

**SRI MUTHUKUMARAN INSTITUTE OF TECHNOLOGY**

**DEPARTMENT OF MANAGEMENT STUDIES**

**BA4205/BUSINESS RESEARCH METHODS**

**Two Marks Question & Answer**

**Unit I**

**1. Define Research.**

According to Clifford woody research comprises of defining and redefining problems, Formulating hypothesis or suggested solutions collecting, organizing and evaluating data, Making deductions and reaching conclusions and at last carefully testing the conclusions to Determine whether they fit the formulating hypothesis.

**2. Define Research Design.**

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. The research design refers to the overall strategy that you choose to integrate the different components of the study in a coherent and logical way, thereby, ensuring you will effectively address the research problem; it constitutes the blueprint for the collection, measurement, and analysis of data.

**3. Explain the importance of research?**

1. To face competitive global market
2. To identify critical issues
3. To understand,  
Predict and control events in the environment
4. To sense spot and deal with Problems before they go out of hand
5. To eliminate or avoid making decisions on Subjective or biased manner.

**4. What is exploratory research? Exploratory research is a type of research conducted because a problem has not been clearly defined.**

List the steps in the Research Process. Observation, primary data gathering, Extensive literature survey, Problem definition, Theoretical Frame work, Hypothesis Development, preparation of research design, determining the sample design, data analysis, Interpretation and report.

**5. What do you understand by Research Objective?**

- It develops focus
- It reveals characteristics
- It determines frequency of occurrence

- It tests hypothesis
- Promotes better decision making
- Research is the basis for innovation
- Research identifies the problem areas.
- Helps in forecasting which is very useful for manages

### **7. What do you understand by null hypothesis?**

The null hypothesis is a proposition that states a definitive, exact relationship between two variables. That is, it states that population correlation between two variables is equal to zero. In general the null hypothesis is expressed as no significant relationship between two variables or no significant difference between two groups.

### **8. What is a confounding variable, and why do confounding variables create problems in research studies?**

An extraneous variable is a variable that may compete with the independent variable in explaining the outcome of a study. A confounding variable (also called a third variable) is a variable that does cause a problem because it is empirically related to both the independent and dependent variable. A confounding variable is a type of extraneous variable (it's the type that we know is a problem, rather than the type that might potentially be a problem).

### **9. What is Reliability?**

The results of the test hypothesis should be supported again and again when the same type of Research is repeated in some other circumstances.

### **10. State the different types of hypothesis.**

1. Statement Hypotheses 2. Directional hypothesis 3. Non directional hypothesis 4. Null Hypothesis 5. Alternate hypothesis.

### **11. Define Rating Scales.**

Rating scales are used to judge properties of objects without reference to other similar objects. An object is judged in absolute terms against certain specified criteria.

### **12. What is Likert Scale?**

Likert scale is designed to examine how strongly the respondents agree or disagree with statements relating to the attitude or object on a five point scale.

### **13. What is Itemized rating scale?**

It is five point or seven point scale with anchors provided for each item and the respondent states the appropriate number on the side of each item or circles the relevant number against each item. The responses to the items are then summated.

#### **14. What is staple scale?**

It is simplified version of semantic differential scales. It is used when it becomes difficult to find bipolar adjectives that match the investigative questions.

#### **15. What is Graphic rating scale?**

The respondent indicates his rating by simply making a mark at the appropriate point on a line. that runs from one extreme to the other.

#### **16. State the objectives of Research.**

- To gain familiarity with new insights into a phenomenon (i.e., formulative research studies);
- To accurately portray the characteristics of a particular individual, group, or a situation (i.e., descriptive research studies);
- To analyse the frequency with which something occurs (i.e., diagnostic research studies)

#### **17. Mention the significance of research.**

- Research encourages scientific and inductive thinking, besides promoting the development of logical habits of thinking and organisation.
- The role of research in applied economics in the context of an economy or business is greatly increasing in modern times.
- The increasingly complex nature of government and business has raised the use of research in solving operational problems.

#### **18. What descriptive research?**

Descriptive research consists of surveys and fact-finding enquiries of different types. The main objective of descriptive research is describing the state of affairs as it prevails at the time of study. The term 'ex post facto research' is quite often used for descriptive research studies in social sciences and business research.

#### **19. What is Applied Research?**

Research can also be applied or fundamental in nature. An attempt to find a solution to an immediate problem encountered by a firm, an industry, a business organisation, or the society is known as applied research. Researchers engaged in such researches aim at drawing certain conclusions confronting a concrete social or business problem.

#### **20. Define Empirical Research.**

Empirical research is also known as experimental type of research, in which it is important to first collect the facts and their sources, and actively take steps to stimulate the production of desired information. In this type of research, the researcher first formulates a working hypothesis, and then gathers sufficient facts to prove or disprove the stated hypothesis.

#### **21. Discuss the qualities of good researcher.**

- First of all, the nature of a researcher must be of the temperament that vibrates in unison with the theme which he is searching.

- Hence, the seeker of knowledge must be truthful with truthfulness of nature, which is much more important, much more exacting than what is sometimes known as truthfulness.
- The truthfulness relates to the desire for accuracy of observation and precision of statement. Ensuring facts is the principal rule of science, which is not an easy matter.

## 22. How do you determine the sample design?

Although the sampling plan is included in the research design, the actual sampling is a separate stage of the research process. However, for convenience, the sample planning and sample generation processes are treated together in this section. Sampling involves any procedure that uses a small number of items or that uses parts of the population to make a conclusion regarding the whole population.

## 23. List the research process.



## 24. What is fundamental research?

On the other hand, fundamental research mainly concerns generalizations and formulation of a theory. In other words, “Gathering knowledge for knowledge’s sake is termed ‘pure’ or ‘basic’ research”. Researches relating to pure mathematics or concerning some natural phenomena are instances of Fundamental Research. Likewise, studies focusing on human behavior also fall under the category of fundamental research.

## 25. Define Qualitative Research.

Qualitative research is concerned with qualitative phenomena, or more specifically, the aspects related to or involving quality or kind. For example, an important type of qualitative research is 'Motivation Research', which investigates into the reasons for certain human behaviour.

## UNIT I (13 Marks)

### **Q.1. What do you mean by research? Explain its objectives, significance and types?**

**Ans.** Research in simple terms refers to search for knowledge. It is a scientific and systematic search for information on a particular topic or issue. It is also known as the art of scientific investigation.

According to Redman and Mory (1923), research is a “systematized effort to gain new knowledge”. It is an academic activity and therefore the term should be used in a technical sense. According to Clifford Woody, research comprises “defining and redefining problems, formulating hypotheses or suggested solutions; collecting, organizing and evaluating data; making deductions and reaching conclusions; and finally, carefully testing the conclusions to determine whether they fit the formulated hypotheses”.

Thus, research is an original addition to the available knowledge, which contributes to its further advancement. It is an attempt to pursue truth through the methods of study, observation, comparison and experiment. In sum, research is the search for knowledge, using objective and systematic methods to find solution to a problem.

#### **Objectives of Research:**

The objective of research is to find answers to the questions by applying scientific procedures. In other words, the main aim of research is to find out the truth which is hidden and has not yet been discovered. Although every research study has its own specific objectives, the research objectives may be broadly grouped as follows:

1. To gain familiarity with new insights into a phenomenon (i.e., formulative research studies);
2. To accurately portray the characteristics of a particular individual, group, or a situation (i.e., descriptive research studies);
3. To analyse the frequency with which something occurs (i.e., diagnostic research studies); and
4. To examine the hypothesis of a causal relationship between two variables (i.e., hypothesis-testing research studies).

#### **Significance of Research:**

According to a famous Hudson Maxim, “All progress is born of inquiry. Doubt is often better than overconfidence, for it leads to inquiry, and inquiry leads to invention”. It brings out the significance of research, increased amount of which makes the progress possible. Research encourages scientific and inductive thinking, besides promoting the development of logical habits of thinking and organisation. The role of research in applied economics in the context of an economy or business is greatly increasing in modern times. The increasingly complex nature of government and business has raised the use of research in solving operational problems. Research assumes significant role in the formulation of economic policy for both, the government and business. It provides the basis for almost all government policies of an economic system. Government budget formulation, for example, depends particularly on the analysis of needs and desires of people, and the availability of revenues, which requires research. Research helps to formulate alternative policies, in addition to examining the consequences of these alternatives. Thus, research also facilitates the decision-making of policy-makers, although in it is not a part of research. In the process, research also helps in the proper allocation of a country’s scarce resources.

Research is also necessary for collecting information on the social and economic structure of an economy to understand the process of change occurring in the country. Collection of statistical information, though not a routine task, involves various research problems. Therefore, large staff of research technicians or experts is engaged by the government these days to undertake this work.

Research also assumes significance in solving various operational and planning problems associated with business and industry. In several ways, operations research, market research and motivational research are vital and their results assist in taking business decisions. Market research refers to the investigation of the structure and development of a market for the formulation of efficient policies relating to purchases, production and sales. Operational research relates to the application of logical, mathematical, and analytical techniques to find solution to business problems, such as cost minimization or profit maximization, or the optimization problems. Motivational research helps to determine why people behave in the manner they do with respect to market characteristics. More specifically, it is concerned with the analysis of the motivations underlying consumer behaviour. All these researches are very useful for business and industry, and are responsible for business decision-making.

Research is equally important to social scientists for analyzing the social relationships and seeking explanations to various social problems. It gives intellectual satisfaction of knowing things for the sake of knowledge. It also possesses the practical utility for the social scientist to gain knowledge so as to be able to do something better or in a more efficient manner. The research in social sciences is concerned with both knowledge for its own sake, and knowledge for what it can contribute to solve practical problems.

## **2. Elaborate the types of research.**

### **Types of Research:**

#### **1. Descriptive Versus Analytical:**

Descriptive research consists of surveys and fact-finding enquiries of different types. The main objective of descriptive research is describing the state of affairs as it prevails at the time of study. The term 'ex post facto research' is quite often used for descriptive research studies in social sciences and business research. The most distinguishing feature of this method is that the researcher has no control over the variables here. He/she has to only report what is happening or what has happened. Majority of the ex post facto research projects are used for descriptive studies in which the researcher attempts to examine phenomena, such as the consumers' preferences, frequency of purchases, shopping, etc. Despite the inability of the researchers to control the variables, ex post facto studies may also comprise attempts by them to discover the causes of the selected problem. The methods of research adopted in conducting descriptive research are survey methods of all kinds, including correlational and comparative methods. Meanwhile in the Analytical research, the researcher has to use the already available facts or information, and analyse them to make a critical evaluation of the subject.

#### **2. Applied Versus Fundamental:**

Research can also be applied or fundamental in nature. An attempt to find a solution to an immediate problem encountered by a firm, an industry, a business organisation, or the society is known as applied research. Researchers engaged in such researches aim at drawing certain conclusions confronting a concrete social or business problem.

On the other hand, fundamental research mainly concerns generalizations and formulation of a theory. In other words, "Gathering knowledge for knowledge's sake is termed 'pure' or 'basic' research". Researches relating to pure mathematics or concerning some natural phenomenon are

instances of Fundamental Research. Likewise, studies focusing on human behaviour also fall under the category of fundamental research.

Thus, while the principal objective of applied research is to find a solution to some pressing practical problem, the objective of basic research is to find information with a broad base of application and add to the already existing organized body of scientific knowledge.

### **3. Quantitative Versus Qualitative:**

Quantitative research relates to aspects that can be quantified or can be expressed in terms of quantity. It involves the measurement of quantity or amount. Various available statistical and econometric methods are adopted for analysis in such research which includes correlation, regressions and time series analysis etc,

On the other hand, Qualitative research is concerned with qualitative phenomena, or more specifically, the aspects related to or involving quality or kind. For example, an important type of qualitative research is 'Motivation Research', which investigates into the reasons for certain human behaviour. The main aim of this type of research is discovering the underlying motives and desires of human beings by using in-depth interviews. The other techniques employed in such research are story completion tests, sentence completion tests, word association tests, and other similar projective methods. Qualitative research is particularly significant in the context of behavioural sciences, which aim at discovering the underlying motives of human behaviour. Such research helps to analyze the various factors that motivate human beings to behave in a certain manner, besides contributing to an understanding of what makes individuals like or dislike a particular thing. However, it is worth noting that conducting qualitative research in practice is considerably a difficult task. Hence, while undertaking such research, seeking guidance from experienced expert researchers is important.

### **4. Conceptual Versus Empirical:**

The research related to some abstract idea or theory is known as Conceptual Research. Generally, philosophers and thinkers use it for developing new concepts or for reinterpreting the existing ones. Empirical Research, on the other hand, exclusively relies on the observation or experience with hardly any regard for theory and system. Such research is data based, which often comes up with conclusions that can be verified through experiments or observation. Empirical research is also known as experimental type of research, in which it is important to first collect the facts and their sources, and actively take steps to stimulate the production of



desired information. In this type of research, the researcher first formulates a working hypothesis, and then gathers sufficient facts to prove or disprove the stated hypothesis. He/she formulates the experimental design, which according to him/her would manipulate the variables, so as to obtain the desired information. This type of research is thus characterized by the researcher's control over the variables under study. In simple term, empirical research is most appropriate when an attempt is made to prove that certain variables influence the other variables in some way. Therefore, the results obtained by using the experimental or empirical studies are considered to be the most powerful evidences for a given hypothesis.

### **5. Other Types of Research:**

The remaining types of research are variations of one or more of the afore-mentioned type of research. They vary in terms of the purpose of research, or the time required to complete it, or may be based on some other similar factor. On the basis of time, research may either be in the nature of one-time or longitudinal time series research. While the research is restricted to a single time-period in the former case, it is conducted over several time-periods in the latter case. Depending upon the environment in which the research is to be conducted, it can also be laboratory research or field-setting research, or simulation research, besides being diagnostic or clinical in nature. Under such research, in-depth approaches or case study method may be employed to analyse the basic causal relations. These studies usually undertake a detailed in-depth analysis of the causes of certain events of interest, and use very small samples and sharp data collection methods. The research may also be explanatory in nature. Formalized research studies consist of substantial structure and specific hypotheses to be verified. As regards to historical research, sources like historical documents, remains, etc. Are utilized to study past events or ideas. It also includes philosophy of persons and groups of the past or any remote point of time.

Research has also been classified into decision-oriented and conclusion-oriented categories. The decision-oriented research is always carried out as per the need of a decision maker and hence, the researcher has no freedom to conduct the research according to his/her own desires. On the other hand, in the case of Conclusion-oriented research, the researcher is free to choose the problem, redesign the enquiry as it progresses and even change conceptualization as he/she wishes to. Operations research is a kind of decision-oriented research, where in scientific method is used in providing the departments, a quantitative basis for decision-making with respect to the activities under their purview.

#### **Q.4 What could be the objective of conducting research? Also discuss the qualities of a good researcher?**

**Ans.** The importance of knowing how to conduct research is listed below:

- i. The knowledge of research methodology provides training to new researchers and enables them to do research properly. It helps them to develop disciplined thinking or a 'bent of mind' to objectively observe the field;
- ii. The knowledge of doing research inculcates the ability to evaluate and utilize the research findings with confidence;
- iii. The knowledge of research methodology equips the researcher with the tools that help him/her to make the observations objectively; and
- iv. The knowledge of methodology helps the research consumers to evaluate research and make rational decisions.

