	0.525	0.58	0	0.385	–1.28
D	–0.255	–0.525	–0.385	0	–0.2
E	0.38	0.255	1.28	0.2	0
Total Distance	0.395	0.565	–0.21	1.365	–2.115
Average Distance	0.079	0.113	–0.042	0.273	–0.423
Brand	D	B	A	C	E
Interval scale value with change of origin	0.696	0.536	0.502	0.381	0

The entries in Table 5.4 show the distance between two brands. Assuming that the scores can be added, the total distance is computed. The average distance is computed by dividing the total score by the number of brands. This way one obtains the absolute position of each brand. Now the highest negative values among all the column is added to each entry corresponding to the average value so that by change of origin, interval scale values can be obtained. This is shown in the last row and the values are of interval scale, indicating the difference between brands. Brand D is the most preferred brand and E is the least preferred brand and the distance between the two is 0.696. The distance between brand C and E equals 0.381.

(b) Rank Order Scaling: In the rank order scaling, respondents are presented with several objects simultaneously and asked to order or rank them according to some criterion. Consider, for example the following question:

- Rank the following soft drinks in order of your preference, the most preferred soft drink should be ranked one, the second most preferred should be ranked two and so on.

Soft Drinks	Rank
Coke	
Pepsi	
Limca	
Sprite	
Mirinda	
Seven Up	
Fanta	

Like paired comparison, this approach is also comparative in nature. The problem with this scale is that if a respondent does not like any of the above-mentioned soft drink and is forced to rank them in the order of his choice, then, the soft drink which is ranked one should be treated as the least disliked soft drink and similarly, the other rankings can be interpreted. This scale is very commonly used to measure preferences for brands as well as attributes. The rank order scaling results in the ordinal data.

(c) Constant Sum Rating Scaling: In constant sum rating scale, the respondents are asked to allocate a total of 100 points between various objects and brands. The respondent distributes the points to the various objects in the order of his preference. Consider the following example:

- Allocate a total of 100 points among the various school into which you would like to admit your child. The more the points you allocate to a school, more preferred it is considered to be. The points should be allocated in such a way that the sum total of the points allocated to various schools adds up to 100.

Schools	Points
DPS	
Modern School	
Mother's International	
APEEJAY	
DAV Public School	
Laxman Public School	
Tagore International	
TOTAL POINTS	**100**

Suppose Mother's International is awarded 30 points, whereas Laxman Public School is awarded 15 points, one can make a statement that the respondent rates Mother's International twice as high as Laxman Public School. This type of data is not only comparative in nature but could also result in ratio scale measurement. This type of scale is widely used in allocating points which the individual may assign to the various attributes of an object.

(d) Q-sort Technique: The Q-sort technique was developed to discriminate among a large number of objects quickly. This technique makes use of the rank order procedure in which objects are sorted into different piles based on their similarity with respect to certain criterion. Suppose there are 100 statements and an individual is asked to pile them into five groups, in such a way, that the strongly agreed statements could be put in one pile, agreed statements could be put in another pile, neutral statement form the third pile, disagreed statements come in the fourth pile and strongly disagreed statements form the fifth pile, and so on. The data generated in this way would be ordinal in nature. The distribution of the number of statement in each pile should be such that the resulting data may follow a normal distribution. The number of piles need not be restricted to 5. It could be as large as 10 or more as the large number increases the reliability or precision of the results.

2. Non-Comparative Scales

In the non-comparative scales, the respondents do not make use of any frame of reference before answering the questions. The resulting data is generally assumed to be interval or ratio scale. For example:

The respondent may be asked to evaluate the quality of food in a restaurant on a five point scale (1 = very poor, 2 = poor and 5 = very good). The non-comparative scales are divided into two categories, namely, the graphic rating scales and the itemized rating scales. The itemized rating scales are further divided into Likert scale, Semantic Differential scale and Stapel scale. All these come under the category of the multiple item scales.

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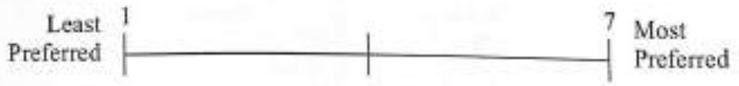
(a) Graphic Rating Scale

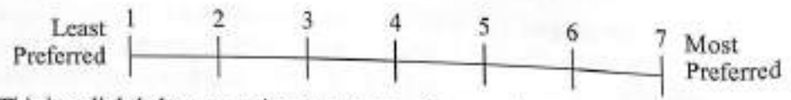
This is a continuous scale, also called graphic rating scale. In the graphic rating scale respondents is asked to tick their preference on a graph. Consider for example the following question:

- Please put a tick mark (√) on the following line to indicate your preference for fast food.



