GOVERNMENT ARTS COLLEGE FOR WOMEN SALEM

(Recognized under Section 2(f) & 2 (B) of UGC Act, 1956 and Accredited with "A" Grade- III Cycle by NAAC)

Affiliated to Periyar University, Salem-11

Yercaud Main Road, Gorimedu, Salem – 636 008

PG & RESEARCH DEPARTMENT OF COMMERCE

STUDY MATERIAL

PAPER NAME : RESEARCH METHODOLOGY
SEMESTER : THIRD
CLASS : II M.COM
PAPER CODE : 19PCM09

RESEARCH METHODOLOGY

UNIT – I

Meaning of business research – Type of research – Descriptive, Exploratory, Empirical, Historical and case study – Research design - Components of Research design.

UNIT – II

Census – Samples – Sampling techniques – Random and Non -Random Sampling – size of the sample- Sampling Error.

UNIT – III

Collection of data – Primary and Secondary Data – Tools of collection of data – Questionnaire – Scaling Techniques-Personal Interview – Interview Schedule – Observation, Pilot study and Pre- Testing.

UNIT – IV

Analysis and Interpretation of data – Hypothesis – Characteristics of a good Hypothesis – Formulation and Testing of Hypothesis – Methods at testing Hypothesis – T-Test , F- Test and Chi- Square Test.

UNIT – V

Research Report – Types of Reports-Steps in drafting a Research Report –Quality of Research Report.

REFERENCE BOOK:

1. Research Methodology – Kothari.C.R
2. Research Method in Commerce – Amar chand. D
3. Research Methodology – Thanulingam.N
4. Research Methodology – Krishnasamy and Obuli Reddy.

RESEARCH METHODOLOGY

Question Paper Pattern

Time: 3 Hours **Max. Marks: 75**

PART – A

Answer All Questions **(5x5=25)**

All Question carry equal Marks.

UNIT – I

Qn.No.1 : (a) or (b)

UNIT – II

Qn. No.2 : (a) **(or)** (b)

UNIT – III

Qn. No.3 (a) **(or)** (b)

UNIT – IV

Qn. No.4 (a) **(or)** (b)

UNIT – V

Qn. No.5 (a) **(or)** (b)

PART –B

Answer All Questions. (5x10=50)

All Question carry equal Marks.

UNIT – I

Qn.No.6 :(a) **(or)** (b)

UNIT-II

Qn.No.7 : (a) **(or)** (b)

UNIT-III

Qn.No.8 (a) **(or)** (b)

UNIT-IV

Qn.No.9 (a) **(or)** (b)

UNIT-V

Qn.No.10 (a) **(or)** (b)

Unit- I

RESEARCH METHODOLOGY

- Introduction of Research
- Meaning of Research
- Definition of Research
- Norms guiding the researcher
- Qualities of a Researcher
- Characteristics of Research
- Objectives of Research
- Qualification of Researcher
- Classification of Research
- Business Research
- Benefits of Research
- Identification of research problems
- Selection of a problem
- Formulation of a problem
- Meaning of Research Design
- Research design
- Components of Research design
- Factors affecting Research design

Introduction:

One of the basic desires of man is to know of things around him. He wants to understand fully the things of the world. No wonder does a man which to acquire knowledge by enquiry. He asks so many questions such as why? How? When? of thing. He is desirous of finding answers to such questions.

Moreover, in day-to-day life, man confronts numerous problems, for which he wants to find immediate solution.

Thus, man asks questions and finds answers. His efforts to find answers is the outcome of a man's thirst for knowledge. This prompts him to find solutions to problems and urges him to do something better or more efficiently.

Such questions and problems crop up from the observation of an event or series of events. Sir Isaac Newton propounded the law of Gravitation by observing the apples falling from the apple tree. He started asking the questions "why do apples regularly fall to the ground instead of floating off into space? This enquiry led to the discovery of the law of Gravitation.

Meaning of Research:

The word 'Research' is derived from the French word, Researcher meaning 'to search back'. A man in his social, economic, educational, political and business life faces many problems.

Definitions of Research:

Fred Kerlinger – "Research is an organized enquiry designed and carried out to provide information for solving a problem."

Robert Ross – "Research is essentially an investigation, a recording and analysis of evidence for the purpose of gaining knowledge'.

Norms guiding the Researcher:

A number of norms, which commonly guide the researcher in the pursuit of knowledge, have been identified.

1. Faith in rationality
2. Emotional neutrality towards ideas and research findings.
3. Belief in the universal right of all people to claims of discovery and possession of knowledge.

4. Individualism or the unwillingness to be swayed by the majority.
5. Belief in the larger interest of the community
6. Un interestedness in personal prestige or self-interest.

Qualities of a Researcher:

The researcher should be a man of science in the true sense of the word. He is firmly committed to the 'articles of faith' of the scientific method.

1.Social Research:

Like physical, biological and technological research, social research commands equal importance as a major field of research. Social research includes social sciences, humanities and languages.