#### **Qualities of a Researcher:**

It is important for a researcher to possess certain qualities to conduct research. First and foremost, he being a scientist should be firmly committed to the 'articles of faith' of the scientific methods of research. This implies that a researcher should be a social science person in the truest sense. A researcher should possess the following qualities:

(1) First of all, the nature of a researcher must be of the temperament that vibrates in unison with the theme which he is searching. Hence, the seeker of knowledge must be truthful with truthfulness of nature, which is much more important, much more exacting than what is sometimes known as truthfulness. The truthfulness relates to the desire for accuracy of observation and precision of statement. Ensuring facts is the principle rule of science, which is not an easy matter. The difficulty may arise due to untrained eye, which fails to see anything beyond what it has the power of seeing and sometimes even less than that. This may also be due to the lack of discipline in the method of science. An unscientific individual often remains satisfied with the expressions like approximately, almost, or nearly, which is never what nature is. A real research cannot see two things which differ, however minutely, as the same.

(2) A researcher must possess an alert mind. Nature is constantly changing and revealing itself through various ways. A scientific researcher must be keen and watchful to notice such changes, no matter how small or insignificant they may appear. Such receptivity has to be cultivated slowly and patiently over time by the researcher through practice. An individual who is ignorant or not alert and receptive during his research will not make a good

researcher. He will fail as a good researcher if he has no keen eyes or mind to observe the unusual changes behind the routine. Research demands a systematic immersion into the subject matter by the researcher grasp even the slightest hint that may culminate into significant research problems.

(3) Scientific enquiry is pre-eminently an intellectual effort. It requires the moral quality of courage, which reflects the courage of a steadfast endurance. The process of conducting research is not an easy task. There are occasions when a research scientist might feel defeated or completely lost. This is the stage when a researcher would need immense courage and the sense of conviction. The researcher must learn the art of enduring intellectual hardships.

In order to cultivate the afore-mentioned three qualities of a researcher, a fourth one may be added. This is the quality of making statements cautiously. A researcher should cultivate the habit of reserving judgment when the required data are insufficient.

### **Q.5 Describe the research process in detail? Also discuss the problems encountered by researchers in India?**

#### **Ans. Research Process:**

Research process consists of a series of steps or actions required for effectively conducting research. The following are the steps that provide useful procedural guidelines regarding the conduct of research:

**(1) Formulating the research problem:** The research process begins with problem discovery, and identifying the problem is the first step toward its solution. The word problem, in general usage, suggests something has gone wrong. Actually, the research task may be to clarify a problem, to evaluate a program, or to define an opportunity, and problem discovery and definition will be used in this broader context. It should be noted that the initial stage is problem discovery, rather than definition. Thus the problem statement is often made only in general terms.

The adage “a problem well defined is a problem half solved” is worth remembering. This adage emphasizes that an orderly definition of the research problem gives a sense of direction to the investigation. Careful attention to problem definition allows the researcher to set the proper research objectives. If the purpose of the research is clear, the chances of collecting the necessary and relevant information-without collecting surplus information-will be much greater.

**(2) Extensive literature survey:** Once the problem is formulated, the next step is to write down a brief summary of previous research so that the researcher may be familiar with what is already

known and with what is still unknown and untested. This helps to eliminate the replication of work and provides useful basis for the formulation of hypothesis.

**(3) Developing hypothesis:** A hypothesis is a tentative explanation for certain behaviours, phenomena, or events that have occurred or will occur. A hypothesis states the researcher's expectations concerning the relationship between the variables in the research problem; a hypothesis is the most specific statement of the problem. The hypothesis is formulated following the review of related literature and prior to the execution of the study. It logically follows the review since it is based on the implications of previous research. The related literature leads one to expect a certain relationship.

**(4) Preparing the research design:** After the researcher has formulated the research problem, the research design must be developed. A research design is a master plan specifying the methods and procedures for collecting and analysing the needed information. It is a framework of the research plan of action. The objectives of the study determined during the early stages of the research are included in the design to ensure that the information collected is appropriate for solving the problem. The research investigator must also determine the sources of information, the design technique (survey or experiment, for example), the sampling methodology, and the schedule and cost of the research. Once an appropriate design has been determined, the researcher moves on to the next stage-planning the sample to be used.

**(5) Determining sample design:** Although the sampling plan is included in the research design, the actual sampling is a separate stage of the research process. However, for convenience, the sample planning and sample generation processes are treated together in this section. Sampling involves any procedure that uses a small number of items or that uses parts of the population to make a conclusion regarding the whole population. In other words, a sample is a subset from a larger population. If certain statistical procedures are followed, it is unnecessary to select every item in a population because the results of a good sample should have the same characteristics as the population as a whole.

**(6) Collecting data:** Once the research design (including the sampling plan) has been formalized, the process of gathering information from respondents may begin. When the survey method is utilized, some form of direct participation by the respondent is necessary during the process. The respondent may participate by filling out a questionnaire or by interacting with an interviewer. However the data are collected, it is important to minimize errors in the data collection process.

**(7) Execution of the project:** The researcher should see that the project is executed in a systematic manner and in time. The basic aim in this stage is that the data is collected in the correct form and within the specified schedules.

**(8) Analysis of data:** (a) Editing and coding- Once the field work has been completed, the data must be converted into a format that will answer the decision maker's questions. Data processing generally begins with the editing and coding of the data. Editing involves checking the data collection forms for omissions, legibility, and consistency in classification. The editing process corrects problems like interviewer errors (e.g., an answer recorded on the wrong portion of a questionnaire) before the data are transferred to a computer or readied for tabulation.

Before data can be tabulated, meaningful categories and character symbols must be established for groups of responses. The rules for interpreting categorizing, recording and transferring the data to the data storage media are called codes. This coding process facilitates computer or hand tabulation. Of course, if computer analysis is to be utilized the data are entered into the computer and verified. Computer-assisted (on-line) interviewing illustrates the impact of technological changes on the research process. Telephone interviewers are seated at a computer terminal. Survey questions are printed out on the screen. The interviewer asks the questions and then types the respondents' answers on the keyboard. Thus answers are collected and processed into the computer at the same time, eliminating intermediate steps where errors could creep in.

(b) Analysis- Analysis is the application of logic to understand and interpret the data that have been collected about a subject. In simple description, analysis may involve determining consistent patterns and summarizing the appropriate details revealed in the investigation. The appropriate analytical technique for data analysis will be determined by management's information requirements, the characteristics of the research design, and the nature of the data collected. Statistical analysis may range from portraying a simple frequency distribution to very complex multivariate analysis such as multiple regressions.

**(9) Hypothesis testing:** After analysing the data, the researcher is in a position to test the hypothesis, if any, he had formulated earlier. It will result in either accepting the hypothesis or in rejecting it.

**(10) Generalization and interpretation:** Data interpretation is done with the intention of seeking explanation for the research results on the basis of existing theories and doors are thrown open for newer explanations and possibilities for further research.

**(11) Preparation of the report or presentation of the results:** The research report should communicate the research findings effectively. All too often the report is a complicated statement of the study's technical aspects and sophisticated research methods. Often, management is not interested in detailed reporting of the research design and statistical findings but wishes only a summary of the findings. It cannot be overemphasized that if the findings of the research remain unread on the manager's desk, the study is useless. The manager's information needs will determine how much detail is provided in the written report. The written report serves another purpose: it is a historical document that will be a source of record for later usage, such as repeating the survey or providing a basis for building upon the survey findings. In other words, it involves the formal write-up of conclusions.

## **Unit II**

### **1. What is Experimental design?**

Experimental design enables a researcher to alter systematically the variables involved in the Study. The independent variables are manipulated and the effects of the same on the dependent Variables are observed.

### **2. What is nominal scale?**

Nominal scale is simply a system of assigning number to events in order to label them. A nominal scale simply describes difference between things by assigning them to categories.

### **3. What is ordinal scale?**

The ordinal scale places events in order, but there is no attempt to make the intervals of the scale equal in terms of some rule.

### **4. What is Interval scale?**

In the case of interval scale the intervals are adjusted in terms of some rule that has been established as a basis for making the units equal.

### **5. What is Ratio scale?**

Ratio scale represents the actual amount of variables. Measures of physical dimensions such as weight, height, distance are examples.

### **6. What is content validity?**

Content validity is the extent to which a measuring instrument provides adequate coverage of the topic under study.

### **7. What is criteria related validity?**

It relates to our ability to predict some outcome or estimate the existence of some current condition.

### **8. What is predictive validity?**

It refers to the usefulness of test in predicting some future performance. Predictive validity refers to the ability of a test or other measurement to predict a future outcome. Here, an outcome can be a behavior, performance, or even disease that occurs at some point in the future.

### **9. What is concurrent validity?**

It refers to the usefulness of a test in closely relating to other measures of known validity. Concurrent validity measures how a new test compares against a validated test, called the criterion or “gold standard.” The tests should measure the same or similar constructs, and allow you to validate new methods against existing and accepted ones.

### **10. What is construct validity?**

A measure is said to possess construct validity to the degree that it conforms to predicted correlations with other theoretical propositions.

### **11. What is reliability?**

Reliability refers to consistency ie. A measure is reliable to the degree that it supplies consistent results. Reliability is defined as the probability that a product, system, or service will perform its intended function adequately for a specified period of time, or will operate in a defined environment without failure.

### **12. What is Test-Retest Reliability?**

The conduct of resurvey is call test-retest arrangement which involves comparisons between the two tests to learn about the reliability. Test-retest reliability is a statistical measure commonly used to assess the consistency and reproducibility of results obtained from healthy controls in research studies. While time between the first test and the second test differs, the same group of people receive the same test both times.

### **13. What is Equivalence?**

Equivalence is concerned with how much error may be introduced by different investigators or different sample of items being studied. “Equivalence” refers to a special form of validity. This form of validity comes into play when the relationship between test scores (and the latent constructs the respective test scores should reflect) is the same across different groups, contexts, or separate testing processes.

### **14. What is Split – Half reliability?**

Split – Half reliability reflects the correlations between two halves of an instrument. This technique can be used when the measuring tool has many similar questions or statements. Split-half reliability is determined by dividing the total set of items (e.g., questions) relating to a construct of interest into halves (e.g., odd-numbered and even-numbered questions) and comparing the results obtained from the two subsets of items thus created.

### **15. What is Inter- item consistency reliability?**

It is a test of the consistency of respondents answers to all the items in a measure. If the items are independent measures of the same concept, they will be correlated with one another. Inter-item reliability refers to the extent of consistency between multiple items measuring the same construct. Personality questionnaires for example often consist of multiple items that tell you

something about the extraversion or confidence of participants. These items are summed up to a total score.

### **16. State the three inter-related stages.**

The decision-making process associated with the development and implementation of a strategy involves three interrelated stages.

1. Identifying problems or opportunities
2. Selecting and implementing a course of action
3. Evaluating the course of action

### **17. What research design?**

A research design is a framework or blueprint for conducting the research project. It gives details, of the procedures necessary for obtaining the information needed to structure or solve research problems. Although a broad approach to the problem has already been developed, the research design specifies the details-the nuts and bolts of implementing that approach.

### **18.State the research design.**

The sampling design that deals with the method of selecting items to be observed for the selected study;

- b. The observational design that relates to the conditions under which the observations are to be made;
- c. The statistical design that concerns with the question of how many items are to be observed, and how the information and data gathered are to be analysed; and
- d. The operational design that deals with the techniques by which the procedures specified in the sampling, statistical and observational designs can be carried out.

### **19. Mention the Features of Research Design.**

The important features of Research Design may be outlined as follows:

- i. It constitutes a plan that identifies the types and sources of information required for the research problem;
- ii. It constitutes a strategy that specifies the methods of data collection and analysis which would be adopted; and
- iii. It also specifies the time period of research and monetary budget involved in conducting the study, which comprise the two major constraints of undertaking any research

### **20. State the research hypothesis.**

#### **Research Hypothesis:**

When a prediction or a hypothesized relationship is tested by adopting scientific methods, it is known as research hypothesis. The research hypothesis is a predictive statement which



relates to a dependent variable and an independent variable. Generally, a research hypothesis must consist of at least one dependent variable and one independent variable.

### **21. What is Experimental Groups?**

When a group is exposed to usual conditions in experimental hypothesis-testing research, it is known as 'control group'. On the other hand, when the group is exposed to certain new or special condition, it is known as an 'experimental group'.

### **22. What is Control Groups?**

In the afore-mentioned example, Group A can be called as control group and Group B as experimental group. If both the groups, A and B are exposed to some special feature, then both the groups may be called as 'experimental groups'. A research design may include only the experimental group or both the experimental and control groups together.

### **23. List the forms of exploratory research.**

Three interrelated forms of exploratory research exist:

- (1) diagnosing a situation,
- (2) screening alternatives, and
- (3) discovering new ideas.

### **24. List the types of research design.**

There are different types of research designs. They may be broadly categorized as:

- (1) Exploratory Research Design;
- (2) Descriptive and Diagnostic Research Design; and
- (3) Hypothesis-Testing Research Design.

### **25. What is Exploratory Research Design?**

The Exploratory Research Design is known as formulative research design. When a researcher has a limited amount of experience with or knowledge about a research issue, exploratory research is a useful preliminary step that helps ensure that a more rigorous, more conclusive future study will not begin with an inadequate understanding of the nature of the management problem.

## UNIT-II (Part B)

### **1 Q. Analysis the Problems Encountered by Researchers in India.**

Researchers in India, particularly those engaged in empirical research, are facing several problems. Some of the important problems are as follows:

1. The lack of a scientific training in the methodology of research is a great impediment for researchers in our country. There is paucity of competent researchers. Many researchers take a leap in the dark without knowing research methods. Most of the work, which goes in the name of research, is not methodologically sound. Research, to many researchers and even to their guides, is mostly a scissor and paste job without any insight shed on the collated materials. The consequence is obvious, viz., the research results, quite often, do not reflect the reality or realities. Thus, a systematic study of research methodology is an urgent necessity. Before undertaking research projects, researchers should be well equipped with all the methodological aspects. As such, efforts should be made to provide short-duration intensive courses for meeting this requirement.
2. There is insufficient interaction between the university research departments on one side and business establishments, government departments and research institutions on the other side. A great deal of primary data of non-confidential nature remains untouched/untreated by the researchers for want of proper contacts. Efforts should be made to develop satisfactory liaison among all concerned for better and realistic researches.
3. Most of the business units in our country do not have the confidence that the material supplied by them to researchers will not be misused and as such they are often reluctant in supplying the needed information to researchers. The concept of secrecy seems to be sacrosanct to business organisations in the country so much so that it proves an impermeable barrier to researchers. Thus, there is the need for generating the confidence that the information data obtained from a business unit will not be misused.
4. Research studies overlapping one another are undertaken quite often for want of adequate information. This results in duplication and flutters away resources. This problem can be solved by proper compilation and revision, at regular intervals, of a list of subjects on which and the places where the research is going on. Due attention should be given toward identification of research problems in various disciplines of applied science which are of immediate concern to the industries.
5. There does not exist a code of conduct for researchers and inter-university and inter-departmental rivalries are also quite common. Hence, there is a need for developing a code of conduct for researchers which, if adhered sincerely, can win over this problem.