To measure the preference of an individual towards fast food one has to measure the distance from the extreme left to the position where a tick mark has been put. Higher the distance, higher would be the individual preference for fast food. This scale suffers from two limitations—one, if a respondent has put a tick mark at a particular position and after ten minutes, he or she is given another form to put a tick mark, it will virtually be impossible to put a tick at the same position as was done earlier. Does it mean that the respondent's preference for fast food has undergone a change in10 minutes? The basic assumption in this scale is that the respondents can distinguish the fine shade in differences between the preference/attitude which need not be the case. Further, the coding, editing and tabulation of data generated through such a procedure is a very tedious task and researchers would try to avoid using it. Another version of graphic scale could be the following:

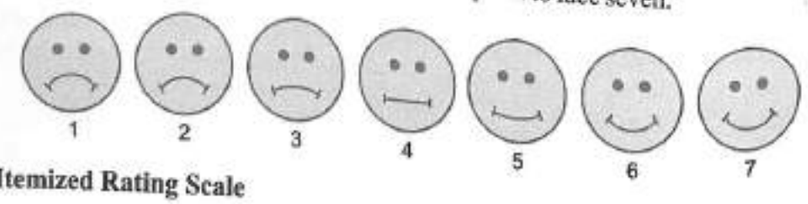
- Please put a tick mark (√) on the following line to indicate your preference for fast food.



This is a slightly better version than the one discussed earlier. It will overcome the limitation of the scale to some extent. For example, if a respondent had earlier ticked between 5 and 6, it is likely that he would remember the same and the second time, he would tick very close to where he did earlier. This means that the difference in the two responses could be negligible.

Another way of presenting the graphic rating scale is through smiling face scale. The following example would illustrate the same.

- Please indicate how much do you like fast food by pointing to the face that best shows your attitude and taste. If you do not prefer it at all, you would point to face one. In case you prefer it the most, you would point to face seven.



(b) Itemized Rating Scale

In the itemized rating scale, the respondents are provided with a scale that has a number of brief descriptions associated with each of the response categories. The response categories are ordered in terms of the scale position and the respondents are supposed

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to select the specified category that describes the best possible way an object is rated. Itemized rating scales are widely used in survey research. There are certain issues that should be kept in mind while designing the itemized rating scale. These issues are:

- **Number of categories to be used:** There is no hard and fast rule as to how many categories should be used in an itemized rating scale. However, it is a practice to use five or six categories. Some researchers are of the opinion that more than five categories should be used in situations where small changes in attitudes are to be measured. There are others that argue that the respondents would find it difficult to distinguish between more than five categories. It is, however, a fact that the additional categories need not increase the precision with the attitude being measured. It is generally seen that researchers use five-category scales and in special cases, may increase or decrease the number of categories.
- **Odd or even number of categories:** It has been a matter of debate among the researchers as to whether odd or even number of categories are to be used in survey research. By using even number of categories, the scale would not have a neutral category and the respondent will be forced to choose either the positive or the negative side of the attitude. If odd numbers of categories are used, the respondent has the freedom to be neutral if he wants to be so. The Likert scale (to be discussed later) is a balanced rating scale with an odd number of categories and a neutral point. It is generally seen that if respondents are not aware of the subject matter being measured by the scale, they would prefer to be neutral. However, if we have selected our unit of analysis to be one who are knowledgeable about the study being conducted and if they prefer to be neutral, we should not debar them from this opportunity.
- **Balanced versus unbalanced scales:** A balanced scale is the one which has equal number of favourable and unfavourable categories. Examples of balanced and unbalanced scale are given below.

The following is the example of a balanced scale:

(i) How important is price to you in buying a new car?

Very important
Relatively important
Neither important nor unimportant
Relatively unimportant
Very unimportant

In this question, there are five response categories, two of which emphasize the importance of price and two others that do not show its importance. The middle category is neutral.

The following is the example of the unbalanced scale.

(ii) How important is price to you in buying a new car?

More important than any other factor
Extremely important
Important
Somewhat important
Unimportant

In this question, there are four response categories that are skewed towards the importance given to the price, whereas one category is for the unimportant side. Therefore,

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this question is an unbalanced question. In the unbalanced scale, the numbers of favourable and unfavourable categories are not the same. One could use an unbalanced scale depending upon the nature of attitude distribution to be measured. If the distribution is dominantly favourable, an unbalanced scale with more favourable categories than unfavourable categories should be appropriate. If an unbalanced scale is used, the nature and degree of the unbalance in the scale should be taken into account during the data analysis.

- **Nature and degree of verbal description:** Many researchers believe that each category must have a verbal, numerical or pictorial description. Verbal description should be clearly and precisely worded so that the respondents are able to differentiate between them. Further, the researcher must decide whether to label every scale category, some scale categories, or only extreme scale categories. It is argued that a clearly defined response category increases the reliability of the measurement.
- **Forced versus non-forced scales:** An important issue concerning the construction of an itemized rating scale is the use of a forced scale versus non-forced scale. In the forced scale, the respondent is forced to take a stand, whereas in the non-forced scale, the respondent can be neutral if he/she so desires. The argument for a forced scale is that those who are reluctant to reveal their attitude are encouraged to do so with the forced scale. Paired comparison scale, rank order scale and constant sum rating scales are examples of forced scales.
- **Physical form:** There are many options that are available for the presentation of the scales. It could be presented vertically or horizontally. The categories could be expressed in boxes, discrete lines or as units on a continuum. They may or may not have numbers assigned to them. The numerical values, if used, may be positive, negative or both.