2. Business Research:

Research in all aspects of business is becoming increasingly important in the major countries of the world. It is a method of obtaining and evaluating data for the decision process. Business research is both basic and applied. Basic research is carried on for the purpose of extended the frontiers of knowledge. Applied research is problem oriented in that the research is carried on to solve a specific problem about which a decision must be reached. For example financial research may be carried on for the purpose of making a decision among alternative investment opportunities or among alternative sources of capital funds.

CHARACTERISTICS OF RESEARCH

The following are some of the characteristics of good research:

1) Research is a systematic and critical investigation into a phenomenon.
2) It is not a mere compilation but a purposive investigation it aims at describing, interpreting and explaining a phenomenon.
3) It adopts scientific method
4) It is objective and logical, applying possible tests to validate the measuring tools and the conclusion reached.
5) It is based upon observable experience or empirical evidence.
6) Research is directed toward finding answers to pertinent questions and solutions to problems.
7) It emphasizes the development of generalization, principles or theories.

8) The purpose of research is not to arrive at an answer, which is personally pleasing to the researcher but rather one which will stand up the test of criticism.

OBJECTIVES OF RESEARCH (OR) PURPOSE OF RESEARCH

The objectives of research or purpose of research are varied. They are:

1) Research extends knowledge of human beings, social life and environment. Scientist and researcher build up the wealth of knowledge through their research findings. They search answers for various types of questions: what, where, when, how and why of various phenomena and enlighten us. The bodies of knowledge have been developed by researcher in general and pure or fundamental research in particular.
2) Research unravels the mysteries of nature, brings to light hidden information that might never be discovered fully during the ordinary course of life.
3) Research establishes generalizations and general laws and contributes to theory building in various fields of knowledge. Our knowledge of isolated events is connected together to draw generalizations and general laws. Law of gravitation, law of demand, and principles of organization such as unity of command and scalar principle, the theory of consumer behavior and motivation theories are some examples for such generalization laws and theories.
4) Research verifies and tests existing facts and theory and those help improving our knowledge and ability to handle situations and events.
5) General laws developed through research may enable us to make reliable predictions of events yet to happen.
6) Research aims to analyze inter relationships between variables and to derive causal explanations' and thus enables us to have a better understanding of the world in which we live.
7) Applied research aims at finding solutions to problem, socio economic problems(for example social unrest, unemployment, poverty) health problems, human relations problems in organization and so on. Thanks to fruit research, we have better quality of life, longer life span and better control over events.
8) Research also aims at developing new tools, concepts and theories for a better study of unknown phenomena.
9) Research aids planning and thus contributes to national development.
10) Analytical studies of internal and external environment of business and non-business organizations provide factual data for rational decision making- formulation of

strategies and policies. Study of their operational problems contributes to an improvement in their performance.

OBJECTIVES OF RESEARCH

1. To find solutions to problems.
2. To verify and test existing laws or theories.
3. To obtain information.
4. To extend knowledge.
5. To establish general laws.
6. To predict events.
7. To analyze interrelationships.
8. To develop new tools, concepts and theories.

The purpose of research is to discover answers to questions through the application of scientific procedures. The main aim of research is to find out the truth which is hidden and which has not been discovered as yet. Though each research study has its own specific purpose, we may think of research objectives as falling into a number of following broad groupings:

QUALIFICATIONS OF A RESEARCHER :

1. **Passion for original and creative work:**

A research worker should be seeking ever newer truths in the interpretation of scientific phenomena. Research interest develops only when there is a craving for discovery and zeal for investigation into fields of human inquiry.

2. **Steady and incision observation:**

A researcher's mind should be versatile enough for observing subtle shades of difference for getting straight to the point and for understanding the causal relation.

3. **Capacity for solving problems:**

A researcher should have the capacity for solving problems both deductive and inductive. They should develop their reasoning power to attain accuracy. They should process a sound sense of logic so that they are perspicacious in making deductions.

4.Continuous concentration in reading and analysis:

A research worker should have sustained interest in exploring new fields of knowledge. They should be sincere single minded and much earnest in pursuing their efforts until success is achieved.

5.Accuracy:

This is the hallmark of efficiency in research. A research worker should make use of statistical methods for presenting their data.

6.Intellectual honesty and wholesome moral standards:

They should be honest and reliable not only in the collection, but also in the presentation of facts.

7.Clear and effective expression:

The composition of the research report should be brief, exact and clear, so that the reader may be able to grasp the main idea and the general effect of the matter presented.

8.Budgeting the time:

A painstaking planned work is an important requisite for any research activity. Just as the selection of a proper subject or problem for the research study, determination of time for completing the study is also no less an important factors. The researcher should be able to allot some rough time for the various phases of their work.

Classification of Research:

The purpose of all research is to discover answers to questions raised by scientists and decision-makers.

1. Action Research:

The process by which practitioners attempt to study their problems scientifically in order to guide, correct and evaluate their decisions and actions is called action research.

The action research requires the person who faces the problem to find out a solution for it. The following example will clearly explain how action research is conducted. A teacher finds out that most of his pupils are weak in comprehension. This poses a problem to him. He finds out the probable causes for it and guesses that the poor comprehension may be due to the lack of emphasis on developing the following abilities.

1. Ability to understand vocabulary

2. Ability to follow the organization of a passage
3. Ability to select the main ideas
4. Ability to draw inferences from the passage.