6. Many researchers in our country also face the difficulty of adequate and timely secretarial assistance, including computerial assistance. This causes unnecessary delays in the completion of research studies. All possible efforts are made in this direction so that efficient secretarial assistance is made available to researchers and that too well in time.

7. Library management and functioning is not satisfactory at many places and much of the time and energy of researchers are spent in tracing out the books, journals, reports, etc., rather than in tracing out relevant material from them.

8. There is also the problem that many of our libraries are not able to get copies of old and new acts/rules, reports and other government publications in time. This problem is felt more in libraries which are away in places from Delhi and/or the state capitals. Thus, efforts should be made for the regular and speedy supply of all governmental publications to reach our libraries.

9. There is also the difficulty of timely availability of published data from various government and other agencies doing this job in our country. Researcher also faces the problem on account of the fact that the published data vary quite significantly because of differences in coverage by the concerning agencies.

10. There may, at times, take place the problem of conceptualization and also problems relating to the process of data collection and related things.

## **Q.2. Discuss the managerial value of business research?**

### **Ans. Managerial Value of Business Research**

The prime managerial value of business research is that it reduces uncertainty by providing information that improves the decision-making process. The decision making process associated with the development and implementation of a strategy involves three interrelated stages.

1. Identifying problems or opportunities
2. Selecting and implementing a course of action
3. Evaluating the course of action

Business research, by supplying managers with pertinent information, may play an important role by reducing managerial uncertainty in each of these stages.

### **Identifying Problems or Opportunities**

Before any strategy can be developed, an organization must determine where it wants to go and how it will get there. Business research can help managers plan strategies by determining the nature of situations by identifying the existence of problems or opportunities present in the organization.

Business research may be used as a diagnostic activity to provide information about what is occurring within an organization or in its environment. The mere description of some social or economic activity may familiarize managers with organizational and environmental occurrences and help them understand a situation. For example, the description of the dividend history of stocks in an industry may point to an attractive investment opportunity. Information supplied by business research may also indicate problems. For example, employee interviews undertaken to delineate the dimensions of an airline reservation clerk's job may reveal that reservation clerks emphasize competence in issuing tickets over courtesy and friendliness in customer contact. Once business research indicates a problem, managers may feel that the alternatives are clear enough to make a decision based on experience or intuition, or they may decide that more business research is needed to generate additional information for a better understanding of the situation.

Whether an organization recognizes a problem or gains insight into a potential opportunity, an important aspect of business research is its provision of information that identifies or clarifies alternative courses of action.

### **Selecting and implementing a course of action**

After the alternative courses of action have been identified, business research is often conducted to obtain specific information that will aid in evaluating the alternatives and in selecting the best course of action. In such a case, business research can be designed to supply the exact information necessary to determine which course of action is best of the organization.

Opportunities may be evaluated through the use of various performance criteria. For example, estimates of market potential allow managers to evaluate the revenue that will be generated by each of the possible opportunities. A good forecast supplied by business researchers is among the most useful pieces of planning information a manager can have. Of course, complete accuracy in forecasting the future is not possible because change is constantly occurring in the business environment. Nevertheless, objective information generated by business research to forecast environmental occurrences may be the foundation for selecting a particular course of action.

Clearly, the best plan is likely to result in failure if it is not properly implemented. Business research may be conducted with the people who will be affected by a pending decision to indicate the specific tactics required to implement that course of action.

### **Evaluating course of action**

After a course of action has been implemented, business research may serve as a tool to inform managers whether planned activities were properly executed and whether they accomplished what they were expected to accomplish. In other words, business research may be conducted to provide feedback for evaluation and control of strategies and tactics.

Evaluation research is the formal, objective measurement and appraisal of the extent to which a given action, activity, or program has achieved its objectives. In addition to measuring the extent to which completed programs achieved their objectives or to which continuing programs are presently performing as projected, evaluation research may provide information about the major factor influencing the observed performance levels.

When analysis of performance indicated that all is not going as planned, business research may be required to explain why something “went wrong.” Detailed information about specific mistakes or failures is frequently sought. If a general problem area is identified, breaking down industry sales volume and a firm’s sales volume into different geographic areas may provide an explanation of specific problems, and exploring these problems in greater depth may indicate which managerial judgments were erroneous.

### **Q.3. Define research design? Explain the characteristics and types of research design?**

**Ans.** A research design is a framework or blueprint for conducting the research project. It gives details, of the procedures necessary for obtaining the information needed to structure or solve research problems. Although a broad approach to the problem has already been developed, the research design specifies the details-the nuts and bolts of implementing that approach. A research design lays the foundation for conducting the project. A good research design will ensure that the business research project is conducted effectively. The most important step after defining the research problem is preparing the design of the research project, which is popularly known as the ‘research design’. A research design helps to decide upon issues like what, when, where, how much, by what means etc. with regard to an enquiry or a research study. A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. Thus, research design provides an outline of what the researcher is going to do in terms of framing the hypothesis, its operational implications and the final data analysis. Specifically, the research design highlights decisions which include:

1. The nature of the study
2. The purpose of the study

3. The location where the study would be conducted
4. The nature of data required
5. From where the required data can be collected
6. What time period the study would cover
7. The type of sample design that would be used
8. The techniques of data collection that would be used
9. The methods of data analysis that would be adopted and
10. The manner in which the report would be prepared

In view of the stated research design decisions, the overall research design may be divided into the following:

- a. The sampling design that deals with the method of selecting items to be observed for the selected study;
- b. The observational design that relates to the conditions under which the observations are to be made;
- c. The statistical design that concerns with the question of how many items are to be observed, and how the information and data gathered are to be analysed; and
- d. The operational design that deals with the techniques by which the procedures specified in the sampling, statistical and observational designs can be carried out.

### **Features of Research Design:**

The important features of Research Design may be outlined as follows:

- i. It constitutes a plan that identifies the types and sources of information required for the research problem;
- ii. It constitutes a strategy that specifies the methods of data collection and analysis which would be adopted; and
- iii. It also specifies the time period of research and monetary budget involved in conducting the study, which comprise the two major constraints of undertaking any research

### **Q4. Explain the Concepts Relating To Research Design process?**

Some of the important concepts relating to Research Design are discussed below:

#### **1. Dependent and Independent Variables:**

A magnitude that varies is known as a variable. The concept may assume different quantitative values like height, weight, income etc. Qualitative variables are not quantifiable in the strictest sense of the term. However, the qualitative phenomena may also be quantified

in terms of the presence or absence of the attribute(s) considered. The phenomena that assume different values quantitatively even in decimal points are known as ‘continuous variables’. But all variables need not be continuous. Values that can be expressed only in integer values are called ‘non-continuous variables’. In statistical terms, they are also known as ‘discrete variables’. For example, age is a continuous variable, whereas the number of children is a non-continuous variable. When changes in one variable depend upon the changes in other variable or variables, it is known as a dependent or endogenous variable, and the variables that cause the changes in the dependent variable are known as the independent or explanatory or exogenous variables. For example, if demand depends upon price, then demand is a dependent variable, while price is the independent variable. And, if more variables determine demand, like income and price of the substitute commodity, then demand also depends upon them in addition to the price of original commodity. In other words, demand is a dependent variable which is determined by the independent variables like price of the original commodity, income and price of substitutes.

## **2. Extraneous Variables:**

The independent variables which are not directly related to the purpose of the study but affect the dependent variables, are known as extraneous variables. For instance, assume that a researcher wants to test the hypothesis that there is a relationship between children’s school performance and their self-confidence, in which case the latter is an independent variable and the former, a dependent variable. In this context, intelligence may also influence the school performance. However, since it is not directly related to the purpose of the study undertaken by the researcher, it would be known as an extraneous variable. The influence caused by the extraneous variable(s) on the dependent variable is technically called the ‘experimental error’. Therefore, a research study should always be framed in such a manner that the influence of extraneous variables on the dependent variable/s is completely controlled, and the influence of independent variable/s is clearly evident.

## **3. Control:**

One of the most important features of a good research design is to minimize the effect of extraneous variable(s). Technically, the term ‘control’ is used when a researcher designs the study in such a manner that it minimizes the effects of extraneous variables. The term ‘control’ is used in experimental research to reflect the restraint in experimental conditions.

#### **4. Confounded Relationship:**

The relationship between the dependent and independent variables is said to be confounded by an extraneous variable, when the dependent variable is not free from its effects.

#### **5. Research Hypothesis:**

When a prediction or a hypothesized relationship is tested by adopting scientific methods, it is known as research hypothesis. The research hypothesis is a predictive statement which relates to a dependent variable and an independent variable. Generally, a research hypothesis must consist of at least one dependent variable and one independent variable. Whereas, the relationships that are assumed but not to be tested are predictive statements that are not to be objectively verified, thus are not classified as research hypotheses.

#### **6. Experimental and Non-experimental Hypothesis Testing Research:**

When the objective of a research is to test a research hypothesis, it is known as hypothesis-testing research. Such research may be in the nature of experimental design or non-experimental design. The research in which the independent variable is manipulated is known as 'experimental hypothesis-testing research', whereas the research in which the independent variable is not manipulated is termed as 'non-experimental hypothesis-testing research'. For example, assume that a researcher wants to examine whether family income influences the school attendance of a group of students, by calculating the coefficient of correlation between the two variables. Such an example is known as a non-experimental hypothesis-testing research, because the independent variable - family income is not manipulated here. Again assume that the researcher randomly selects 150 students from a group of students who pay their school fees regularly and then classifies them into two sub-groups by randomly including 75 in Group A, whose parents have regular earning, and 75 in Group B, whose parents do not have regular earning. Assume that at the end of the study, the researcher conducts a test on each group in order to examine the effects of regular earnings of the parents on the school attendance of the student. Such a study is an example of experimental hypothesis-testing research, because in this particular study the independent variable regular earnings of the parents have been manipulated.

#### **7. Experimental and Control Groups:**

When a group is exposed to usual conditions in an experimental hypothesis-testing research, it is known as 'control group'. On the other hand, when the group is exposed to certain new



or special condition, it is known as an ‘experimental group’. In the afore-mentioned example, Group A can be called as control group and Group B as experimental group. If both the groups, A and B are exposed to some special feature, then both the groups may be called as ‘experimental groups’. A research design may include only the experimental group or both the experimental and control groups together.

### **8. Treatments:**

Treatments refer to the different conditions to which the experimental and control groups are subject to. In the example considered, the two treatments are the parents with regular earnings and those with no regular earnings. Likewise, if a research study attempts to examine through an experiment the comparative effect of three different types of fertilizers on the yield of rice crop, then the three types of fertilizers would be treated as the three treatments.

### **9. Experiment:**

Experiment refers to the process of verifying the truth of a statistical hypothesis relating to a given research problem. For instance, an experiment may be conducted to examine the yield of a certain new variety of rice crop developed. Further, Experiments may be categorized into two types, namely, ‘absolute experiment’ and ‘comparative experiment’. If a researcher wishes to determine the impact of a chemical fertilizer on the yield of a particular variety of rice crop, then it is known as absolute experiment. Meanwhile, if the researcher wishes to determine the impact of chemical fertilizer as compared to the impact of bio-fertilizer, then the experiment is known as a comparative experiment.

### **10. Experimental Unit(s):**

Experimental units refer to the pre-determined plots, characteristics or the blocks, to which different treatments are applied. It is worth mentioning here that such experimental units must be selected with great caution.

### **Q 5. Explain the Types of Research Design:**

There are different types of research designs. They may be broadly categorized as:

- (1) Exploratory Research Design;
- (2) Descriptive and Diagnostic Research Design; and
- (3) Hypothesis-Testing Research Design.

## **1. Exploratory Research Design:**

The Exploratory Research Design is known as formulative research design. When a researcher has a limited amount of experience with or knowledge about a research issue, exploratory research is a useful preliminary step that helps ensure that a more rigorous, more conclusive future study will not begin with an inadequate understanding of the nature of the management problem. The findings discovered through exploratory research would lead the researcher to emphasize learning more about the particulars of the findings in subsequent conclusive studies. Conclusive research answers questions of fact necessary to determine course of action. This is never the purpose of exploratory research. The main objective of using such a research design is to formulate a research problem for an in-depth or more precise investigation, or for developing a working hypothesis from an operational aspect. The major purpose of such studies is the discovery of ideas and insights. Therefore, such a research design suitable for such a study should be flexible enough to provide opportunity for considering different dimensions of the problem under study. The in-built flexibility in research design is required as the initial research problem would be transformed into a more precise one in the exploratory study, which in turn may necessitate changes in the research procedure for collecting relevant data. Usually, the following three methods are considered in the context of a research design for such studies. They are (a) a survey of related literature; (b) experience survey; and (c) analysis of 'insight-stimulating' instances.

### **Why conduct exploratory research?**

The purpose of exploratory research is intertwined with the need for a clear and precise statement of the recognized problem. Three interrelated forms of exploratory research exist: (1) diagnosing a situation, (2) screening alternatives, and (3) discovering new ideas. *Diagnosing a Situation*

Much has already been said about the need for situation analysis to clarify a problem's nature. Exploratory research helps diagnose the dimensions of problems so that successive research projects will be on target. It helps set priorities for research. In some cases exploratory research provides an orientation for management by gathering information on a topic with which management has little experience. Although a research project has not yet been planned, information about an issue is needed before the appropriate action can be developed.

Personnel research managers often conduct exploratory research as a diagnostic tool to point out issues of employee concern' or to generate possible explanations for motivational patterns. For example, preliminary interviews with employees may be utilized to learn

current “hot” issues, as well as concerns about bread-and-butter issues such as wages, working conditions, career opportunities, and the like.

### *Screening Alternative*

When several opportunities arise but the budget precludes investigating all possible options, exploratory research may be used to determine the best alternatives. Many good investments were not made because a company chose to invest in something better. Some new organizational structures are found to be unworkable. In an exploratory look at market data (size, number, and so on), a product alternative, may informally not be feasible because the market is too small. Although this aspect of exploratory research is not a substitute for conclusive research, certain evaluative information can be acquired in exploratory studies.

The need for concept testing is a frequent reason for conducting exploratory research. Concept testing is a general term for many different research procedures, all of which have the same purpose. It refers to those research procedures that test some sort of stimulus as a proxy for a new or revised program, product, or service. Typically, test subjects are presented with an idea and asked if they liked it, and so on. Concept testing is a means of evaluating ideas by providing a “feel” for the merits and idea prior to the commitment of research and development, manufacturing, or other company resources. Researchers look for trouble in business signals in evaluations of concepts in order to avoid future problems in business research.