Suppose we want to measure the perception about Jet Airways using a multi-item scale. One of the questions is about the behaviour of the crew members. Given below is a set of scale configurations that may be used to measure their behaviour. The following are some of the examples where various forms of presenting the scales are shown:

The behaviour of the crew members of Jet Airways is:

1. Very bad ___ ___ ___ ___ ___ Very good
   1 2 3 4 5
2. Very bad
3. ☐ Very bad
   ☐
   ☐ Neither bad nor good
   ☐
   ☐ Very good
4. Very bad Bad Neither bad nor good Good Very good
   −2 −1 0 1 2
5. Very bad Neither bad nor good Very good

Below we will describe some of the itemized rating scales which are very commonly used in survey research.

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Likert Scale

This is a multiple item agree–disagree five-point scale. The respondents are given a certain number of items (statements) on which they are asked to express their degree of agreement/disagreement. The likert scale will be discussed in detail later in the same unit.

Semantic Differential Scale

This scale is widely used to compare the images of competing brands, companies or services. Here the respondent is required to rate each attitude or object on a number of five-or seven-point rating scales. This scale is bounded at each end by bipolar adjectives or phrases. The difference between Likert and Semantic differential scale is that in Likert scale, a number of statements (items) are presented to the respondents to express their degree of agreement/disagreement. However, in the semantic differential scale, bipolar adjectives or phrases are used. As in the case of Likert scale, the information on the phrases and adjectives is obtained through exploratory research. At times there may be a favourable or unfavourable descriptor (adjectives) on the right-hand side and on certain occasions these may be presented on the left-hand side. This rotation becomes necessary to avoid the halo effect. This is because the location of previous judgments on the scale may influence the subsequent judgements because of the carelessness of the respondents. The mid-point of a bipolar scale is a neutral point. In the Likert scale, ten statements were used where respondents were asked to express their degree of agreement/disagreement regarding the image of the company. Taking the same example further, the semantic differential scale corresponding to those ten statements in Likert scale is shown below where the bipolar adjectives/phrases are separated by seven points. These points can be numbered as 1, 2, 3, ..., 7 or +3, +2, +1, 0, −1, ..., −3 − for a favourable descriptor positioned on the left hand side. For an unfavourable descriptor the numberings would be reversed. A typical semantic differential scale where bipolar adjectives/phrases are positioned at the two extreme ends is given in Table 5.5.

Table 5.5 Select Bipolar Adjectives/Phrases of Semantic Differential Scale

1	Makes quality products		Does not make quality products
2	Leader in technology		Backward in technology
3	Does not care about general public		Cares about general public
4	Leads in R & D		Lagging behind in R&D
5	Not a good paymaster		A good paymaster
6	Products go through stringent quality test		Products don't go through quality test
7	Does nothing to curb pollution		Does a remarkable job in curbing pollution
8	Does not care about community near plants		Cares about community near plants
9	Company stocks good to buy		Not advisable to invest in company stock
10	Does not have good labour relations		Has good labour relations

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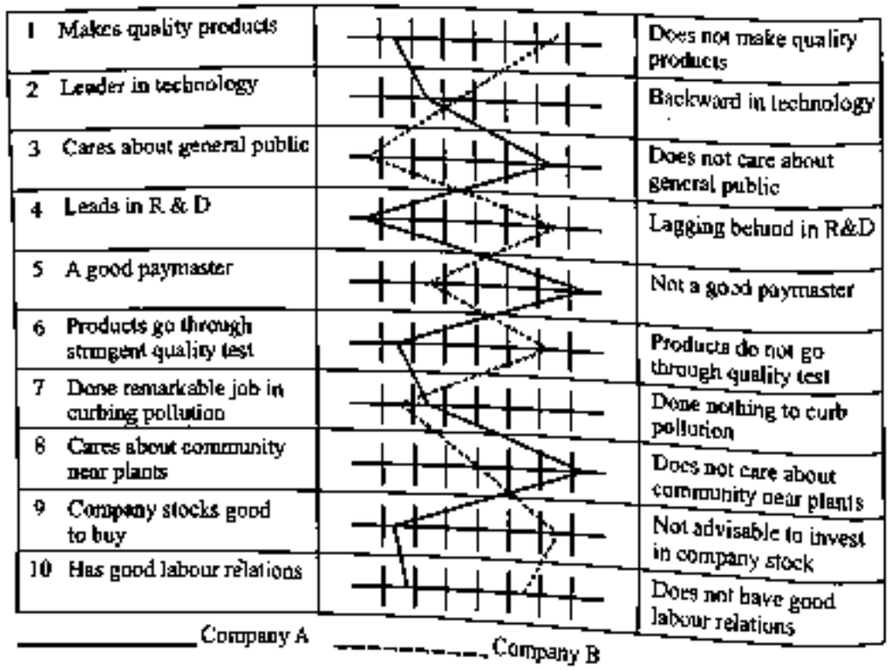
Once the scale is constructed and administered to the representative respondents, the mean score for each of the descriptor is calculated. The scale is administered under the assumption that the numerical values assigned to the response categories are of interval scale in nature. This is generally the practice adopted by many researchers. However, if the response categories are treated as ordinal scale, instead of computing the arithmetic mean, median may be computed. In this example, we are treating the responses as the interval scale and hence the mean is computed. Once the mean for all the bipolar adjectives/phrases is computed we put the result in the form of a pictorial profile so as to make the comparison easy. At this time, all the favourable descriptors are kept on one side and all the unfavourable descriptors are positioned at the other. In our example, we have positioned all the favourable descriptors for the two companies whose image we want to compare on the left hand side. This is shown in Table 5.6.