The teacher innovate a methods to develop the ability of the students. He develops teaching techniques, observes the response of the pupils and records the data.

2. Descriptive Research:

A descriptive study may be simple or complex. It determines who, what, when, where and how of a topic. It is concerned with describing the characteristics (e.g) the extent to which libraries are used) estimating the proportion of the people in a specified population who hold certain views or attitudes.

Descriptive study may employ and of or all the methods of data collection such as interview, questionnaire, observation, tests and cumulative records cards.

In a descriptive study an accurate description of a situation or an association between variables will be emphasized.

3. Exploratory Studies:

When the purpose of research is to gain familiarity with phenomenon or acquire new insights into it in order to formulate a more precise problem or develop hypothesis, the exploratory studies come in handy. If the theory happens to be too general or too specific, a hypothesis cannot be formulated.

Three approaches to the exploratory study:

1. **Survey of Literature** – A review of the literature helps to identify the hypothesis which may serve as a guide for further investigation.
2. **Experience survey** – A small portion of existing knowledge and experience is put into written form. Every day experience provides opportunity to obtain information required to formulate hypothesis.
3. **Case study** – The focus may be on individuals or situations or groups or communities. The method of study may lay stress on the examination of the existing records. It may be unstructured interviewing or participant observation or some other approach.

4. Historical Research:

Historical Research is nothing but objective location, evaluation and synthesis of evidence in order to establish facts and draw conclusions concerning the past. Historical method has greater significance for social science research. Many social problem can be adequately analyzed only with historical background.

5. Comparative Research:

This research aims at comparing institutions, practices, concepts trends in economic variable, economics of different countries and the like over a period of time.

6. Theory Construction Research:

A critical evaluation of these views in terms of empirical justification and internal validity is a useful piece of research.

(E.g) Two researchers have been involved in evolving a model for fair rate of return in two engineering units. The two models are very specific in their application, a researcher can compare the models and advantages of the models and state which model is better.

7. Model Building Research:

This type of research is mostly done in the field of management. The basic management science represents many theories, which are more complex. The model constructed will show the inter-relationship among many variables and describe the result of research. In the area of business sales forecasting models, advertising models, inventory control models, production control models and capital investment models can be constructed.

8. Pure Research:

Pure research is being undertaken to satisfy the researcher's thirst for knowledge and it is mainly goaded by the researcher's curiosity. It may be undertaken for designing tools to tackle practical problems. It is concerned with singular situation and not suitable to a wide area.

9. Applied Research:

Applied research is undertaken with the aim of uncovering data to solve an existing problem. The driving force of this research is finding solution to a problem. Applied research aims at application of science to a singular situation.

Applied research may be conducted with a view to test the basic assumptions of a theory or validity of a theory.

10. Operations Research:

This method of research has been done for solving problems by using scientific methods and quantitative techniques.

Research can also be classified as conclusion-oriented and decision-oriented. Operational research is an example of decision-oriented research.

Business Research:

In general, business research refers to any type of researching done when starting or running any kind of business. For example, starting any type of business requires research into the target customers and the competition to create a business plan. Conducting business market research in existing businesses is helpful in keeping in touch with consumer demand. Small business research begins with researching an idea and a name and continues with research begins on customer demand and other business offering similar products or services. All business research is done to learn information that could make the company more successful.

Business research methods vary depending on the size of the company and the type of information needed. For instance, customer research may involve finding out both a customer's feelings about and experiences using a product or service. The methods used to gauge customer satisfaction may be questionnaires, interview or seminars. Researching public data can provide business with statistics on financial and educational information in regards to customer demographics and product usage, such as the hours of television viewed per week by people in a certain geographic area. Business research used for advertising purposes is common because marketing dollars must be carefully spent to increase sales and brand recognition from ads.

Other than business market and advertising research, researching is dome to provide information for investors. Business people are not likely to invest in a company or organization without adequate research and statistics to show them that their investment is likely to pay off. Large or small business research can also help a company analyze its strengths and weaknesses by learning what customers are looking for in terms of products or services the business is offering. Then a company can use the business research information to adjust itself to better serve customers, gain over the competition and have a better chance of staying in business.

1. Marketing Research:

There is a great need for wide variety of basic research projects in marketing. The Bible for any research in marketing is the book titled, The meaning and sources of marketing by Michael Halbert (McGrawHill,1965). They are lots of research topic identified in the field of marketing research.

2. Organization Research:

Organization research is a meeting ground for the sociologist, the economist, the political scientist, the operations researcher, the mathematician, the social psychologist and the engineer. Illustrious men of these fields have made a rich contribution to the knowledge about nature and dynamics of organization.

3. Industrial Research:

An industrial research laboratory is presumably a pragmatic organization. It objectives are directly connected with the future welfare of a particular company.

4. Production Research:

A good production organization is never static. It keeps on changing. If the production units is successful, the changes turn about to be improvements. But the changes always bring difficulties, if not troubles. Thus the research laboratory plays a logical and continuing role of production research in the production picture.