Concept testing may portray the functions, uses, and possible situations for a proposed product. For example, Del Monte conducted a concept test to determine if consumers would accept the idea of shelf-stable yogurt. The plan was scrapped after survey showed that buyers refused to accept the idea that yogurt could be kept unrefrigerated. Early research indicated that such a concept was viewed as desirable and unique, but the cost of achieving believability finally judged to be high.

In other cases, when subjects have expressed reservations about certain aspects of the idea but the general concept has not been evaluated negatively, researchers know that the concept needs to be refined. The intangibles influencing brand image, product appearance, name and price— as well as a description of the product simulate reality. Thus, prior to actual product development, the idea expressing the nature of the brand is conveyed to the test subjects.

## Unit III

2 marks

### **1. Define Rating Scales.**

Rating scales are used to judge properties of objects without reference to other similar objects. An object is judged in absolute terms against certain specified criteria.

### **2. What is Likert Scale?**

Likert scale is designed to examine how strongly the respondents agree or disagree with statements relating to the attitude or object on a five point scale.

### **3. What is Itemized rating scale?**

It is five point or seven point scale with anchors provided for each item and the respondent states the appropriate number on the side of each item or circles the relevant number against each item. The responses to the items are then summated.

### **4. What is staple scale?**

It is simplified version of semantic differential scales. It is used when it becomes difficult to find bipolar adjectives that match the investigative questions.

### **5. What is Graphic rating scale?**

The respondent indicates his rating by simply making a mark at the appropriate point on a line that runs from one extreme to the other.

### **6. What is Consensus Scale?**

As the name suggests is developed by consensus by a panel of judges. The judges select certain items which enable to measure a concept.

### **7. What is Paired comparison scale?**

The paired comparison scale is used when the respondents are expected to express attitudes or choice between two objects at a time.

### **8. Write about forced ranking scale?**

Forced ranking scale is easier and faster compared to the paired comparison method . It requires the respondents to rank a list of attributes.

### **9. What is participant observation?**

If the observer observes by making himself, more or less, a member of the group he is observing, so that he can experience what the the member of the group experience.

### **10. What is disguised observation?**

When the observer is observing in such a manner that his presence may be unknown to the people he is observing.

### **11. What is controlled observation?**

When observation takes place according to definite pre-arranged plans, involving experimental

procedure, then it is termed as controlled observation.

**12. What is uncontrolled observation?**

If the observation takes place in the natural setting, it may be termed as uncontrolled observation.

**13. Write a note on Interview method?**

The interview method of collection involves presentation of oral-verbal stimuli and reply in terms of oral verbal responses.

**14. What is personal interview?**

Personal interview method requires a person known as the interviewer asking questions generally in a face to face contact to the other person or persons.

**15. What is telephone interview?**

This method of collecting information consists in contacting respondents on telephone itself.

**16. Explain about dichotomous questions.**

Two alternatives are suggested in dichotomous questions. The choices presented should be mutually exclusive.

**17. Write a note on Electronic questionnaire design?**

Electronic questionnaire combines questionnaire based survey functionality with that of a web page or web site.

**18. What is sequential sampling?**

The ultimate size of the sample is not fixed in advance but is determined according to mathematical decisions on the basis of information yielded as survey progresses.

**19. Write about area sampling?**

When the total geographical area of interest happens to be big one. Under area sampling we first divide the total area in to a number of smaller non-overlapping areas, generally called geographical clusters.

**20. What is Convenience sampling?**

When population elements are selected for inclusion in the sample based on the ease of access, it can be called as convenience sampling.

**21. What is judgment sampling?**

In judgement sampling the researcher's judgement is used for selecting items which he considers as representative of the population.

**22. What is structured observation?**

In case the observation is characterized by a careful definition of the units to be observed, the style of recording the observed information is called as structured observation.

### **23. What is unstructured observation?**

When observation is to take place without the characteristic of structured it is termed as unstructured observations. In unstructured observations, the researcher records all relevant behavior without a system. There may be too much to record, and the behaviors recorded may not necessarily be the most important, so the approach is usually used as a pilot study to see what type of behaviors would be recorded.

### **24. List the Methods of primary data collection**

- Interviews
- Observations
- Surveys and Questionnaires
- Focus Groups

### **25. What Primary and secondary data collection?**

Primary data refers to the first-hand data gathered by the researcher himself. Secondary data means data collected by someone else earlier. Surveys, observations, experiments, questionnaire, personal interview, etc. Government publications, websites, books, journal articles, internal records etc.

## **UNIT-III (PART-B)**

### **1. Explain the various Data Collection Methods.**

Data collection methods are techniques and procedures used to gather information for research purposes. These methods can range from simple self-reported surveys to more complex experiments and can involve either quantitative or qualitative approaches to data gathering.

Some common data collection methods include surveys, interviews, observations, focus groups, experiments, and secondary data analysis. The data collected through these methods can then be analyzed and used to support or refute research hypotheses and draw conclusions about the study's subject matter.

#### **Importance of Data Collection Methods**

Data collection methods play a crucial role in the research process as they determine the quality and accuracy of the data collected. Here are some major importance of data collection methods.

- Determines the quality and accuracy of collected data.
- Ensures that the data is relevant, valid, and reliable.
- Helps reduce bias and increase the representativeness of the sample.

- Essential for making informed decisions and accurate conclusions.
- Facilitates achievement of research objectives by providing accurate data.
- Supports the validity and reliability of research findings.

The importance of data collection methods cannot be overstated, as it plays a key role in the overall success and internal validity of the research study.

## Types of Data Collection Methods

The choice of data collection method depends on the research question being addressed, the type of data needed, and the resources and time available. You can categorize data collection methods into primary methods of data collection and secondary methods of data collection.

### Primary Data Collection Methods

Primary data is collected from first-hand experience and is not used in the past. The data gathered by primary data collection methods are specific to the research's motive and highly accurate.

Primary data collection methods can be divided into two categories: quantitative methods and qualitative methods.

### **Quantitative Methods:**

Quantitative techniques for market research and demand forecasting usually use statistical tools. In these techniques, demand is forecasted based on historical data. These methods of primary data collection are generally used to make long-term forecasts. Statistical methods are highly reliable as subjectivity is minimal in these methods.

**Time Series Analysis:** The term time series refers to a sequential order of values of a variable, known as a trend, at equal time intervals. Using patterns, an organization can predict the demand for its products and services for the projected time.

**Smoothing Techniques:** In cases where the time series lacks significant trends, smoothing techniques can be used. They eliminate a random variation from the historical demand. It helps in identifying patterns and demand levels to estimate future demand. The most common methods used in smoothing demand forecasting techniques are the simple moving average method and the weighted moving average method.

**Barometric Method:** Also known as the leading indicators approach, researchers use this method to speculate future trends based on current developments. When the past events are considered to predict future events, they act as leading indicators.

## **Qualitative Methods:**

Qualitative data collection methods are especially useful in situations when historical data is not available. Or there is no need of numbers or mathematical calculations. Qualitative research is closely associated with words, sounds, feeling, emotions, colors, and other elements that are non-quantifiable. These techniques are based on experience, judgment, intuition, conjecture, emotion, etc.

Quantitative methods do not provide the motive behind participants' responses, often don't reach underrepresented populations, and span long periods to collect the data. Hence, it is best to combine quantitative methods with qualitative methods.

**Surveys:** Surveys are used to collect data from the target audience and gather insights into their preferences, opinions, choices, and feedback related to their products and services. Most survey software often has a wide range of question types to select.

You can also use a ready-made survey template to save time and effort. Online surveys can be customized as per the business's brand by changing the theme, logo, etc. They can be distributed through several distribution channels such as email, website, offline app, QR code, social media, etc. Depending on the type and source of your audience, you can select the channel.

Once the data is collected, survey software can generate various reports and run analytics algorithms to discover hidden insights. A survey dashboard can give you statistics related to response rate, completion rate, filters based on demographics, export and sharing options, etc. Integrating survey builder with third-party apps can maximize the effort spent on online real-time data collection.

**Polls:** Polls comprise one single or multiple-choice question. You can go for polls when it is required to have a quick pulse of the audience's sentiments. Because they are short in length, it is easier to get responses from people.

Like surveys, online polls can also be embedded into various platforms. Once the respondents answer the question, they can also be shown how they stand compared to others' responses.

**Interviews:** In this method, the interviewer asks the respondents face-to-face or by telephone. In face-to-face interviews, the interviewer asks a series of questions to the interviewee in person and notes down responses. If it is not feasible to meet the person, the interviewer can go for a telephone interview. This form of data collection is suitable for only a few respondents. It is too time-consuming and tedious to repeat the same process if there are many participants.

**Delphi Technique:** In delphi method, market experts are provided with the estimates and assumptions of forecasts made by other experts in the industry. Experts may reconsider and



revise their estimates and assumptions based on the information provided by other experts. The consensus of all experts on demand forecasts constitutes the final demand forecast.

**Focus Groups:** In a focus group, a small group of people, around 8-10 members, discuss the common areas of the research problem. Each individual provides his insights on the issue concerned. A moderator regulates the discussion among the group members. At the end of the discussion, the group reaches a consensus.

**Questionnaire:** A questionnaire is a printed set of questions, either open-ended or closed-ended. The respondents must answer based on their knowledge and experience with the issue. The questionnaire is a part of the survey, whereas the questionnaire's end goal may or may not be a survey.

### Secondary Data Collection Methods

**Secondary data is the data that has been used in the past.** The researcher can obtain data from the data sources, both internal and external, to the organizational data.

Internal sources of secondary data:

- Organization's health and safety records
- Mission and vision statements
- Financial Statements
- Magazines
- Sales Report
- CRM Software
- Executive summaries

External sources of secondary data:

- Government reports
- Press releases
- Business journals
- Libraries
- Internet

The secondary data collection methods can also involve quantitative and qualitative techniques. Secondary data is easily available and hence, less time-consuming and expensive than primary data. However, with the secondary data collection methods, the authenticity of the data gathered cannot be verified.

## **2. Write a detailed note on Multivariate Analysis Technique?**

Multivariate Analysis is defined as a process involving multiple dependent variables resulting in one outcome. This explains that the majority of the problems in the real world are Multivariate.

For example, we cannot predict the weather of any year based on the season. There are multiple factors like pollution, humidity, precipitation, etc. Here, we will introduce you to multivariate analysis, its history, and its application in different fields. Also, take up a [Multivariate Time Series Forecasting In R](#) to learn more about the concept.

### **The History of Multivariate analysis**

In 1928, Wishart presented his paper. The Precise distribution of the sample covariance matrix of the multivariate normal population, which is the initiation of MVA.

In the 1930s, R.A. Fischer, Hotelling, S.N. Roy, and B.L. Xu et al. did a lot of fundamental theoretical work on multivariate analysis. At that time, it was widely used in the fields of psychology, education, and biology.

In the middle of the 1950s, with the appearance and expansion of computers, multivariate analysis began to play a big role in geological, meteorological, Medical, social, and science. From then on, new theories and new methods were proposed and tested constantly by practice, and at the same time, more application fields were exploited. With the aid of modern computers, we can apply the methodology of multivariate analysis to do rather complex statistical analyses.

### **Multivariate analysis: An overview**

Suppose a project has been assigned to you to predict the sales of the company. You cannot simply say that 'X' is the factor which will affect the sales.

We know that there are multiple aspects or variables which will impact sales. To analyze the variables that will impact sales majorly, can only be found with multivariate analysis. And in most cases, it will not be just one variable.

Like we know, sales will depend on the category of product, production capacity, geographical location, marketing effort, presence of the brand in the market, competitor analysis, cost of the product, and multiple other variables. Sales is just one example; this study can be implemented in any section of most of the fields.

Multivariate analysis is used widely in many industries, like healthcare. In the recent event of COVID-19, a team of data scientists predicted that Delhi would have more than 5 lakh COVID-19 patients by the end of July 2020. This analysis was based on multiple variables like government decision, public behavior, population, occupation, public transport, healthcare services, and overall immunity of the community. Check out [Multivariate Time Series on Covid Data](#) for more information.

As per the Data Analysis study by Murtaza Haider of Ryerson university on the coast of the apartment and what leads to an increase in cost or decrease in cost, is also based on multivariate analysis. As per that study, one of the major factors was transport infrastructure. People were thinking of buying a home at a location which provides better transport, and as per the analyzing team, this is one of the least thought of variables at the start of the study. But with analysis, this came in few final variables impacting outcome.

Multivariate analysis is part of Exploratory data analysis. Based on MVA, we can visualize the deeper insight of multiple variables.

There are more than 20 different methods to perform multivariate analysis and which method is best depends on the type of data and the problem you are trying to solve.

**Multivariate analysis (MVA)** is a Statistical procedure for analysis of data involving more than one type of measurement or observation. It may also mean solving problems where more than one dependent variable is analyzed simultaneously with other variables.

### **Advantages and Disadvantages of Multivariate Analysis**

#### **Advantages**

- The main advantage of multivariate analysis is that since it considers more than one factor of independent variables that influence the variability of dependent variables, the conclusion drawn is more accurate.
- The conclusions are more realistic and nearer to the real-life situation.

### **Disadvantages**

- The main disadvantage of MVA includes that it requires rather complex computations to arrive at a satisfactory conclusion.
- Many observations for a large number of variables need to be collected and tabulated; it is a rather time-consuming process.

### **Classification Chart of Multivariate Techniques**

Selection of the appropriate multivariate technique depends upon-

- a) Are the variables divided into independent and dependent classification?
- b) If Yes, how many variables are treated as dependents in a single analysis?
- c) How are the variables, both dependent and independent measured?

Multivariate analysis technique can be classified into two broad categories viz., This classification depends upon the question: are the involved variables dependent on each other or not?

**Dependence technique:** Dependence Techniques are types of multivariate analysis techniques that are used when one or more of the variables can be identified as dependent variables and the remaining variables can be identified as independent.

### **Multiple Regression**

**Multiple Regression Analysis**– Multiple regression is an extension of simple linear regression. It is used when we want to predict the value of a variable based on the value of two or more other variables. The variable we want to predict is called the dependent variable (or sometimes, the outcome, target, or criterion variable). Multiple regression uses multiple “x” variables for each independent variable:  $(x_1)_1, (x_2)_1, (x_3)_1, Y_1$

### **Conjoint analysis**

‘**Conjoint analysis**’ is a survey-based statistical technique used in market research that helps determine how people value different attributes (feature, function, benefits) that make up an individual product or service. The objective of conjoint analysis is to determine the choices or decisions of the end-user, which drives the policy/product/service. Today it is used in many fields including marketing, product management, operations research, etc.

It is used frequently in testing consumer response to new products, in acceptance of advertisements and in-service design. Conjoint analysis techniques may also be referred to as multi-attribute compositional modeling, discrete choice modeling, or stated preference research, and is part of a broader set of trade-off analysis tools used for systematic analysis of decisions.

There are multiple conjoint techniques, few of them are CBC (Choice-based conjoint) or ACBC (Adaptive CBC).

### **Multiple Discriminant Analysis**

The objective of discriminant analysis is to determine group membership of samples from a group of predictors by finding linear combinations of the variables which maximize the differences between the variables being studied, to establish a model to sort objects into their appropriate populations with minimal error.