***Table 5.6** Pictorial Profile Based on Semantic Differential Ratings*



Stapel Scale

The Stapel scale is used to measure the direction and intensity of an attitude. At times it may be difficult to use semantic differential scales because of the problem in creating bipolar adjectives. The Stapel scale overcomes this problem by using only single adjectives. This scale generally has 10 categories involving numbering –5 to +5 without a neutral point and is usually presented in a vertical form. The job of the respondent is to indicate how accurately or inaccurately each term describes the object by selecting an appropriate numerical response category. If a positive higher number is selected by the respondent, it means the respondent is able to describe it more favourably. Suppose a restaurant is to be evaluated on quality of food and quality of service, then the Stapel scale would be presented as shown below:

RESTAURANT

	+5	+5
	+4	+4
	+3	+3
	+2*	+2
	+1	+1
Quality of Food		Quality of Service
–1		–1
–2		–2
–3		–3
–4		–4
–5		–5*

In the above scale, the respondents are asked to evaluate how accurately each word or phrase describes the restaurant in question. They will choose a value of +5 if the restaurant very accurately describes the attribute and –5 if it does not describe at all correctly the word in question. Suppose a respondent has chosen his options as indicated by *. This shows that the respondent slightly prefers the quality of food and is of the opinion that the quality of service is totally useless.

5.4.3 Likert Scale

This is also called a summated scale because the scores on individual items can be added together to produce a total score for the respondent. An assumption of the Likert scale is that each of the items (statements) measures some aspect of a single common factor, otherwise the scores on the items cannot legitimately be summed up. In a typical research study, there are generally 25 to 30 items on a Likert scale.

To construct a Likert scale to measure a particular construct, a large number of statements pertaining to the construct are listed. These statements could range from 80 to 120. The identification of the statements is done through exploratory research which is carried out by conducting a focus group, unstructured interviews with knowledgeable people, literature survey, analysis of case studies and so on. Suppose we want to assess the image of a company. As a first step, an exploratory research may be conducted by having an informal interview with the customers, and employees of the company. The general public may also be contacted. A survey of the literature on the subject may also give a set of information that could be useful for constructing the statements. Suppose the number of statements to measure the constructs is 100 in number. Now samples of representative respondents are asked to state their degree of agreement/disagreement on those statements. Table 5.7 gives a few statements to assess the image of the company.

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Table 5.7 Likert Scale Statements to Measure the Image of the Company

No.	Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	The company makes quality products			√		
2.	It is a leader in technology					√
3.	It doesn't care about the general public.		√			
4.	The company leads in R&D to improve products				√	
5.	The company is not a good paymaster	√				
6.	The products of the company go through stringent quality tests.				√	
7.	The company has not done anything to curb pollution.		√			
8.	It does not care about the community near its plant.	√				
9.	The company's stocks are good to buy or own.				√	
10.	The company does not have good labour relations.		√			

It may be noted that only anchor labels and no numerical values are assigned to the response categories. Once the scale is administered, numerical values are assigned to the response categories. The scale contains statements' some of which are favourable to the construct we are trying to measure and some are unfavourable to it.

For example, out of the ten statements given, statements numbering 1, 2, 4, 6 and 9 in Table 5.7 are favourable statements, whereas the remaining are unfavourable statements. The reason for having a mixture of favourable and unfavourable statements in a Likert scale is that the responses by the respondent should not become monotonous while answering the questions. Generally, in a Likert scale, there is an approximately equal number of favourable and unfavourable statements. Once the scale is administered, numerical values are assigned to the responses. The rule is that a 'strongly agree' response for a favourable statement should get the same numerical value as the 'strongly disagree' response of the unfavourable statement. Suppose for a favourable statement, the numbering is done as Strongly disagree = 1, Disagree = 2, Neither agree nor disagree = 3, Agree = 4 and Strongly agree = 5.

Accordingly, an unfavourable statement would get the numerical values as Strongly disagree = 5, Disagree = 4, Neither agree nor disagree = 3, Agree = 2 and Strong agree = 1. In order to measure the image that the respondent has about the company, the scores are added.