Benefits of Research:

Research is essentially an investigation, a recording and an analysis of evidence for the purpose of gaining knowledge. Knowledge is a tool to solve the problems of individuals, institutions, and the society at large.

1. Addition to existing literature:

Many books have come out of research conducted in various fields. A book is not a talked thing, but a written thing, and written, not with the view of mere communication but with the aim of offering new insights into unknown spheres of human life.

2. Scientific Investigation:

Research may be pure or applied. Pure research is done in colleges and universities in large scale and the findings of such studies will be the basis for applied research.

3. Intellectual Satisfaction:

Unquestionably research enables a person to attain intellectual satisfaction. Dr.Chandrasekar who has been awarded Nobel Prize for his thesis, "How stars are born and what they are made of 'stated that he worked for personal satisfaction. As usual his work could command public appreciation only after some length of time.

4. Research is a tool of social transformation:

In social research the problems of the society are given top most priority and the current social problems are taken up for an indepth study. In the process of identification, selection and formulation of the research problems, the researcher has social interaction with people of different backgrounds.

5. Research sharpens the mind:

Observation is the basic method of obtaining information around us. It is seeing things with a purpose. It is in fact looking closely and purposefully. There are three components in observation, namely, sensation, attention and perception.

Identification of research problems:

Research may be motivated by the desire to know for the sake of knowing or by the desire to solve practical problems. The researcher, who is associated with practical problems, need not identify problems, since he has many problems, on hand. But the researcher, who is associated with academic institutions, has to identify possible problems for investigation.

1. Ask experts:

If the problems are to be identified, ask experts in the area of research. The researcher can attend professional society meetings and listen to the business executives. The researcher can also interview the executive and thus he can be conversant with various issues.

2. Become a specialist:

Knowledge knows no bounds. It is very difficult to acquire knowledge in a wide area of study. Therefore the researcher may select a narrow area of both theoretical and significance. He can make himself an expert in the field through course work and independent reading.

3. Search the literature:

The researcher should read professional journals in his area of concentration, masters theses, doctoral dissertations, research reports and government publications. Through the

survey of literature the researcher will discover unanswered questions which require answer, the solutions of various scholars to the same problem and research studies in progress at other institutions on the same problem.

4. Explore areas of dissatisfaction:

The researcher should read critical articles appearing in periodicals and newspapers. He should discuss the issues with professors and colleagues and listen to their critical points of view. The critical articles and discussions will enable the researcher to identify many possible problems.

5. Look for current development:

The current developments in a particular field of specialization provide scope for many topics.

6. Maintain a diary:

The researcher should keep a diary and jot down questions and ideas that strike him. In the course of his reading, discussion with his colleagues, in having contacts with business executive and in meditative moment, the curious and scientifically oriented researcher will always be wondering and critically evaluating

7. Examine the gap between theory and practice:

The researcher may identify problems by re-examining the theoretical structure of the area of research in which he is interested. He may also find the gap between theory and practice.

8. Locating the problem in a firm:

All the managerial techniques of control and direction that are appropriate for the operations of a firm under consideration would provide information in search for possible problems that might call for research.

Selection of a Problem:

A research problem rightly and rationally selected helps the researcher to complete the project within the prescribed time limit and the budgeted amount.

1. Researcher's Interest: The researcher should possess probing attitude, tenacity of spirit and dedication to thoroughness. A researcher will be able to imbibe these three virtues, if he has personal interest in the results of study.

2. Topic of significance:

If a student selects a problem which could be applied in practice, he may be able to attract the attention of the people in the practical field of study. The results of the study will also be used by the people in the business.

3. Novelty of the Idea:

A novel problem may offer scope for new ways of looking at the problem. A novel problem conceived by the researcher is sign ensuring his promising research career.

4. Researcher's Resources:

The resources of the researcher are his intelligence, training and experience and other facilities such as funds, clerical and technical assistance, library facilities and availability of time. Time is the foremost factor in choosing a problem.

5. Availability of data:

The researcher has to examine whether the data for the project are available in plenty. If the study is based on secondary data, the researcher has to find out whether the data is within his reach.

6. Benefits of the research:

The results of a research study may give intellectual satisfaction to the researcher. He gets recognition for his work from his colleagues and outside scholars. The researcher can also publish his thesis.

7. Feasibility of the study:

The factors such as availability of equipment's, subjects, library facilities and time should be noted before selecting a problem.

Formulation of a problem:

Formulation of a research problem is translating and transforming the selected problem into a scientific research question. A problem well put is half solved.

1. Step in formulation:

A researcher has to follow the undermentioned steps one by one in formulating a research problem.

2. Developing a title:

The title of the study indicates the intention of the researcher and shows the focus of the study. It reveals whether the study is a case, a statistical, exploratory, formalized and observational survey, descriptive, casual and experimental study or simulation. The title should be specific.

3. Working out conceptual model:

A problem may be selected from theory or ideas derived from theory. Once a problem area s conceived, the researcher could develop and define the problem statement. He has to narrow down from general and vague to more specific statements. Sometimes he has to broaden a narrow specific question into a broader significant problem.

4.Defining the objectives:

The researcher must first of all decide the questions to be answered. Hen he has to decide whether the study is descriptive or analytical.