Discriminant analysis derives an equation as a linear combination of the independent variables that will discriminate best between the groups in the dependent variable. This linear combination is known as the discriminant function. The weights assigned to each independent variable are

corrected for the interrelationships among all the variables. The weights are referred to as discriminant coefficients.

The discriminant equation:

$$F = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_p + \varepsilon$$

where, F is a latent variable formed by the linear combination of the dependent variable, X1, X2,... Xp is the p independent variable,  $\varepsilon$  is the error term and  $\beta_0, \beta_1, \beta_2, \dots, \beta_p$  is the discriminant coefficients.

### **A linear probability model**

A linear probability model (LPM) is a regression model where the outcome variable is binary, and one or more explanatory variables are used to predict the outcome. Explanatory variables can themselves be binary or be continuous. If the classification involves a binary dependent variable and the independent variables include non-metric ones, it is better to apply linear probability models.

Binary outcomes are everywhere: whether a person died or not, broke a hip, has hypertension or diabetes, etc.

## **3. Explain the method of Factor Analysis.**

It refers to a method that reduces a large variable into a smaller variable factor. Furthermore, this technique takes out maximum ordinary variance from all the variables and put them in common score.

Moreover, it is a part of General Linear Model (GLM) and it believes several theories that contain no multicollinearity, linear relationship, true correlation, and relevant variables into the analysis among factors and variables.

### **Types of Factor Analysis**

There are different methods that we use in factor analysis from the data set:

#### **1. Principal component analysis**

It is the most common method which the researchers use. Also, it extracts the maximum variance and put them into the first factor. Subsequently, it removes the variance explained by the first factor and extracts the second factor. Moreover, it goes on until the last factor.

#### **2. Common Factor Analysis**

It's the second most favoured technique by researchers. Also, it extracts common variance and put them into factors. Furthermore, this technique doesn't include the variance of all variables and is used in SEM.

#### **3. Image Factoring**

It is on the basis of the correlation matrix and makes use of OLS regression technique in order to predict the factor in image factoring.

#### **4. Maximum likelihood method**

It also works on the correlation matrix but uses a maximum likelihood method to factor.

#### **5. Other methods of factor analysis**

Alfa factoring outweighs least squares. Weight square is another regression-based method that we use for factoring.

**Factor loading-** Basically it the correlation coefficient for the factors and variables. Also, it explains the variable on a particular factor shown by variance.

**Eigenvalues-** Characteristics roots are its other name. Moreover, it explains the variance shown by that particular factor out of the total variance. Furthermore, commonality column helps to know how much variance the first factor explained out of total variance.

**Factor Score-** It's another name is the component score. Besides, it's the score of all rows and columns that we can use as an index for all variables and for further analysis. Moreover, we can standardize it by multiplying it with a common term.

**Rotation method-** This method makes it more reliable to understand the output. Also, it affects the eigenvalues method but the eigenvalues method doesn't affect it. Besides, there are 5 rotation methods: (1) No Rotation Method, (2) Varimax Rotation Method, (3) Quartimax Rotation Method, (4) Direct Oblimin Rotation Method, and (5) Promax Rotation Method.

#### **Assumptions of Factor Analysis**

Factor analysis has several assumptions. These include:

1. There are no outliers in the data.
2. The sample size is supposed to be greater than the factor.
3. It is an interdependency method so there should be no perfect multicollinearity between the variables.
4. Factor analysis is a linear function thus it doesn't require homoscedasticity between variables.

5. It is also based on the linearity assumption. So, we can also use non-linear variables. However, after a transfer, they change into a linear variable.
6. Moreover, it assumes interval data.

#### 4. **Explain in detail the important Projective Techniques and Pictorial techniques.**

Projective techniques are useful for assessing [personality types](#), identifying mental illness, and understanding cultural differences. They make it easier for respondents to answer survey questions because they can more directly relate their responses to their own experiences and feelings.

This helps ensure that their answers are accurate and honest, which is important when conducting surveys. This is because projective techniques rely on the ability of the respondent to project their own thoughts and feelings onto another person in order for them to respond.

There are four popular types of projective techniques: Word association Tests, Sentence Completion Tests, Thematic Apperception Tests (TAT), and Third-person Techniques.

1. Word association tests ask you to say the first thing that comes to mind when you think about a certain object or activity.
2. Sentence completion tests ask you to write down what comes to mind when you hear or read a particular set of words.
3. Thematic apperception test (TAT) asks you to draw a picture from your imagination based on what is said to you.
4. Third-person techniques involve asking questions about yourself or others such as “What would happen if...?” and “Who would you be if...?”

#### **Examples of Each Type of Projective Technique**

- **Word Association Test:** This is a projective technique in which the respondent is asked to write down a word that comes to mind when given a particular stimulus. For example, if you ask someone what they think of when they think of “intelligence,” they might respond with “intelligent people.”
- **Sentence Completion Test:** This projective technique involves asking the respondent to write down words that begin with each letter of the word given. For example, if you ask someone “What does your typical day look like?” and the person responds with “I wake up, put on my uniform, go out for breakfast,” you can infer that their typical day is one in which they are generally active.
- **Thematic Apperception Test (TAT):** This projective technique involves asking respondents questions about their social experiences. For example, if someone asks them whether or not they have ever been in love with someone else at some point in their life, they may respond affirmatively because love is an important aspect of human relationships. A TAT can also be used to assess feelings about certain objects or concepts.
- **Third-person Techniques:** Third-person techniques are a set of techniques that involve projecting one’s own feelings onto someone else in order for them to see things from your perspective, such as “Don’t you wish these people would stop talking?,” or “Would you be afraid if your boss found out you were late today?”

## **Advantages of Projective Techniques**

The advantages of projective techniques include the following:

- It can be used to test for a subject's unconscious thoughts and feelings about an object or event.
- It is a powerful tool for understanding the unconscious processes in the human mind, as it allows us to see how people think about things that have not been consciously recognized.
- It can help us understand the way that people experience their lives and what they need from other people in order to feel safe and secure themselves (especially in relationships).
- Projective techniques are often used in psychotherapy because they help patients gain insight into their emotions and their thoughts/feelings about them, which helps them learn how to deal with those emotions more effectively in real-life situations; this is especially true if you're trying to get someone who has suffered from trauma or abuse therapy so they can heal from whatever caused it in the first place!
- Projective techniques are also great for improving communication between therapists and clients because they let them know how someone else might be feeling without having to ask them directly

## **Disadvantages of Projective Techniques**

Projective techniques are a form of empathy that can be used to gain information about people, but they also have disadvantages.

1. The biggest drawback of projective techniques is that the people involved may not be able to accurately interpret what has been projected onto them. This means that people do not always get accurate feedback on the projectivity technique, which makes it difficult for them to know how the technique should be used in the future.
2. Additionally, projective techniques may not work well with certain personality types because they are more likely to get caught up in their own projections and become defensive rather than receptive.
3. There is also the possibility that the participant will feel like they're being judged and criticized, which can cause them to feel defensive and closed off.
4. The participant may also be confused by what they are experiencing which could lead to a decreased ability to trust their own perceptions.

## **Conclusion**

In conclusion, projective techniques are a way to get inside the heads of others and understand how they process information. They are especially useful when you're trying to understand why people do what they do, or even just trying to get them to open up about their past.

## **5. Explain about the design of Electronic Questionnaire.**

A questionnaire is a research tool consisting of a set of questions or other 'prompts' to collect data from a set of respondents.

When used in most research, a questionnaire will consist of a number of types of questions (primarily open-ended and closed) in order to gain both quantitative data that can be analyzed to draw conclusions, and qualitative data to provide longer, more specific explanations.

A research questionnaire is often mistaken for a survey - and many people use the term questionnaire and survey, interchangeably.

### **Survey definition**

A survey is the process of collecting data from a set of respondents and using it to gather insights.

Survey research can be conducted using a questionnaire, but won't always involve one.

### **Questionnaire definition**

A questionnaire is the list of questions you circulate to your target audience.

In other words, the survey is the task you're carrying out, and the questionnaire is the instrument you're using to do it.

By itself, a questionnaire doesn't achieve much.

It's when you put it into action as part of a survey that you start to get results.

### **Advantages vs disadvantages of using a questionnaire**

While a questionnaire is a popular method to gather data for market research or other studies, there are a few disadvantages to using this method (although there are plenty of advantages to using a questionnaire too).

Let's have a look at some of the advantages and disadvantages of using a questionnaire for collecting data.

### **Advantages of using a questionnaire**

#### **1. Questionnaires are relatively cheap**

Depending on the complexity of your study, using a questionnaire can be cost effective compared to other methods.

You simply need to write your survey questionnaire, and send it out and then process the responses.



You can set up an online questionnaire relatively easily, or simply carry out market research on the street if that's the best method.

## **2. You can get and analyze results quickly**

Again depending on the size of your survey you can get results back from a questionnaire quickly, often within 24 hours of putting the questionnaire live.

It also means you can start to analyze responses quickly too.

## **3. They're easily scalable**

You can easily send an online questionnaire to anyone in the world and with the right software you can quickly identify your target audience and your questionnaire to them.

## **4. Questionnaires are easy to analyze**

If your questionnaire design has been done properly, it's quick and easy to analyze results from questionnaires once responses start to come back.

This is particularly useful with large scale market research projects.

Because all respondents are answering the same questions, it's simple to identify trends.

## **5. You can use the results to make accurate decisions**

As a research instrument, a questionnaire is ideal for commercial research because the data you get back is from your target audience (or ideal customers) and the information you get back on their thoughts, preferences or behaviors allows you to make business decisions.

## **6. A questionnaire can cover any topic**

One of the biggest advantages of using questionnaires when conducting research is (because you can adapt them using different types and styles of open ended questions and closed ended questions) they can be used to gather data on almost any topic.

There are many types of questionnaires you can design to gather both quantitative data and qualitative data - so they're a useful tool for all kinds of data analysis.

## **Disadvantages of using a questionnaire**

### **1. Respondents could lie**

This is by far the biggest risk with a questionnaire, especially when dealing with sensitive topics.

Rather than give their actual opinion, a respondent might feel pressured to give the answer they deem more socially acceptable, which doesn't give you accurate results.

### **2. Respondents might not answer every question**

There are all kinds of reasons respondents might not answer every question, from questionnaire length, they might not understand what's being asked, or they simply might not want to answer it.

If you get questionnaires back without complete responses it could negatively affect your research data and provide an inaccurate picture.

### **3. They might interpret what's being asked incorrectly**

This is a particular problem when running a survey across geographical boundaries and often comes down to the design of the survey questionnaire.

If your questions aren't written in a very clear way, the respondent might misunderstand what's being asked and provide an answer that doesn't reflect what they actually think.

Again this can negatively affect your research data.

### **4. You could introduce bias**

The whole point of producing a questionnaire is to gather accurate data from which decisions can be made or conclusions drawn.

But the data collected can be heavily impacted if the researchers accidentally introduce bias into the questions.

This can be easily done if the researcher is trying to prove a certain hypothesis with their questionnaire, and unwittingly write questions that push people towards giving a certain answer.

In these cases respondents' answers won't accurately reflect what is really happening and stop you gathering more accurate data.

## **5. Respondents could get survey fatigue**

One issue you can run into when sending out a questionnaire, particularly if you send them out regularly to the same survey sample, is that your respondents could start to suffer from survey fatigue.

In these circumstances, rather than thinking about the response options in the questionnaire and providing accurate answers, respondents could start to just tick boxes to get through the questionnaire quickly.

Here are a few steps to help you get into the right mindset.

### **1. Keep the respondent front and center**

A survey is the process of collecting information from people, so it needs to be designed around human beings first and foremost.

In his post about survey design theory, David Vannette, PhD, from the Qualtrics Methodology Lab explains the correlation between the way a survey is designed and the quality of data that is extracted.

“To begin designing an effective survey, take a step back and try to understand what goes on in your respondents' heads when they are taking your survey.

This step is critical to making sure that your questionnaire makes it as likely as possible that the response process follows that expected path.”

From writing the questions to designing the survey flow, the respondent's point of view should always be front and center in your mind during a questionnaire design.

### **2. How to write survey questions**

Your questionnaire should only be as long as it needs to be, and every question needs to deliver value.

That means your questions must each have an individual purpose and produce the best possible data for that purpose, all while supporting the overall goal of the survey.

A question must also must be phrased in a way that is easy for all your respondents to understand, and does not produce false results.

To do this, remember the following principles:

### **Get into the respondent's head**

The process for a respondent answering a survey question looks like this:

1. The respondent reads the question and determines what information they need to answer it.
2. They search their memory for that information.
3. They make judgments about that information.
4. They translate that judgment into one of the answer options you've provided. This is the process of taking the data they have and matching that information with the question that's asked.

When wording questions, make sure the question means the same thing to all respondents. Words should have one meaning, few syllables, and the sentences should have few words.

## Unit IV

### **1. Define Error Variance.**

Sample surveys do imply the study of a small portion of the population and as such there would naturally be a certain amount of inaccuracy in the information collected.

### **2. What is confidence level?**

Confidence level is the expected percentage of times that the actual value will fall within the stated precision limits.

### **3. Write a note on Focus Group?**

Focus group involves a formalized process of bringing small group of people together for an interactive and spontaneous discussion on any one particular topic.

### **4. Static the nature of Dynamic Panel.**

Members change from time to time as the study progresses to successive phases. Dynamic panel models contain dependent variable with one or more lags in according with its characteristics. There is no difference between static panel data and dynamic panel data.

### **5. What is Factor?**

A factor is an underlying dimension that account for several observed variables. A factor is a number that divides another number, leaving no remainder. In other words, if multiplying two whole numbers gives us a product, then the numbers we are multiplying are factors of the product because they are divisible by the product. There are two methods of finding factors: multiplication and division.

### **6. Write a note on Factor Loadings.**

Factor loadings are those values which explain how closely the variables are related to each one of the factors discovered. Loadings can range from -1 to 1. Loadings close to -1 or 1 indicate that the variable strongly influences the factor. Loadings close to 0 indicate that the variable has a weak influence on the factor. Evaluating the loadings can also help you characterize each factor in terms of the variables.

### **7. What is Eigen value?**

When we take the sum of squared values of factor loadings relating to a factor, then such sum is referred to as Eigen value.

### **8. Define R- Type Factor Analysis.**

High correlations occur when respondents who score high on variable 1 also score high on variable 2 and respondents who score low on variable 1 also score low on variable 2. Factors emerge when there are high correlations within groups of variables.

### **9. What is cluster Analysis?**

Cluster analysis is to determine how many mutually and exhaustive groups or clusters, based on the similarities of profiles among entities, really exist in the population and then state the composition of such groups.

**10. State the nature of Static Panel.**

The same members form part of the panel over an extended period of time. Required input values are denoted with an asterix (\*). The input field with the colored background indicates that this is the identifier field for the selected static resource class. The identifier values for this input field must be unique across all instances of the static resource definition class within a project.

**11. What is Panel?**

Panel refers to the sample of individuals, house holds or firms from whom information may be collected in successive time periods.