For example, if a respondent has ticked (√) statements numbering from one to ten as shown in Table 5.7, his total score would be 3 + 5 + 4 + 4 + 5 + 4 + 4 + 5 + 4 + 4 = 42 out of 50. Now if there are 100 respondents and 100 statements, the score on the

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image of the company can be worked out for each respondent by adding his/her scores on the 100 statements. The minimum score for each respondent will be 100, whereas the maximum score would be 500.

As mentioned earlier, a typical Likert scale comprises about 25–30 statements. In order to select 25 statements from the 100 statements, we need to discard some of them. The rule behind discarding the statements is that those items that are non-discriminating should be removed. The procedure for choosing 25 (say number of statements) is shown.

As mentioned earlier, the score for each of the respondents on each of the statements can be used to measure his/her total score about the image of the company. The data may look as given in Table 5.8.

Table 5.8 Total Score and Individual Score of Each Respondent on Various Statements

	Scores of Statements									
Resp. No.	1	2	3	...	i	...	j	...	100	Total Score
1	-	-	-	...	5	...	4	...	-	410
2	-	-	-	...	4	...	2	...	-	209
3	-	-	-	...	-	...	-	...	-	-
-	-	-	-	...	-	...	-	...	-	-
-	-	-	-	...	-	...	-	...	-	-
-	-	-	-	...	-	...	-	...	-	-
-	-	-	-	...	-	...	-	...	-	-
-	-	-	-	...	-	...	-	...	-	-
-	-	-	-	...	-	...	-	...	-	-
-	-	-	-	...	-	...	-	...	-	-
100	-	-	-	...	-	...	-	...	-	-

Table 5.8 shows that the total score for respondent no. 1 is 410, whereas for respondent no. 2 it is 209. This means that respondent no. 1 has a more favourable image for the company as compared to respondent no. 2. Now, in order to select 25 statements, let us consider statements numbering i and j. We note that the statement no. j is more discriminating as compared to statement no. i. This is because the score on statement j is very highly correlated with the total score as compared to the scores on statement i. Therefore, if we have to choose between i and j, we will choose statement no. j. From this we can conclude that only those statements will be selected which have a very high correlation with the total score. Therefore, the 100 correlations are to be arranged in the ascending order of magnitudes corresponding to each statement and only top 25 statements having a high correlation with the total score need to be selected.

Another method of selecting the number of statements from a relatively large number of them is through the use of factor analysis.

5.4.4 Bogardus Scale

The Bogardus scale is also known as the Bogardus social distance scale. This scale was invented by Emory S. Bogardus in the 1930s and is used for measuring social distance.

The development of the social distance scale took place with regard to the relations between the West Coast Caucasian Americans and the immigrant Japanese in the early twentieth century. Bogardus (1931) explains, 'While a number of Americans were openly

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expressing prejudice against the Orientals, there were other Americans who felt that the Japanese were being unjustifiably insulted. [The latter] urged that an investigation of the problem be made, feeling that a scientific inquiry would undermine much of the unfair tactics of those opposed to the Japanese.' Dr Robert Park was hired by the Institute of Social and Religious Research to supervise this study, who in turn appointed Bogardus for this purpose. He was required to advance a quantitative measure of racial attitudes. To make the research work objective with the use of scientific methodology, they used the term 'race relations survey' with special emphasis on the term 'survey'. Moreover, he had 'undertaken the tabooed procedure of penetrating hidden subjective fields of experience and their resultant attitudes...and attempted to make those attitudes ... measurable.'

The Bogardus scale is a psychological testing scale to measure through experiment or observation people's willingness to contribute and take part in social meetings of varying degrees of closeness with people from different social backgrounds such as ethnic and racial groups. This technique is mostly applied to the study of social groups, social values and ethnic relations. The Bogardus scale helps in measuring the respondent's response towards a particular social relationship like aggression, warmth, familiarity and indifference by acquiring views about various religious groups. For instance, would a group of people be accepted as a fellow citizen or a neighbour in another country through marriage? Further, the scales make the supposition that the qualities that are being measured maybe seen as a continuum of social distance. There are other examples of social distance scaling techniques like the socio-metric measurement and occupational prestige scales.

According to Bogardus, social distance is a function of emotional detachment between the members of two groups wherein it is basically a measure of how sympathetic the members of two group are towards each other. The scale also measures the extent to which each member of a group would be accepting the members of other group wherein a score of 1.00 is taken to indicate no social distance.

It was important for Bogardus to distinguish between 'feeling' and 'thinking' since social distance for him put emphasis on the feeling reactions of one group of people toward some other group of people. Feelings, he explained, are 'spontaneous expressions of the autonomic nervous system to whatever is happening in the organism. They are expressions in part of the urge for security.' Moreover, feelings had a predictive power according to Bogardus since feelings suggest and guide the attitude of a person and it sheds more light on attitudes than anything else except the actual behaviour of the person. The test of the working of the scale was to capture the respondent's 'first feeling reaction'. This meant that Bogardus wanted people to complete this scale without the inclusion of thoughts or 'without thinking'. 'Feeling reactions', he wrote, 'indicate "just the way he feels", and without regard to politeness, social amenities, or his own status'. (Bogardus, 1947).

The Bogardus social distance scale, hence, validates the point that scales can be used as an important data reduction tool.