5.Limiting the scope:

The researcher must demarcate the geographical limits, time limit and magnitude of the problem.

6.Formulation of hypothesis:

Hypothesis is a proposition or principle which is assumed in order to draw logical conclusions. Hypothesis is a provisional idea based on limited amount of evidence. Once a hypothesis is tested with the help of evidence, it becomes a thesis. Hypothesis given direction to research.

7. Operational definition of concepts:

The operational definition enables to form specific ideas regarding the data needed. A word gives multiple meanings. (e.g) a student of sociology must know that culture refers to the totality of the social heritage of any society. On the other hand, the word, ‘culture’ has different meaning is Bacteriology. So, the researcher must be very careful in giving the operational definition.

MEANING OF RESEARCH DESIGN

The formidable problem that follows the task of defining the research problem is the preparation of the design of the research project, popularly known as the “research design”. Decisions regarding what, where, when, how much, by what means concerning an inquiry or

a research study constitute 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.”In fact, the research design is the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. As such the design includes amount line of what the researcher will do from writing the hypothesis and its operational implications to the final analysis of data. More explicitly, the design decisions happen to be in respect of:

(i)What is the study about?

(ii)Why is the study being made?

(iii)Where will the study be carried out?

(iv)What type of data is required?

(v)Where can the required data be found?

(vi)What periods of time will the study include?

(vii)What will be the sample design?

(viii)What techniques of data collection will be used?

ix) How will the data be analyzed?

(x)In what style will the report be prepared?

Keeping in view the above stated design decisions; one may split the overall research design into the following parts

(a) the sampling designwhich deals with the method of selecting items to be observed for the given study

(b) the observational design which relates to the conditions under which the observations are to be made;

(c) the statistical design which concerns with the question of how many items are to be observed and how the information and data gathered are to be analyzed; and

(d) the operational design which deals with the techniques by which the procedures specified in the sampling, statistical and observational designs can be carried out

.From what has been stated above, we can state the important features of a research design as under:

(i) It is a plan that specifies the sources and types of information relevant to the research problem

(ii)It is a strategy specifying which approach will be used for gathering and analyzing the data.

(iii)It also includes the time and cost budgets since most studies are done under these two constraints.

In brief, research design must, at least, contain—(a) a clear statement of the research problem; (b) procedures and techniques to be used for gathering information; (c) the population to be studied (d) methods to be used in processing and analyzing data.

COMPONENTS OF THE RESEARCH DESIGN / STEPS IN RESEARCH DESIGN

The steps in the design process interact and often occur simultaneously. For example, the design of a measurement instrument is influenced by the type of analysis that will be conducted. However, the type of analysis is also influenced by the specific characteristics of the measurement instrument.

Step 1: Define the Research Problem:

Problem definition is the most critical part of the research process. Research problem definition involves specifying the information needed by management. Unless the problem is properly defined, the information produced by the research process is unlikely to have any value. Coca-Cola Company researchers utilized a very sound research design to collect information on taste preferences. Unfortunately for Coca-Cola, taste preferences are only part of what drives the soft drink purchase decision.

Research problem definition involves four interrelated steps: (1) management problem / opportunity clarification, (2) situation analysis, (3) model development, and (4) specification of information requirements.

Step 2: Estimate the Value of the Information

A decision maker normally approaches a problem with some information. If the problem is, say, whether a new product should be introduced, enough information will normally have been accumulated through past experience with other decisions concerning the introduction of new products and from various other sources to allow some preliminary judgments to be formed about the desirability of introducing the product in question. There will rarely be sufficient confidence in these judgments that additional information relevant to

the decision would not be accepted if it were available without cost or delay. There might be enough confidence, however, that there would be an unwillingness to pay very much or wait very long for the added information.

Step 3: Select the Data Collection Approach

There are three basic data collection approaches in marketing research: (1) secondary data, (2) survey data, and (3) experimental data. Secondary data were collected for some purpose other than helping to solve the current problem, whereas primary data are collected expressly to help solve the problem at hand.

Step 4: Select the Measurement Technique

There are four basic measurement techniques used in marketing research: (1) questionnaires, (2) attitude scales, (3) observation, and (4) depth interviews and projective techniques.

Step 5: Select the Sample

Most marketing studies involve a sample or subgroup of the total population relevant to the problem, rather than a census of the entire group.

Step 6: Select the Model of Analysis

It is imperative that the researcher select the analytic techniques prior to collecting the data. Once the analytic techniques are selected, the researcher should generate fictional responses (dummy data) to the measurement instrument. These dummy data are then analyzed by the analytic techniques selected to ensure that the results of this analysis will provide the information required by the problem at hand.

Step 7: Evaluate the Ethics of the Research

It is essential that marketing researchers restrict their research activities to practices that are ethically sound. Ethically sound research considers the interests of the general public, the respondents, the client and the research profession as well as those of the researcher.