**12. What is Centroid Method?**

The centroid method tends to maximize the sum of loadings, disregarding signs, it is the method which extracts the largest sum of absolute loadings for each factor in turn.

**13. Briefly explain about Clinical Interview?**

It is concerned with broad underlying feelings or motivations or with the course of individuals life experience.

**14. What is Multivariate Analysis Techniques?**

All statistical techniques which simultaneously analyse more than two variables on a sample of observations can be categorized as multivariate technique.

**15. Write a note on Sociometry.?**

Sociometry attempts to describe attractions or repulsions between individuals by asking them to indicate whom they would choose or reject in various situations.

**16. What is research proposal?**

A research proposal is also a type of research report prepared for getting the permission to proceed with the research work. It is a work plan, outline, statement or intent or draft plan of the proposed research work.

**17. What is Gantt Chart?**

A Gantt chart represents the schedule of a project. Unit of time is represented along the horizontal axis and sub processes are explained on the vertical axis. The lines indicate the starting and ending point of each sub process.

**18. What is Pilot Testing?**

Pilot testing reveals error in the design and improper control of extraneous or environmental conditions.

**19. What is Intervening Variable?**

An intervening variable is one that surfaces between the time, the independent variable start operating to influence the dependent variable and the time the impact is felt on it.

**20. List the factors affecting internal validity of Experimental design?**

History, maturation, testing, instrumentation, selection, statistical regression  
experimental mortality, diffusion, compensatory equalization, rivalry

**21. Write about the building blocks of science in research?**

Deduction and induction are two important aspects of the scientific research through which the answers to a research question can be arrived at.

**22. List the different types of variables.**

1. Dependent variable 2. independent variable 3. moderating variable 4. intervening Variable

**23. Write about the Hallmarks of Scientific Research?**

1. Purposiveness 2. Rigor 3. Testability 4. Replicability 5. precision 6. confidence 7. objectivity 8. Generalizability 9. parsimony

**24. Give the characteristics of Mapping rules.**

1. Classification
2. Order
3. Distance
4. Origin

**25. What is One shot case study?**

A single group of test subjects is exposed to the independent variable treatment X, and then a single measurement on the dependent variable is taken O1. one shot case study does not use pretest and control group.

**26. List the factors affecting External validity of Experimental design.**

The reactivity of testing on the experimental treatment 2. Interaction of selection and the experimental treatment 3. other reactive factors.

**27. What is one sample test?**

One sample test are used when a single sample is taken is undertaken to know whether the sample comes from a specified population.

## UNIT-IV

### **1. How is a problem stated? Describe the various ways of defining a problem. Discuss characteristics of good problem and criteria for evaluating a problem.**

**Research problem** is a statement about an area of concern, a condition to be improved upon, a difficulty to be eliminated, or a troubling question that exists in scholarly literature, theory, or practice that points to the need for a meaningful understanding and deliberate investigation. It may be expressed in declarative or interrogative form. In some social science disciplines, however, the research problem is typically posed in the form of one or more questions. A research problem, commonly called the heart of research, is what researchers aim to answer later on as they go through the research endeavor.

The following must be considered in constructing a research problem:

- A research problem is not just answerable by yes or no. It should imply that explanations and justifications regarding the true situation or observation are required.
- A research problem implies relationship between the variables of the study.
- The problem should be stated in clear, unambiguous manner.
- A researchable problem must imply interpretation and analysis of data.

#### Characteristics

A good research problem should have the following criteria:

1. **Novel.** A good research problem should be something that is new. It may be a new process, product, or principle.
2. **Interesting.** A good research problem should draw attention and interest from other people.
3. **Practical.** The aim of research is to improve people's quality of living. A good research problem then should be useful and beneficial to its target population.
4. **Innovative.** A good research problem should improve the current state of existing technology.
5. **Cost-effective.** A good research problem should provide a good value for money, time, resources, and manpower while conducting the study. It should be economical in addressing the problems of the community.

#### Criteria for Evaluation

Another thing to consider and remember is that a research problem should be **SMART**, whether it is qualitative or quantitative research.

1. **S-specific.** The research problem must be specifically stated.
2. **M-easurable.** The research problem should be quantifiable or observable. This may include interviews, surveys, or recorded observations such as videos and



audio recordings. There should be instruments that will help the researchers gather data from their respondents.

3. **A-ttainable.** A research problem should be easily achieved, solved, or answered by the researcher after all valid procedures had been carried out.
4. **R-ealistic.** It should be possible for the researchers to perform the experimentations or observations needed to solve their problems.
5. **T-ime-Bound.** Researchers should also consider the time allotment for their research. They should think of a research problem that could be carried out in the given time period.

## **2. Define the term ‘Review of literature’, how is it different from traditional meaning? Enumerate the objectives and significance of review of literature.**

A literature review is the writing process of summarizing, synthesizing and/or critiquing the literature found as a result of a literature search. It may be used as background or context for a primary research project.

There are several **reasons to review the literature**:

- Identify the developments in the field of study
- Learn about the information sources and the research methodologies
- Find gaps in the literature that can become research questions
- Validate the originality of a research project
- Evaluate the methods
- Identify errors to avoid
- Highlight the strengths, weaknesses and controversies in the field of study
- Identify the subject experts

When writing your review, there are **objectives you should keep in mind**:

- Inform the audience of the developments in the field
- Establish your credibility
- Discuss the relevance and significance of your question(s)
- Provide the context for your methodological approach
- Discuss the relevance and appropriateness of your approach.

The level of detail or comprehensiveness of your literature review may depend on many things, but especially the purpose and audience of your review. For example, if you're writing a literature review that will aid you in writing a thesis or dissertation, you may want to have a very comprehensive lit review that reviews all relevant literature on a topic, as well as relevant sources beyond what is immediately and freely available (e.g. foundational scholarly articles not available through library collections).

### 3. What do you mean by ‘Sample Design’? What points should be taken into consideration by a Researcher in developing a sample design for this research project.

#### Steps In Sample design:

- **Type of universe:** The first step in developing any sample design is to clearly define the set of objects, technically called the Universe, to be studied. The universe can be finite or infinite. In finite universe the number of items is certain, but in case of an infinite universe the number of items is infinite, i.e., we cannot have any idea about the total number of items. The population of a city, the number of workers in a factory and the like are examples of finite universes, whereas the number of stars in the sky, listeners of a specific radio programme, throwing of a dice etc. are examples of infinite universes.
- **Sampling unit:** A decision has to be taken concerning a sampling unit before selecting sample. Sampling unit may be a geographical one such as state, district, village, etc., or a construction unit such as house, flat, etc., or it may be a social unit such as family, club, school, etc., or it may be an individual. The researcher will have to decide one or more of such units that he has to select for his study.
- **Source list:** It is also known as ‘sampling frame’ from which sample is to be drawn. It contains the names of all items of a universe (in case of finite universe only). If source list is not available, researcher has to prepare it. Such a list should be comprehensive, correct, reliable and appropriate. It is extremely important for the source list to be as representative of the population as possible.
- **Size of sample:** This refers to the number of items to be selected from the universe to constitute a sample. This is a major problem before a researcher. The size of sample should neither be excessively large, nor too small. It should be optimum. An optimum sample is one which fulfills the requirements of efficiency, representativeness, reliability and flexibility. While deciding the size of sample, researcher must determine the desired precision as also an acceptable confidence level for the estimate. The size of population variance needs to be considered as in case of larger variance usually a bigger sample is needed. The size of population must be kept in view for this also limits the sample size. The parameters of interest in a research study must be kept in view, while deciding the size of the sample. Costs too dictate the size of sample that we can draw. As such, budgetary constraint must invariably be taken into consideration when we decide the sample size.
- **Parameters of interest:** In determining the sample design, one must consider the question of the specific population parameters which are of interest. For instance, we may be interested in estimating the proportion of persons with some characteristic in the population, or we may be interested in knowing some average or the other measure concerning the population. There may also be important sub-groups in the population about whom we would like to make estimates. All this has a strong impact upon the sample design we would accept.
- **Budgetary constraint:** Cost considerations, from practical point of view, have a major impact upon decisions relating to not only the size of the sample but also to the type of sample. This fact can even lead to the use of a non-probability sample.

- **Sampling procedure:** Finally, the researcher must decide the type of sample he will use i.e., he must decide about the technique to be used in selecting the items for the sample. In fact, this technique or procedure stands for the sample design itself. There are several sample designs (explained in the pages that follow) out of which the researcher must choose one for his study. Obviously, he must select that design which, for a given sample size and for a given cost, has a smaller sampling error.

**4. How would you differentiate between simple random sampling and complex random sampling Designs? Explain clearly giving examples.**

- There are mainly two methods of sampling which are random and non-random sampling. Random sampling is referred to as that sampling technique where the probability of choosing each sample is equal.
- The sample that is chosen randomly is an unbiased representation of the total population. If at all, the sample chosen does not represent the population, it leads to sampling error.
- Non-random sampling is a sampling technique where the sample selection is based on factors other than just random chance. In other words, non-random sampling is biased in nature.
- Here, the sample will be selected based on the convenience, experience or judgment of the researcher.
- Following are some of the points of difference between random sampling and non-random sampling

<b>Random Sampling</b>	<b>Non-random Sampling</b>
<b>Definition</b>	
Random sampling is a sampling technique where each sample has an equal probability of getting selected	Non-random sampling is a sampling technique where the sample selected will be based on factors such as convenience, judgement and experience of the researcher and not on probability
<b>Biases involved in Sampling</b>	
Random sampling is unbiased in nature	Non-random sampling is biased in nature
<b>Based on</b>	
Based on probability	Based on other factors such as convenience,

	judgement and experience of researcher but, not based on probability
<b>Representation of Population</b>	
Random sampling is representative of the entire population	Non-random sampling lacks the representation of the entire population
<b>Chances of Zero Probability</b>	
Never	Zero probability can occur
<b>Complexity</b>	
Random sampling is the most simple sampling technique	Non-random sampling method is a somewhat complex sampling technique

**5. Why probability sampling is generally preferred in comparison to non-probability sampling? Explain the procedure of selecting a simple random sample.**

A sample is a subset, or smaller group, within a population. When designing studies, researchers must ensure that the sample replicates the larger population in all the characteristic ways that could be important to the study's research findings.

Some samples so closely represent the larger population that it's easy to make inferences about the larger population from your observations of the sample group. In market research, there are two general approaches to sampling: probability sampling and nonprobability sampling.

Generally, nonprobability sampling is a bit rough, with a biased and subjective process. This sampling is used to generate a hypothesis. Conversely, probability sampling is more precise, objective and unbiased, which makes it a good fit for testing a hypothesis.

**Probability Sampling**

In the technique of probability sampling, also known as random sampling, everyone in the population has an equal chance of being chosen as a representative sample:

- Everyone in the sample must have the same probability, or fixed opportunity, to be in the sample set.
- and*
- The probability of any member of the sample group being selected for the sample can be mathematically calculated. In other words, everyone has the same, a fair chance of being selected.

The characteristics of probability sampling can be summarized as follows:

- Random basis of selection
- Fixed, known opportunity of selection
- Used for conclusive research
- Produces an unbiased result
- The method is objective
- Can make statistical inferences
- The hypothesis is tested

#### Nonprobability Sampling

One of the most noteworthy features of the method of nonprobability sampling, also known as nonrandom sampling, is that there isn't any specific probability that any given person will be in the sample set. In other words, you don't know which person from a population will be chosen for the sample.

Some characteristics of nonprobability sampling include:

- Arbitrary basis of selection
- Used for exploratory research
- Produces a biased result
- Uses a subjective method
- Can make analytical inferences
- The hypothesis is generated

#### An Important Limitation of Nonprobability Sampling

With nonprobability sampling, inferences cannot be drawn about the larger population based on a nonprobability sample. This is not always the case, however, since a realistic view of how people approach research findings readily identifies situations where people do inappropriately draw conclusions from findings associated with nonprobability samples.

#### Potential Sampling Errors

When working with nonprobability samples, it is important to understand the occurrence of sampling error. The smaller the sampling group, the greater the chance of sampling error. One particular type of bias occurs a result of nonparticipation, which can have an important effect on the overall outcome of a study.

For example, in the 1980 General Society Survey (GSS), those who did not participate in the research were found to be quite different, as a group, from those who had participated. The hard-to-reach group members were significantly different from their peer labor-force participants—most markedly in socioeconomic status, marital status, age, the number of children, health, and sex.

#### Convenience Sampling

Convenience samples are commonly used in social science and behavioral science because of the heavy reliance on college students, patients, paid volunteers, members of social networks or formal organizations, and even prisoners.

The purpose of much social science and behavioral science research is to verify that certain characteristics occur or do not occur in the group undergoing study. A common approach is to look for relationships among several attributes. Convenience samples are useful and adequate for this type of study, although a convenience sample is not always easy to put together.

Convenience samples may also be matched in order to compare two groups. In order to use matched convenience samples, a researcher must be able to identify a counterpart for each member of the first sample. These counterparts are members of the second (matched) sample.

The variables that are commonly matched include gender, age, race, ethnicity, educational attainment, place of residence, political orientation, religion, job type, and wages or salary. Matching these variables helps to reduce sources of bias, although even careful matching may not result in samples free of bias. The possibility of bias from hidden sources always exists.

#### Purposive Sampling

Purposive sampling is used when the research design calls for a sample of people who exhibit particular attributes. Generally, these attributes are rare or unusual and are typically not distributed normally (that is, according to the "normal curve") in the larger population. Purposive sampling is fraught with bias, some of which occurs as a result of the methods used to identify the members of a purposive sample.

For example, if the research purpose requires studying veterans with traumatic brain injury (TBI), then the sample must consist of ex-members of the military who have sustained a TBI and who identify themselves accordingly and agree to participate in the study. Each of these attributes or conditions contributes a measure of bias to the sample, thereby limiting the level and type of conclusions that result from the study.

Samples that act like public opinion polls are disseminated with the idea that they represent how members of a population will vote in a coming election, for example. These samples must be highly representative of the population in order to make reliable forecasts.

## Unit V

### **1. What is Technical Report?**

A technical report is used whenever a full written report of the study is required whether for record keeping or for public dissemination.

### **2. What is Popular report?**

A popular report is used if the research results have policy implications. The popular report is one which gives emphasis on simplicity and attractiveness. The simplification should be sought through clear writing, minimization of technical, particularly mathematical, details and liberal use of charts and diagrams.

### **3. When oral presentation is necessary?**

At times oral presentation of the research of the study is considered effective, particularly in cases where policy recommendation are indicated by project results.

### **4. What is Footnote?**

Footnotes are meant for cross reference, citation of authorities and sources, acknowledgement and elucidation or explanation of a point of view.

### **5. What is long report?**

A long report examines the problem in detail and requires more extensive effort in preparation. A long report is the culmination of many weeks of hard work. It differs from a short report in purpose, scope, format, and, many times, audience. A long report provides an in-depth view of an issue and may discuss not just one or two current events but a long history.