Check Your Progress

4. What is the difference between single item scale and multiple item scale?
5. When is the paired comparison technique useful?
6. How is the non-comparative scale categorized?
7. State the difference between Likert and Semantic differential scale.
8. What does the Bogardus social distance scale validate?

5.5 MEASUREMENT ERROR

Measurement error occurs when the observed measurement on a construct or concept deviates from its true values. The following is a list of the sources of measurement errors.

- There are factors like mood, fatigue and health of the respondent which may influence the observed response while the instrument is being administered.
- The variations in the environment in which measurements are taken may also result in a departure from the true value.
- There are situations when a respondent may not understand the question being asked and the interviewer may have to rephrase the same. While rephrasing the question, the interviewer's bias may get into the responses. Also, how the questionnaire is administered (telephone survey, personal interview with questionnaire or mail survey) will have its own impact on the responses.
- At times, some of the questions in the questionnaire may be ambiguous and some may be very difficult for the respondents to understand. Both of them can cause deviation from the correct response, thereby giving rise to measurement error.
- At times, the errors may be committed at the time of coding, entering of data from questionnaire to the spreadsheet on the computer and at the tabulation stage.

The observed measurement in any research need not be equal to the true measurement. The observed measurement can be written as

$$O = T + S + R$$

Where, O = Observed measurement
T = True score
S = Systematic error
R = Random error

It may be noted that the total error consists of two components—systematic error and random error. Systematic error causes a constant bias in the measurement. Suppose there is a weighing scale that weighs 50 gm less for every one kg of product being weighed. The error would consistently remain the same irrespective of the kind of product and the time at which product is weighed. Random error on the other hand involves influences that bias the measurements but are not systematic. Suppose we use different weighing scales to weigh one kg of a product and if systematic error is assumed to be absent, we may find that recorded weights may fall within a range around the true value of the weight, thereby causing random error.

5.5.1 Criteria for Good Measurement

There are three criteria for evaluating measurements: reliability, validity and sensitivity. We have already studied reliability and validity in unit two. Here, we will study reliability and validity with regard to scales.

Reliability

Reliability is concerned with consistency, accuracy and predictability of the scale. It refers to the extent to which a measurement process is free from random errors. The reliability of a scale can be measured using the following methods:

Test–retest reliability: In this method, repeated measurements of the same person or group using the same scale under similar conditions are taken. A very high correlation between the two scores indicates that the scale is reliable. However, the following issues should be kept in mind before arriving at such a conclusion.

- What should be the appropriate time difference between the two observations is a question which requires attention. If the time difference between two consecutive observations is very small (say two or three weeks) it is very likely that the respondents would remember the previous answer and may give the same answer

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when the instrument is administered the second time. This will make the instrument reliable, which may not actually be the case. However, if the difference between the two observations is very large (say more than a year) it is quite likely that the respondent's answers to the various questions of the instrument might have actually undergone a change, resulting in poor reliability of the scale. Therefore, the researcher has to be very careful in deciding upon the time difference between the two observations. Generally, it is thought that a time difference of about five to six months is an ideal period.

- Another problem in this test is that the first measurement may change the response of the subject to the second measurement.
- The situational factors working on two different time periods may not be the same, which may result in different measurement in the two periods.
- The second reading on the same instrument from the same subject may produce boredom, anger or attempt to remember the answers given in an initial measurement.
- A favourable response with a brand during the period between the two tests might cause a shift in the individual rating by the subject.

Split-half reliability method: This method is used in the case of multiple item scales. Here the number of items is randomly divided into two parts and a correlation coefficient between the two is obtained. A high correlation indicates that the internal consistency of the construct leads to greater reliability. Another measure which is used to test the internal consistency of a multiple item scale is the coefficient alpha (α)-commonly known as cronbach alpha. The cronbach alpha computes the average of all possible split-half reliabilities for a multiple item scale. This coefficient demonstrates whether the average score of all split-half of reliabilities converge to a certain point or not.

The coefficient alpha does not address validity. However, many researchers use this as a sole indicator of validity. The alpha coefficient can take values between 0 and 1. The following values of alpha with their interpretation are suggested below:

$\alpha = 0$ means	There is no consistency between the various items of a multiple item scale
$\alpha = 1$ means	There is complete consistency between various items of a multiple item scale
$0.80 \leq \alpha \leq 0.95$ implies	There is very good reliability between the various items of a multiple item scale
$0.70 \leq \alpha \leq 0.80$ implies	There is good reliability between the various items of a multiple item scale
$0.60 \leq \alpha \leq 0.70$ implies	There is fair reliability between the various items of a multiple item scale
$\alpha < 0.60$ means	There is poor reliability between the various items of a multiple item scale

Validity

The validity of a scale refers to the question whether we are measuring what we want to measure. Validity of the scale refers to the extent to which the measurement process is free from both systematic and random errors. The validity of a scale is a more serious issue than reliability. There are different ways to measure validity.