Step 8: Estimate Time and Financial Requirements

The program evaluation review technique (PERT) coupled with the critical path method (CPM) offers a useful aid for estimating the resources needed for a project and clarifying the planning and control process. PERT involves dividing the total research project into its smallest component activities, determining the sequence in which these activities must be performed, and attaching a time estimate for each activity. These activities and time

estimates are presented in the form of a flow chart that allow a visual inspection of the overall process. The time estimates allow one to determine the critical path through the chart – that series of activities whose delay will hold up the completion of the project.

Step 9: Prepare the Research Proposal

The research design process provides the researcher with a blueprint, or guide, for conducting and controlling the research project. The blueprint is written in the form of a research proposal. A written research proposal should precede any research project.

FACTORS AFFECTING RESEARCH DESIGN :

Several factors play a key role in the process of constructing a research design. They are:

Non availability of sufficient data:

This is one of the basic factors affecting research design. A design developed at one stage may undergo changes in the process of research as data may not be available. Then the design would be suitably modified. To overcome this usually researchers conduct a pilot study to ascertain whether the required data would be available or not.

1. **Availability of time**

In the research process various stages are time consuming. For example, problem identification, data collection, analysis and interpretation etc require a lot of time. The research design would be depending upon the availability of sufficient time to carry out all these process rigorously.

2. **Availability of resources**

Certainly the availability of human and financial resources will influence the research design. A study which requires highly specialized skill or experience, identifying such personalities would itself consume a lot of time. Similarly the level of accuracy aimed at would also call for liberal funding of the research process. Therefore researcher with ambitious objectives are usually undertaken only by organizations or with sponsors or by the government, considering the volume of funds required.

3. **Ability of researcher**

Not every researcher is gifted with all the qualities required for conducting good research. A study which is highly analytical would call for knowledge about the analytical tools and the interpretation ability. Similarly an experimental research would require a special temperament. Hence depending upon the potential and ability of the researcher the research design would be prepared.

4. **Several external factors**

Several other factors like co-operation of the informants, literacy level of respondents, the social and economic conditions of the informants the places or documents to be perused etc.

Unit – II

SAMPLING

- Meaning of Sampling
- Definition of sampling
- Sampling Techniques
- Sample design
- Steps in sampling procedures
- Steps in sample design
- Criteria of selecting a sampling procedure
- Steps in sampling
- Methods of sample
- Sample Size
- Sampling Error
- Advantages of Sampling
- Limitation of Sampling
- Sampling techniques advantages & disadvantages

Meaning of Sampling:

Sampling method is the process learning about the population on the basis of a sample. Sample if that part of the universe which we select for the purpose of investigation. A sample should exhibit the characteristics of the universe. It should be a micro some a word which literally means “Small Universe”.

Definitions of Sampling:

According to **Paul and Arthur J. Morgan** defines a sample thus: “statistical sampling may be defined as a process of selecting a segment of the universe to obtain information of ascertainable reliability about the population.

According to **Blalock and Blalock** define a sample as “It is a small piece of the population obtained by a probability process that mirrors, with known, precision, the various patterns and sub classes of the population.”

Sampling Techniques:

There are two methods in which the information is collected during any statistical survey.

1.Census method:

Census survey is also known as Population Survey and Complete Enumeration Survey. Under census survey, the information is collected from each and every unit of the population or universe.

2. Sample Survey:

A sample is a part of a population. If the required information is collected from only a few units of the population and not from all the units, such as a survey is known as a sample survey.

Sample Design:

A sample design is a definite plan for obtaining a sample from a given populations. It refers to the technique or the procedure the researcher would adopt in selecting items for the sample. Sample design may as well lay down the number of items to be included in the sample designs from which a researcher can choose. Some designs are relatively more precise and easier to apply than others. Researchers must select/ prepare a sample design which should be reliable and appropriate for his research study.

Steps in Sampling Process

An operational sampling process can be divided into seven steps as given below:

1. Defining the target population.
2. Specifying the sampling frame.
3. Specifying the sampling unit.
4. Selection of the sampling method.
5. Determination of sample size.
6. Specifying the sampling plan.
7. Selecting the sample.

1. Defining the Target Population:

Defining the population of interest, for business research, is the first step in sampling process. In general, target population is defined in terms of element, sampling unit, extent, and time frame. The definition should be in line with the objectives of the research study. For ex, if a kitchen appliances firm wants to conduct a survey to ascertain the demand for its micro ovens, it may define the population as 'all women above the age of 20 who cook (assuming that very few men cook)'. However this definition is too broad and will include every household in the country, in the population that is to be covered by the survey. Therefore the definition can be further refined and defined at the sampling unit level, that, all women above the age 20, who cook and whose monthly household income exceeds Rs.20,000. This reduces the target population size and makes the research more focused. The population definition can be refined further by specifying the area from where the researcher has to draw his sample, that is, households located in Hyderabad.

A well-defined population reduces the probability of including the respondents who do not fit the research objective of the company. For ex, if the population is defined as all women above the age of 20, the researcher may end up taking the opinions of a large number of women who cannot afford to buy a micro oven.