### **6. State operating report.**

Operating report provide managers with detailed information regarding all activities like sales, inventory, costs etc. Operational reporting is the process of regularly producing detailed reports of an organization's day-to-day operations and activities. These reports typically include data pertaining to production costs, accounts, resource expenditures, and comprehensive examinations of processes.

### **7. What is periodic report?**

Periodic report describes the activities in a department during a particular period. Periodic reports are documents that public companies must continuously file with the Securities and Exchange Commission (SEC) which disclose material updates on the company's business operations. There are three ways a company can have a requirement to file periodic reports.

### **8. What is Investigative report?**

Investigative report analyses the facts and present recommendations and conclusions. An investigation report is a document that provides details on the findings of your investigation - be it a simple workplace one, or a more complex criminal case. When you write an investigation report, be sure to include all pertinent information about the case and any evidence that was gathered.

### **9. What is trouble shooting report?**

It is a form of problem solving report which discusses the source of the problem, extent of damage done and solutions possible. Troubleshoot Report. To help Support team to debug the system problems, troubleshooting report can be generated which consists of the system's current status file and log files. File contains details like list of all the processes currently running on system, resource usage etc. in the encrypted form.

### **10. What is feasibility report?**

A feasibility report is a problem solving report that studies proposed options to assess whether all or any one of them is sound. A feasibility report is a report that evaluates a set of proposed project paths or solutions to determine if they are viable. The person who prepares a feasibility report evaluates the feasibility of different solutions and then chooses their recommendation for the best solution. They then present the feasibility report to their company and make their recommendation.

### **11. What is Compliance report?**

Compliance report explains what a company is doing to conform to the government regulations. Compliance reports serve as proof that your organization is following the stipulations of a particular regulatory standard. Violating laws, rules, and regulations can result in damage to reputations, hefty penalties, and in some cases, imprisonment or forced closure.

### **12. What is Interim compliance report?**

Interim compliance report can also be prepared to monitor and control the licenses granted by the government. purpose of the Compliance Report/Interim Update is to report to the appropriate MHRA inspector the changes on site in the following categories since the last inspection: • Shift in performance. • Key Personnel or staff numbers. • Company ownership/ structure or status.

### **13. What is Pictogram?**

A chart that uses symbols instead of words or number to portray is known as pictogram. A pictogram is a chart that uses pictures to represent data. Pictograms are set out in the same way as bar charts, but instead of bars they use columns of pictures to show the numbers involved.

### **14. What is Decision Chart?**

A decision chart or decision tree is a flow chart that uses graphs to explain whether or not to perform a certain action in a certain situation.

### **15. What is Static group comparison?**

This design uses two groups one receives the experimental stimulus and the other serves as a control group and is not given the treatment. The dependent variable is measured in both groups after the treatment.

### **16. What is complex factorial design?**

A design which considers three or more independent variables simultaneously is called complex factorial design. This is also known as multi factor factorial design.

### **17. What is Quasi Experiment?**



Quasi experiments are done in natural environment, but treatments are given to one or more groups. A quasi-experiment is a type of research design that attempts to establish a cause-and-effect relationship. The main difference between this and a true experiment is that the groups are not randomly assigned.

**18. What is Group time series design?**

This design introduces repeated observations before and after the treatment and allows subject to act on their own control.

**19. What is Main report?**

The main body of the report should be presented in logical sequence and broken down in to readily identifiable sections.

**20. What is Moderating variable?**

The variable that moderates the relationship between dependent and independent variable is called as a moderating variable.

**21. What is non directional hypothesis?**

Non directional hypothesis postulate relationship but does not offer indication of the direction of the relationship.

**22. What is warranty card?**

Warranty cards are usually postal sized cards which are used by dealers of consumer durables to collect information regarding their products.

**23. What is store audit?**

Store audits are performed by distributors as well as manufacturers through their salesmen at regular intervals.

**24. What is the purpose of Eye camera?**

Eye camera are designed to record the focus of eyes of a respondent on a specific portion of a sketch or diagram or written material.

**25. What is pupillometric camera?**

It records dilation of the pupil as a result of visual stimulus. The extent of dilation shows the degree of interest aroused by stimulus. Pupillometer, also spelled pupilometer, is a medical device intended to measure by reflected light the size of the pupil of the eye. In addition to measuring pupil size, current automated pupillometers may also be able to characterize pupillary light reflex.

## UNIT-V

### **1. Explain the phrase ‘Analysis of Data’ or ‘Treatment of Data’. Indicate the need and importance of data analysis.**

Although many groups, organizations, and experts have different ways of approaching data analysis, most of them can be distilled into a one-size-fits-all definition. Data analysis is the process of cleaning, changing, and processing raw data and extracting actionable, relevant information that helps businesses make informed decisions. The procedure helps reduce the risks inherent in decision-making by providing useful insights and statistics, often presented in charts, images, tables, and graphs.

A simple example of data analysis can be seen whenever we make a decision in our daily lives by evaluating what has happened in the past or what will happen if we make that decision. Basically, this is the process of analyzing the past or future and making a decision based on that analysis. **Data Analysis Importants:**

- **Better Customer Targeting:** You don't want to waste your business's precious time, resources, and money putting together advertising campaigns targeted at demographic groups that have little to no interest in the goods and services you offer. Data analysis helps you see where you should be focusing your advertising and marketing efforts.
- **You Will Know Your Target Customers Better:** Data analysis tracks how well your products and campaigns are performing within your target demographic. Through data analysis, your business can get a better idea of your target audience's spending habits, disposable income, and most likely areas of interest. This data helps businesses set prices, determine the length of ad campaigns, and even help project the number of goods needed.
- **Reduce Operational Costs:** Data analysis shows you which areas in your business need more resources and money, and which areas are not producing and thus should be scaled back or eliminated outright.
- **Better Problem-Solving Methods:** Informed decisions are more likely to be successful decisions. Data provides businesses with information. You can see where this progression is leading. Data analysis helps businesses make the right choices and avoid costly pitfalls.
- **You Get More Accurate Data:** If you want to make informed decisions, you need data, but there's more to it. The data in question must be accurate. Data analysis helps businesses acquire relevant, accurate information, suitable for developing future marketing strategies, business plans, and realigning the company's vision or mission.

## Data Analysis Process:

Answering the question “what is data analysis” is only the first step. Now we will look at how it’s performed. The process of data analysis, or alternately, data analysis steps, involves gathering all the information, processing it, exploring the data, and using it to find patterns and other insights. The process of data analysis consists of:

- **Data Requirement Gathering:** Ask yourself why you’re doing this analysis, what type of data you want to use, and what data you plan to analyze.
- **Data Collection:** Guided by your identified requirements, it’s time to collect the data from your sources. Sources include case studies, surveys, interviews, questionnaires, direct observation, and focus groups. Make sure to organize the collected data for analysis.
- **Data Cleaning:** Not all of the data you collect will be useful, so it’s time to clean it up. This process is where you remove white spaces, duplicate records, and basic errors. Data cleaning is mandatory before sending the information on for analysis.
- **Data Analysis:** Here is where you use data analysis software and other tools to help you interpret and understand the data and arrive at conclusions. Data analysis tools include Excel, Python, R, Looker, Rapid Miner, Chartio, Metabase, Redash, and Microsoft Power BI.
- **Data Interpretation:** Now that you have your results, you need to interpret them and come up with the best courses of action based on your findings.
- **Data Visualization:** Data visualization is a fancy way of saying, “graphically show your information in a way that people can read and understand it.” You can use charts, graphs, maps, bullet points, or a host of other methods. Visualization helps you derive valuable insights by helping you compare datasets and observe relationships.

## **What is Data Analysis: Types of Data Analysis**

A half-dozen popular types of data analysis are available today, commonly employed in the worlds of technology and business. They are:

- **Diagnostic Analysis:** Diagnostic analysis answers the question, “Why did this happen?” Using insights gained from statistical analysis (more on that later!), analysts use diagnostic analysis to identify patterns in data. Ideally, the analysts find similar patterns that existed in the past, and consequently, use those solutions to resolve the present challenges hopefully.

- **Predictive Analysis:** Predictive analysis answers the question, “What is most likely to happen?” By using patterns found in older data as well as current events, analysts predict future events. While there’s no such thing as 100 percent accurate forecasting, the odds improve if the analysts have plenty of detailed information and the discipline to research it thoroughly.
- **Prescriptive Analysis:** Mix all the insights gained from the other data analysis types, and you have prescriptive analysis. Sometimes, an issue can’t be solved solely with one analysis type, and instead requires multiple insights.
- **Statistical Analysis:** Statistical analysis answers the question, “What happened?” This analysis covers data collection, analysis, modeling, interpretation, and presentation using dashboards. The statistical analysis breaks down into two sub-categories:
  - **Descriptive:** Descriptive analysis works with either complete or selections of summarized numerical data. It illustrates means and deviations in continuous data and percentages and frequencies in categorical data.
  - **Inferential:** Inferential analysis works with samples derived from complete data. An analyst can arrive at different conclusions from the same comprehensive data set just by choosing different samplings.
- **Text Analysis:** Also called “data mining,” text analysis uses databases and data mining tools to discover patterns residing in large datasets. It transforms raw data into useful business information. Text analysis is arguably the most straightforward and the most direct method of data analysis.

## Data Analysis Methods

Some professionals use the terms “data analysis methods” and “data analysis techniques” interchangeably. To further complicate matters, sometimes people throw in the previously discussed “data analysis types” into the fray as well! Our hope here is to establish a distinction between what kinds of data analysis exist, and the various ways it’s used.

Although there are many data analysis methods available, they all fall into one of two primary types: qualitative analysis and quantitative analysis.

- **Qualitative Data Analysis:** The qualitative data analysis method derives data via words, symbols, pictures, and observations. This method doesn’t use statistics. The most common qualitative methods include:

- Content Analysis, for analyzing behavioral and verbal data.
- Narrative Analysis, for working with data culled from interviews, diaries, surveys.
- Grounded Theory, for developing causal explanations of a given event by studying and extrapolating from one or more past cases.
- Quantitative Data Analysis: Statistical data analysis methods collect raw data and process it into numerical data. Quantitative analysis methods include:
  - Hypothesis Testing, for assessing the truth of a given hypothesis or theory for a data set or demographic.
  - Mean, or average determines a subject's overall trend by dividing the sum of a list of numbers by the number of items on the list.
  - Sample Size Determination uses a small sample taken from a larger group of people and analyzed. The results gained are considered representative of the entire body.

## 2. Differentiate between descriptive statistical analysis and inferential statistical analysis.

### Difference Between Descriptive and Inferential Statistics

In today's fast-paced world, statistics is playing a major role in the field of research; that helps in the collection, analysis and presentation of data in a measurable form. It is quite hard to identify, whether the research relies on descriptive statistics or inferential statistics, as people usually, lacks knowledge about these two branches of statistics. As the name suggests, **descriptive statistics** is one which describes the population.

On the other end, **Inferential statistics** is used to make the generalisation about the population based on the samples. So, there is a big difference between descriptive and inferential statistics, i.e. what you do with your data. Let's take a glance at this article to get some more details on the two topics.

### Comparison Chart

BASIS FOR COMPARISON	DESCRIPTIVE STATISTICS	INFERENCEAL STATISTICS
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Meaning	Descriptive Statistics is that branch of statistics which is concerned with describing the population under study.	Inferential Statistics is a type of statistics, that focuses on drawing conclusions about the population, on the basis of sample analysis and observation.
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## **BASIS FOR COMPARISON OF DESCRIPTIVE STATISTICS AND INFERENCE STATISTICS**

What it does?	Organize, analyze and present data in a meaningful way.	Compares, test and predicts data.
Form of Result	Charts, Graphs and Tables	Probability
Usage	To describe a situation.	To explain the chances of occurrence of an event.
Function	It explains the data, which is already known, to summarize sample.	It attempts to reach the conclusion to learn about the population, that extends beyond the data available.

### **Definition of Descriptive Statistics**

Descriptive Statistics refers to a discipline that quantitatively describes the important characteristics of the dataset. For the purpose of describing properties, it uses measures of central tendency, i.e. mean, median, mode and the measures of dispersion i.e. range, standard deviation, quartile deviation and variance, etc.

The data is summarised by the researcher, in a useful way, with the help of numerical and graphical tools such as charts, tables, and graphs, to represent data in an accurate way. Moreover, the text is presented in support of the diagrams, to explain what they represent.

### **Definition of Inferential Statistics**

Inferential Statistics is all about generalising from the sample to the population, i.e. the results of the analysis of the sample can be deduced to the larger population, from which the sample is taken. It is a convenient way to draw conclusions about the population when it is not possible to query each and every member of the universe. The sample chosen is a representative of the entire population; therefore, it should contain important features of the population.

Inferential Statistics is used to determine the probability of properties of the population on the basis of the properties of the sample, by employing probability theory. The major inferential statistics are based on the statistical models such as Analysis of Variance, chi-square test, student's t distribution, regression analysis, etc. Methods of inferential statistics:

- Estimation of parameters
- Testing of hypothesis

### 3. Distinguish between parametric statistics and non-parametric statistics. Indicate their uses in different types of data or researches.

Parametric is a test in which parameters are assumed and the population distribution is always known. To calculate the central tendency, a mean value is used. These tests are common, and this makes performing research pretty straightforward without consuming much time. No assumptions are made in the non-parametric test and it measures with the help of the median value. A few instances of non-parametric tests are Kruskal-Wallis, Mann-Whitney, and so forth. In this article, you will be learning what is parametric and non-parametric tests, the advantages and disadvantages of parametric and non-parametric tests, parametric and non-parametric statistics and the difference between parametric and non-parametric tests.

#### Differences Between The Parametric Test and The Non-Parametric Test

Properties	Parametric Test	Non-Parametric Test
Assumptions	Yes, assumptions are made	No, assumptions are not made
Value for central tendency	The mean value is the central tendency	The median value is the central tendency
Correlation	Pearson Correlation	Spearman Correlation
Probabilistic Distribution	Normal probabilistic distribution	Arbitrary probabilistic distribution
Population Knowledge	Population knowledge is required	Population knowledge is not required
Used for	Used for finding interval data	Used for finding nominal data
Application	Applicable to variables	Applicable to variables and attributes
Examples	T-test, z-test	Mann-Whitney, Kruskal-Wallis

#### Advantages and Disadvantages of Parametric and Nonparametric Tests

A lot of individuals accept that the choice between using parametric or nonparametric tests relies upon whether your information is normally distributed. The distribution can act as a deciding

factor in case the data set is relatively small. Although, in a lot of cases, this issue isn't a critical issue because of the following reasons:

- Parametric tests help in analyzing non normal appropriations for a lot of datasets.
- Nonparametric tests when analyzed have other firm conclusions that are harder to achieve.

The appropriate response is usually dependent upon whether the mean or median is chosen to be a better measure of central tendency for the distribution of the data.

- A parametric test is considered when you have the mean value as your central value and the size of your data set is comparatively large. This test helps in making powerful and effective decisions.
- A non-parametric test is considered regardless of the size of the data set if the median value is better when compared to the mean value.