- **Content validity:** This is also called face validity. It involves subjective judgement by an expert for assessing the appropriateness of the construct. For example, to measure the perception of an individual towards Kingfisher Airlines, a multiple item scale is developed. A set of 15 items is proposed. These items when combined in an index measure the perception of Kingfisher Airlines. In order to judge the content validity of these 15 items, a set of experts may be requested to examine the representativeness of the 15 items. The items covered may be lacking in the content validity if we have omitted behaviour of the crew, food quality, and food quantity, etc., from the list. In fact, conducting the exploratory research to exhaust the list of items measuring perception of the airline would be of immense help in such a case.
- **Concurrent validity:** It is used to measure the validity of the new measuring techniques by correlating them with the established techniques. It involves computing the correlation coefficient of two measures of the same phenomena (for example, perception of an airline and image of a company) which are administered at the same time. We prepare a 15 item scale to measure the perception of Kingfisher Airline, which is assumed to be a valid one. Suppose a researcher proposes an alternative and shorter technique. The concurrent validity of the new technique would be established if there is a high correlation between the two techniques when administered at the same time under similar or identical conditions.
- **Predictive validity:** This involves the ability of a measured phenomenon at one point of time to predict another phenomenon at a future point of time. If the correlation coefficient between the two is high, the initial measure is said to have a high predictive ability. As an example, consider the use of the Common Admission Test (CAT) to shortlist candidates for admission to the MBA programme in a business school. The CAT scores are supposed to predict the candidate's aptitude for studies towards business education.

Sensitivity

The sensitivity of a scale is an important measurement concept, particularly when changes in attitudes are under investigation. Sensitivity refers to an instrument's ability to accurately measure the variability in a concept. A dichotomous response category such as agree or disagree does not allow the recording of any attitude changes. A more sensitive measure with numerous categories on the scale may be required. For example, adding strongly agree, agree, neither agree nor disagree, disagree and strongly disagree categories will increase the sensitivity of the scale.

The sensitivity of scale based on a single question or a single item can be increased by adding questions or items. In other words, because composite measures allow for a greater range of possible scores, they are more sensitive than a single-item scale. Therefore, the sensitivity of the scale is generally increased by adding more response points or by adding scale items.

Check Your Progress

9. When does a measurement error occur?
10. List two sources of measurement errors.
11. Define validity of the scale.
12. Why does the sensitivity of the scale generally increase by adding more response points or by adding scale items?

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5.6 SUMMARY

In this unit, you have learnt that,

- The term 'measurement' means assigning numbers or some other symbols to the characteristics of certain objects. When numbers are used, the researcher must have a rule for assigning a number to an observation in a way that provides an accurate description.
- Scaling is an extension of measurement. Scaling involves creating a continuum on which measurements on objects are located.
- There are four types of measurement scales—nominal, ordinal, interval and ratio scales. The choice of the measurement scale has implications for the statistical technique to be used for data analysis.
- In the nominal scale there is a strict one-to-one correspondence between the numbers and the objects. Each number is assigned to only one object and each object has only one number assigned to it.
- An ordinal scale tells us the relative positions of the objects and not the difference between the magnitudes of the objects.
- In the ordinal scale, the assigned ranks cannot be added, multiplied, subtracted or divided. One can compute median, percentiles and quartiles of the distribution. The other major statistical analysis which can be carried out is the rank order correlation coefficient, sign test.
- The interval scale measurement is the next higher level of measurement. It takes care of the limitation of the ordinal scale measurement where the difference between the score on the ordinal scale does not have any meaningful interpretation.
- As the interval scale data can be converted into the ordinal and the nominal scale data, therefore all the techniques applicable for the ordinal and the nominal scale data can also be used for interval scale data.
- Ratio scale is the highest level of measurement and takes care of the limitations of the interval scale measurement, where the ratio of the measurements on the scale does not have a meaningful interpretation. The ratio scale measurement can be converted into interval, ordinal and nominal scale. But the other way round is not possible.
- An attitude is viewed as an enduring disposition to respond consistently in a given manner to various aspects of the world, including persons, events and objects. A company is able to sell its products or services when its customers have a favourable attitude towards its products/services.
- The affective component summarizes a person's overall feeling or emotions towards the objects. The examples for this component could be: the food cooked in a pressure cooker is tasty, taste of orange juice is good or the taste of bitter gourd is very bad.
- In the single item scale, there is only one item to measure a given construct.
- In multiple item scale, there are many items that play a role in forming the underlying construct that the researcher is trying to measure. This is because each of the item forms some part of the construct (satisfaction) which the researcher is trying to measure.