2. Specifying the Sampling Frame:

Once the definition of the population is clear a researcher should decide on the sampling frame. A sampling frame is the list of elements from which the sample may be drawn. Continuing with the micro oven ex, an ideal sampling frame would be a database that contains all the households that have a monthly income above Rs.20, 000. However, in practice it is difficult to get an exhaustive sampling frame that exactly fits the requirements of a particular research. In general, researchers use easily available sampling frames like

telephone directories and lists of credit card and mobile phone users. Various private players provide databases developed along various demographic and economic variables. Sometimes, maps and aerial pictures are also used as sampling frames. Whatever may be the case, an ideal sampling frame is one that entire population and lists the names of its elements only once.

A sampling frame error pops up when the sampling frame does not accurately represent the total population or when some elements of the population are missing another drawback in the sampling frame is over –representation. A telephone directory can be over represented by names/household that has two or more connections.

3. Specifying the Sampling Unit:

A sampling unit is a basic unit that contains a single element or a group of elements of the population to be sampled. In this case, a household becomes a sampling unit and all women above the age of 20 years living in that particular house become the sampling elements. If it is possible to identify the exact target audience of the business research, every individual element would be a sampling unit. This would present a case of primary sampling unit. However, a convenient and better means of sampling would be to select households as the sampling unit and interview all females above 20 years, who cook. This would present a case of secondary sampling unit.

4. Selection of the Sampling Method:

The sampling method outlines the way in which the sample units are to be selected. The choice of the sampling method is influenced by the objectives of the business research, availability of financial resources, time constraints, and the nature of the problem to be investigated. All sampling methods can be grouped under two distinct heads, that is, probability and non-probability sampling.

5. Determination of Sample Size:

The sample size plays a crucial role in the sampling process. There are various ways of classifying the techniques used in determining the sample size. A couple those hold primary importance and are worth mentioning are whether the technique deals with fixed or sequential sampling and whether its logic is based on traditional or Bayesian methods. In non-probability sampling procedures, the allocation of budget, thumb rules and number of sub groups to be analyzed, importance of the decision, number of variables, and nature of analysis, incidence rates, and completion rates play a major role in sample size determination.

In the case of probability sampling, however, formulas are used to calculate the sample size after the levels of acceptable error and level of confidence are specified. The details of the various techniques used to determine the sample size will be explained at the end of the chapter.

6. Specifying the Sampling Plan:

In this step, the specifications and decisions regarding the implementation of the research process are outlined. Suppose, blocks in a city are the sampling units and the households are the sampling elements. This step outlines the modus operandi of the sampling plan in identifying houses based on specified characteristics. It includes issues like how is the interviewer going to take a systematic sample of the houses. What should the interviewer do when a house is vacant? What is the re-contact procedure for respondents who were unavailable? All these and many other questions need to be answered for the smooth functioning of the research process. These are guide lines that would help the researcher in every step of the process. As the interviewers and their co-workers will be on field duty of most of the time, a proper specification of the sampling plans would make their work easy and they would not have to revert to their seniors when faced with operational problems.

7. Selecting the Sample:

This is the final step in the sampling process, where the actual selection of the sample elements is carried out. At this stage, it is necessary that the interviewers stick to the rules outlined for the smooth implementation of the business research. This step involves implementing the sampling plan to select the sampling plan to select a sample required for the survey.

Steps in Sample Design

While developing a sampling design the researcher must pay attention to the following points.

1. **Types 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.

2. **Sampling units :**

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.

3. **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. 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 sources list to be as representative of the population as possible.

4. **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 three requirements of efficiency, representativeness, reliability and flexibility. While deciding the size of sample, researcher must determine the desired precision as also an accepted confidence level for the estimate.

5. **Budgetary constraint :**

Cost consideration, from practical point of view, have a major impact upon decision relating to not 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.

6. **Sampling procedure:**

Finally, the researcher must decide the type of sample he will usei.e., he must decide about the technique to be used in selecting the items for the sample. Infact, this technique or procedure stands for the sample design itself.

Criteria of selecting a sampling procedure:

In this context one must remember that two costs are involved in a sampling analysis viz., the cost of collecting the data and the cost of an incorrect inference resulting from the data. Researcher must keep in view the two causes of incorrect inferences via systematic bias and sampling errors. A systematic bias result from errors in the sampling procedures and it cannot be reduced or eliminated by increasing the sample size. At the best the causes responsible for these errors can be detected and corrected. Usually a systematic bias is the result of one or more of the following factors.

1. **Inappropriate sampling frame :**

If the sampling frame is inappropriate i.e. biased representation of the universe it will result in a systematic bias.

2. **Defective measuring device :**

If the measuring device is constantly in error, it will result in systematic bias. In survey work, systematic bias can result if the questionnaire or the interviewer is biased. Similarly if the physical measuring device is defective there will be systematic bias in the data collected through such a measuring device.

3. **Non – respondents :**

If we are unable to sample all the individuals initially include in the sample, there may arise a systematic bias. The reason is that in such a situation the likelihood of establishing contract or receiving a response from an individual is often correlated with the measure of what is to be estimated.

4. **Natural bias in the reporting of data:**

Natural bias of respondents in the reporting of data is often the cause of a systematic bias in many inquiries. There is usually a downward bias in the income data collected by government taxation department, where we find an upward bias in the income data collected by some social organization.

Steps in Sampling

There are six steps which precede collection of the data by means of sample.