Ultimately, if your sample size is small, you may be compelled to use a nonparametric test. As the table shows, the example size prerequisites aren't excessively huge. On the off chance that you have a little example and need to utilize a less powerful nonparametric analysis, it doubly brings down the chances of recognizing an impact.

The non-parametric test acts as the shadow world of the parametric test. In the table that is given below, you will understand the linked pairs involved in the statistical hypothesis tests.

**Related Pairs of Parametric Test and Non-Parametric Tests**

<b>Parametric Tests for Means</b>	<b>Non-Parametric Test for Medians</b>
1 - sample t - test	1 - sample Wilcoxon, 1 - sample sign
2 - sample t - test	Mann - Whitney Test
One - way ANOVA	Kruskal- Wallis, Mood's median test
With a factor and a blocking variable - Factorial DOE	Friedman Test

**Classification Of Parametric Test and Non-Parametric Test**

There are different kinds of parametric tests and [non-parametric tests](#) to check the data. Let us discuss them one by one.

**Types Of Parametric Test**



- **Student's T-Test:-** This test is used when the samples are small and population variances are unknown. The test is used to do a comparison between two means and proportions of small independent samples and between the population mean and sample mean.
- **1 Sample T-Test:-** Through this test, the comparison between the specified value and meaning of a single group of observations is done.
- **Unpaired 2 Sample T-Test:-** The test is performed to compare the two means of two independent samples. These samples came from the normal populations having the same or unknown variances.
- **Paired 2 Sample T-Test:-** In the case of paired data of observations from a single sample, the paired 2 sample t-test is used.
- **ANOVA:-** Analysis of [variance](#) is used when the difference in the mean values of more than two groups is given.
- **One Way ANOVA:-** This test is useful when different testing groups differ by only one factor.
- **Two Way ANOVA:-** When various testing groups differ by two or more factors, then a two way ANOVA test is used.
- **Pearson's Correlation Coefficient:-** This coefficient is the estimation of the strength between two variables. The test is used in finding the relationship between two continuous and quantitative variables.
- **Z - Test:-** The test helps measure the difference between two means.
- **Z - Proportionality Test:-** It is used in calculating the difference between two proportions.

#### **Types Of Non-Parametric Test**

- **1 Sample Sign Test:-** In this test, the median of a population is calculated and is compared to the target value or reference value.
- **1 Sample Wilcoxon Signed Rank Test:-** Through this test also, the population median is calculated and compared with the target value but the data used is extracted from the symmetric distribution.
- **Friedman Test:-** The difference of the groups having ordinal dependent variables is calculated. This test is used for continuous data.
- **Goodman Kruska's Gamma:-** It is a group test used for ranked variables.

- **Kruskal-Wallis Test:-** This test is used when two or more medians are different. For the calculations in this test, ranks of the data points are used.
- **The Mann-Kendall Trend Test:-** The test helps in finding the trends in time-series data.
- **Mann-Whitney Test:-** To compare differences between two independent groups, this test is used. The condition used in this test is that the dependent values must be continuous or ordinal.
- **Mood's Median Test:-** This test is used when there are two independent samples.
- **Spearman Rank Correlation:-** This technique is used to estimate the relation between two sets of data.

#### **Applications Of Parametric Tests**

- This test is used when the given data is quantitative and continuous.
- When the data is of normal distribution then this test is used.
- The parametric tests are helpful when the data is estimated on the approximate ratio or interval scales of measurement.

#### **Applications Of Non-Parametric Tests**

- These tests are used in the case of solid mixing to study the sampling results.
- The tests are helpful when the data is estimated with different kinds of measurement scales.
- The non-parametric tests are used when the distribution of the population is unknown.

### **4. Indicate the basis for selecting a statistical technique in analyzing data for educational research.**

Statistical analysis, or statistics, involves collecting, organizing and analyzing data based on established principles to identify patterns and trends. It is a broad discipline with applications in academia, business, the social sciences, genetics, population studies, engineering and several other fields. Statistical analysis has several functions. You can use it to make predictions, perform simulations, create models, reduce risk and identify trends.

#### **Main types of statistical analysis**

**There are three major types of statistical analysis:**

##### **Descriptive statistical analysis**

Descriptive statistics is the simplest form of statistical analysis, using numbers to describe the qualities of a data set. It helps reduce large data sets into simple and more compact forms for easy interpretation. You can use descriptive statistics to summarize the data from a sample or represent a whole sample in a research population. Descriptive statistics uses data visualization

tools such as tables, graphs and charts to make analysis and interpretation easier. However, descriptive statistics is not suitable for making conclusions. It can only represent data so you can apply more sophisticated statistical analysis tools to draw inferences.

Descriptive statistics can use measures of central tendency, which uses a single value to describe a group. Mean, median and mode are used to get the central value for a given data set. For example, you can use descriptive statistical analysis to find the average age of drivers with a ticket in a municipality. Descriptive statistics can also find the measure of spread. For example, you can find the age range of drivers with a DUI and at-fault car accidents in a state. Techniques used to find a measure of spread include range, variation and standard deviation.

### Inferential statistical analysis

Inferential statistical analysis is used to make inferences or draw conclusions about a larger population-based on findings from a sample group within it. It can help researchers find distinctions among groups present within a sample. Inferential statistics are also used to validate generalizations made about a population from a sample due to its ability to account for errors in conclusions made about a segment of a larger group.

To perform inferential statistical analysis, researchers estimate the parameters of the population from the sample. They can also perform a test of statistical hypothesis to arrive at a confidence interval that validates or disproves the generalizations made from the sample.

### Associational statistical analysis

Associational statistics is a tool researchers use to make predictions and find causation. They use it to find relationships among multiple variables. It is also used to determine whether researchers can make inferences and predictions about a data set from the characteristics of another set of data. Associational statistics is the most advanced type of statistical analysis and requires sophisticated software tools for performing high-level mathematical calculations. To measure association, researchers use a wide range of coefficients of variation, including correlation and regression analysis.

### **Other types of statistical analysis**

#### **Below are four other types of statistical analysis:**

#### Predictive analysis

Predictive analysis uses powerful statistical algorithms and machine learning tools to predict future events and behavior based on new and historical data trends. It relies on a wide range of probabilistic techniques such as data mining, big data, predictive modeling, artificial intelligence and simulations to guess what is likely to occur in the future.

Predictive analysis is a branch of business intelligence as many organizations with operations in marketing, sales, insurance and financial services rely on data to make long-term plans. It is important to note that predictive analysis can only make hypothetical forecasts and the quality of the predictions depends on the accuracy of the underlying data sets.

#### Prescriptive analysis

Prescriptive analysis helps organizations use data to guide their decision-making process. Companies can use tools such as graph analysis, algorithms, machine learning and simulation for this type of analysis. Prescriptive analysis helps businesses make the best choice from several alternative courses of action.

#### Exploratory data analysis

Exploratory data analysis is a technique data scientists use to identify patterns and trends in a data set. They can also use it to determine relationships among samples in a population, validate assumptions, test hypotheses and find missing data points. Companies can use exploratory data analysis to make insights based on data and validate data for errors.

#### Causal analysis

Causal analysis uses data to determine causation or why things happen the way they do. It is an integral part of quality assurance, accident investigation and other activities that aim to find the underlying factors that led to an event. Companies can use causal analysis to understand the reasons for an event and use this understanding to guide future decisions.

#### Statistical analysis process

There are five major steps involved in the statistical analysis process:

##### 1. Data collection

The first step in statistical analysis is data collection. You can collect data through primary or secondary sources such as surveys, customer relationship management software, online quizzes, financial reports and marketing automation tools. To ensure the data is viable, you can choose data from a sample that's representative of a population. For example, a company might collect data from previous customers to understand buyer behaviors.

##### 2. Data organization

The next step after data collection is data organization. Also known as data cleaning, this stage involves identifying and removing duplicate data and inconsistencies that may prevent you from getting an accurate analysis. This step is important because it can help companies ensure their data and the conclusions they draw from the analysis are correct.

### 3. Data presentation

Data presentation is an extension of data cleaning, as it involves arranging the data for easy analysis. Here, you can use descriptive statistics tools to summarize the data. Data presentation can also help you determine the best way to present the data based on its arrangement.

### 4. Data analysis

Data analysis involves manipulating data sets to identify patterns, trends and relationships using statistical techniques, such as inferential and associational statistical analysis. You can use computer software like spreadsheets to automate this process and reduce the likelihood of human error in the statistical analysis process. This can allow you to analyze data efficiently.

### 5. Data interpretation

The last step is data interpretation, which provides conclusive results regarding the purpose of the analysis. After analysis, you can present the result as charts, reports, scorecards and dashboards to make it accessible to nonprofessionals. For example, the interpretation of the analysis of the impact of a 6,000-worker factory on crime rate in a small town with a population of 13,000 residents can show a declining rate of criminal activities. You may use a line graph to display this decline.

## **5. What do you understand by research report or thesis? Indicate its need and importance in the research work.**

Research reporting is the oral or written presentation of the findings in such detail and form as to be readily understood and assessed by the society, economy or particularly by the researchers.

As earlier said that it is the final stage of the research process and its purpose is to convey to interested persons the whole result of the study. Report writing is common to both academic and managerial situations. In academics, a research report is prepared for comprehensive and application-oriented learning. In businesses or organizations, reports are used for the basis of decision making.

**Table of Content** [Show]

### **Research Report Definition**

**According to C. A. Brown**, “A report is a communication from someone who has information to someone who wants to use that information.”

**According to Goode and Hatt**, “The preparation of report is the final stage of research, and it’s purpose is to convey to the interested persons the whole result of the study, in sufficient detail and so arranged as to enable each reader to comprehend the data and to determine for himself the validity of the conclusions.”

It is clear from the above definitions of a research report, it is a brief account of the problem of investigation, the justification of its selection and the procedure of analysis and interpretation. It is only a summary of the entire research proceedings.

In other words, it can be defined as written documents, which presents information in a specialized and concise manner.

## **Contents of Research Report**

Although no hard and fast rules can be laid down, the report must contain the following points.

- **Preliminary Part**
  - Cover
  - Title
  - Preface
  - Acknowledgement
  - Table of contents
  - List of tables
- **Introduction of the Report**
  - Introduction
  - Background of the research study
  - Statement of the problem
- **Review of Literature**
  - Books review
  - Review of articles published in books, journals, periodicals, etc
  - Review of articles published in leading newspapers
  - Working papers / discussion paper / study reports
  - Articles on authorised websites
  - A broad conclusion and indications for further research
- **The Research Methodology**
  - The theoretical framework (variables)
  - Model / hypothesis
  - Instruments for data collection
- **Results**
  - Pilot study
  - Processing of data
  - Hypothesis / model testing
  - Data analysis and interpretation
- **Concluding Remarks**
  - Findings
  - Conclusions
  - Shortcomings
  - Suggestions to the problems
- **Bibliography**
  - Appendices

### **Preliminary Part**

The preliminary part may have seven major components – cover, title, preface, acknowledgement, table of contents, list of tables, list of graphs. Long reports presented in book form have a cover made up of a card sheet. The cover contains title of the research report, the authority to whom the report is submitted, name of the author, etc.

The preface introduces the report to the readers. It gives a very brief introduction of the report. In the acknowledgements author mention names of persons and organisations that have extended co-operation and helped in the various stages of research. Table of contents is essential. It gives the title and page number of each chapter.

## **Introduction of the Report**

The introduction of the research report should clearly and logically bring out the background of the problem addressed in the research. The purpose of the introduction is to introduce the research project to the readers. A clear statement of the problem with specific questions to be answered is presented in the introduction. It contains a brief outline of the chapters.

## **Review of Literature**

The third section reviews the important literature related to the study. A comprehensive review of the research literature referred to must be made. Previous research studies and the important writings in the area under study should be reviewed. Review of literature is helpful to provide a background for the development of the present study.

The researcher may review concerned books, articles published in edited books, journals and periodicals. Researcher may also take review of articles published in leading newspapers. A researcher should study working papers/discussion papers/study reports. It is essential for a broad conclusion and indications for further research.

## **Qualities of Good Report**

Report writing is a highly skilled job. It is a process of analysing, understanding and consolidating the findings and projecting a meaningful view of the phenomenon studied. A good report writing is essential for effective communication.

Following are the essential qualities of good report:

- A research report is essentially a scientific documentation. It should have a suggestive title, headings and sub-headings, paragraphs arranged in a logical sequence.
- Good research report should include everything that is relevant and exclude everything that is irrelevant. It means that it should contain the facts rather than opinion.
- The language of the report should be simple and unambiguous. It means that it should be free from biases of the researchers derived from the past experience. Confusion, pretentiousness and pomposity should be carefully guarded against. It means that the language of the report should be simple, employing appropriate words, idioms and expressions.
- The report has to take into consideration two facts. Firstly, for whom the report is meant and secondly, what is his level of knowledge. The report has to look to the subject matter of the report and the fact as to the level of knowledge of the person for whom it is meant. Because all reports are not meant for research scholars.

## **Steps in Writing Research Report**

Report writing is a time consuming and expensive exercise. Therefore, reports have to be very sharply focused in purpose content and readership. There is no single universally acceptable method of writing a research report.

Following are the general steps in writing a research report:

- **Analysis of the subject matter**
- **Research outline**
- **Preparation of rough draft**
- **Rewriting and polishing**
- **Writing the final draft**

### **Analysis of the subject matter**

This is the first and important step in writing a research report. It is concerned with the development of a subject. Subject matter should be written in a clear, logical and concise manner. The style adopted should be open, straightforward and dignified and folk style language should be avoided.

The data, the reliability and validity of the results of the statistical analysis should be in the form of tables, figures and equations. All redundancy in the data or results presented should be eliminated.

### **Research outline**

The research outline is an organisational framework prepared by the researcher well in advance. It is an aid to logical organisation of material and a reminder of the points to be stressed in the report. In the process of writing, if need be, outline may be revised accordingly.

Time and place of the study, scope and limitations of the study, study design, summary of pilot study, methods of data collection, analysis interpretation, etc., may be included in a research outline.

### **Preparation of rough draft**

Having prepared the primary and secondary data, the researcher has to prepare a rough draft. While preparing the rough draft, the researcher should keep the objectives of the research in mind, and focus on one objective at a time. The researcher should make a checklist of the important points that are necessary to be covered in the manuscript. A researcher should use dictionary and relevant reference materials as and when required.

### **Rewriting and polishing**

This is an important step in writing a research report. It takes more time than a rough draft. While rewriting and polishing, a researcher should check the report for weakness in logical development or presentation. He should take breaks in between rewriting and polishing since this gives the time to incubate the ideas.

### **Writing the final draft**

The last and important step is writing the final draft. The language of the report should be simple, employing appropriate words and expressions and should avoid vague expressions such as 'it seems' and 'there may be' etc.

It should not used personal pronouns, such as I, We, My, Us, etc and should substitute these by such expressions as a researcher, investigator, etc. Before the final drafting of the report, it is advisable that the researcher should prepare a first draft for critical considerations and possible improvements. It will be helpful in writing the final draft. Finally, the report should be logically outlined with the future directions of the research based on the work completed.