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- In comparative scales it is assumed that respondents make use of a standard frame of reference before answering the question.
- Paired comparison technique is useful when the number of items is limited because it requires a direct comparison and overt choice.
- In the rank order scaling, respondents are presented with several objects simultaneously and asked to order or rank them according to some criterion.
- In the non-comparative scales, the respondents do not make use of any frame of reference before answering the questions.
- In the itemized rating scale, the respondents are provided with a scale that has a number of brief descriptions associated with each of the response categories. The response categories are ordered in terms of the scale position and the respondents are supposed to select the specified category that describes in the best possible way an object is rated.
- The difference between Likert and Semantic differential scale is that in Likert scale, a number of statements (items) are presented to the respondents to express their degree of agreement/disagreement. However, in the semantic differential scale, bipolar adjectives or phrases are used.
- The Stapel scale is used to measure the direction and intensity of an attitude. At times it, may be difficult to use semantic differential scales because of the problem in creating bipolar adjectives. The Stapel scale overcomes this problem by using only single adjectives.
- Likert scale is a multiple item agree–disagree five-point scale. The respondents are given a certain number of items (statements) on which they are asked to express their degree of agreement/disagreement.
- To construct a Likert scale to measure a particular construct, a large number of statements pertaining to the construct are listed. These statements could range from 80 to 120.
- The Bogardus scale is also known as the Bogardus social distance scale. This scale was invented by Emory S. Bogardus in the 1930s and is used for measuring social distance.
- According to Bogardus, social distance is a function of emotional detachment between the members of two groups wherein it is basically a measure of how sympathetic the members of two group are towards each other.
- The Bogardus social distance scale, hence, validates the point that scales can be used as an important data reduction tool.
- Measurement error occurs when the observed measurement on a construct or concept deviates from its true values.
- Reliability is concerned with consistency, accuracy and predictability of the scale. It refers to the extent to which a measurement process is free from random errors.
- The sensitivity of a scale is an important measurement concept, particularly when changes in attitudes are under investigation. Sensitivity refers to an instrument's ability to accurately measure the variability in a concept.

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5.7 KEY TERMS

- **Measurement:** It means assigning numbers or some other symbols to the characteristics of certain objects.
- **Scaling:** It is an extension of measurement; it involves creating a continuum on which measurements on objects are located.
- **Ordinal scale measurement:** It tells whether an object has more or less of characteristics than some other objects.
- **Balanced scale:** It is the one which has equal number of favourable and unfavourable categories.
- **Reliability:** It refers to the extent to which a measurement process is free from random errors.
- **Validity of the scale:** It refers to the extent to which the measurement process is free from both systematic and random errors.
- **Content validity:** It is also called face validity in which an expert provides subjective judgement to assess the appropriateness of the construct.
- **Sensitivity:** It refers to an instrument's ability to accurately measure the variability in a concept.

5.8 ANSWERS TO 'CHECK YOUR PROGRESS'

1. The term 'measurement' means assigning numbers or some other symbols to the characteristics of certain objects.
2. There are four types of measurement scales—nominal, ordinal, interval and ratio scales.
3. The three components of attitude are: Cognitive component, affective component and intention or action component.
4. In the single item scale, there is only one item to measure a given construct whereas in multiple item scale, there are many items that play a role in forming the underlying construct that the researcher is trying to measure.
5. Paired comparison technique is useful when the number of items is limited because it requires a direct comparison and overt choice.
6. The non-comparative scales are divided into two categories, namely, the graphic rating scales and the itemized rating scales.
7. The difference between Likert and Semantic differential scale is that in Likert scale, a number of statements (items) are presented to the respondents to express their degree of agreement/disagreement. However, in the semantic differential scale, bipolar adjectives or phrases are used.
8. The Bogardus social distance scale, hence, validates the point that scales can be used as an important data reduction tool.
9. Measurement error occurs when the observed measurement on a construct or concept deviates from its true values.

10. The following are the sources of measurement errors:
    - There are factors like mood, fatigue and health of the respondent which may influence the observed response while the instrument is being administered.
    - The variations in the environment in which measurements are taken may also result in a departure from the true value.
11. Validity of the scale refers to the extent to which the measurement process is free from both systematic and random errors.
12. The sensitivity of scale based on a single question or a single item can be increased by adding questions or items. In other words, because composite measures allow for a greater range of possible scores, they are more sensitive than a single-item scale. Therefore, the sensitivity of the scale is generally increased by adding more response points or by adding scale items.

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5.9 QUESTIONS AND EXERCISES

Short-Answer Questions

1. What are the problems faced by a researcher while conducting research work?
2. What is scaling?
3. Write a note on the nominal scale of measurement.
4. How would you differentiate between an ordinal scale and an interval scale?
5. List the various forms of presenting the scales.
6. When is a Stapel scale used?
7. Distinguish between single-item and multiple-item scale. Should one prefer a multiple-item scale over the single-item scale? Give reasons.
8. Write a note on the Likert scale.
9. What according to Bogardus is the reason behind social distance between two groups of people?
10. What is test–retest reliability? What problems can be faced by the researchers by using the test–retest reliability measure?

Long-Answer Questions

1. What is measurement? Distinguish between the four types of measurement scales.
2. Describe attitude and its three components.
3. Discuss the various classifications of scales.
4. Explain the Likert scale in detail.
5. What led to the development of Bogardus social distance scale? What does the scale measure?
6. Explain measurement error and explain the criteria for good measurement.
7. What is an itemized rating scale? What are the various issues involved in constructing an itemized rating scale?
8. Briefly explain the concepts of reliability and validity.