The first step is defining the population or universe. The population or universe is the specific group o items which the researcher wishes to study and about which they plan to generalize. If a theatre owner is investigating the move going habits of a local college student, the population will be the students enrolled on a particular date. The definition of the universe in any particular case is determined solely by the research objectives of the particular study.

The second step is the development of a frame. A frame is a list of the population. It consists of names and address of the individuals and institutions. It can also specify a definite location, boundary and address or a set of rules by which sampling unit can be identified. For example a researcher has undertaken a study for finding the proportion of the grocery stores in the madras metropolitan area which stock cardamom. Here grocery stores would be observed. For the purpose of identifying the stores, a list of all madras metropolitan area grocery stores must be obtained. From the list it will be easy to choose. If no such list is available one may choose a sample of areas.

The third step is the selection of a sample design. The researcher can go for probability or non probability design. If the researcher wants to estimate the sampling error of the results a probability sample should be used. If it is very difficult to develop a frame, a non probability sample should be used. The researcher should feel confident that the sample used provides a legitimate and accurate picture of the universe.

The fourth step is selecting the sample size. The sample size should never be less than thirty. The sample size should be around one tenth of the size of population. But the final decision on proper sample size really depends on whether the researcher feels reasonably confident that his sample is large enough to accurately depict the population.

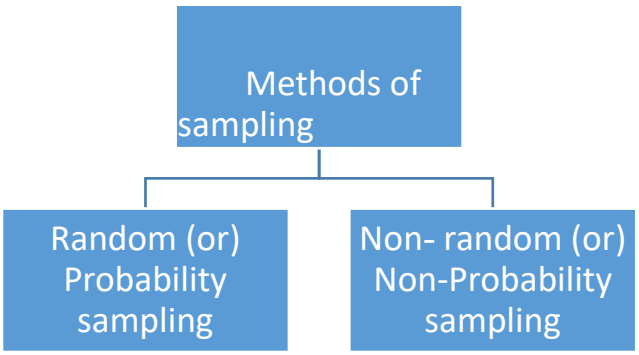
The fifth step is the selection of substitute sample units. All the units selected for the sample will not participate. This necessities the substitution of sample members of non respondents.

The final step is cost consideration. The size and type of sample as well as the data collection method depend upon cost considerations. Probability sample surveys incur callback, listing costing and variety of other costs. The non probability sample can be used with less cost.

Methods of Sampling

Sampling method can be broadly classified as:

1. Random or probability sampling
2. Non-Random or Non probability sampling.



Random or Probability Sampling

Under the random or probability sampling every elements of the population enjoys equal chance of being selected.

For example suppose from 2000 students in a college, 200 are selected at random. Then every one of these 2000 students has equal chance of getting selected.

Non -Random or Non- Probability Sampling

Under the non-random or non-probability sampling, the elements constituting the sample are selected on some basis and so not all the elements will have equal chance of getting selected.

For example in the case of non-random sampling 200 students out of 2000 may be selected in such a way that there are 50 pure science students, 50 arts students, 50 commerce students and 50 life science students. In this case the sample is purposely selected. So it is not a random sample.

A. Random [or] Probability Sampling

Random sampling can be classified into two types.

I. Simple or unrestricted random sampling.

II. Restricted random sampling.

1. Simple or Unrestricted Random Sampling

- **Lottery method**:

In this method the items in the population are given numbers and these are written on chits of uniform size. Then these chits are placed in a bowl or a bag and the required numbers of chits are selected. Even here when the chit selected first is replaced before picking the next one it is called "***lottery method with replacement***". Suppose the chit selected in the first pock is not selected and then the second pick is made we call it "***lottery method without replacement".*** Of these two the first one is preferred as the probability of the second and the subsequent chit selected will remain the same. In the second method the probability of selecting the second or third and subsequent chits will be different as there is no replacement of chits already picked.

- **Table of Random Number:**

In this method, first the size of sample is determined. Then using random number table the required number tables are available. In these tables, random numbers are printed in columns and rows. Random number tables are available with two digits, three digits and more number of digits. Suppose the sample size is 25 out of a total 200 items. Then using a random number table, row-wise or column wise, 25 numbers that match with serial number are selected. This will constitute the sample. For example whenever a new car is introduced in the market people who are booking for the new car is assigned a serial number. After the last dare for booking is over the company will generate those who would be given the allotment for the month going by the random numbers. Once the required numbers are selected the customers who are assigned that number is intimated about the allotment.

III. Restricted Random Sampling

In this method a specific principle or basis is followed while selecting the sample elements. There are three different methods of restricted random sampling. These are explained below.

- **Stratified Random sampling :**

In this method first the population is divided into different strata (i.e. segments). The items in each segment are homogeneous. That is each stratum will contain elements which are similar in every respect. Then from each stratum will contain elements, which are similar in every respect. Then from each stratum a few elements are selected to constitute the sample. While making this selection from each stratum either same number of items could be selected from each strata or the number of items selected may not be the same for each stratum. If same number of items are selected from each stratum it is called ***"proportionate stratified random sampling".*** If the number of items selected is not the same for all the strata it is called ***"disproportionate stratified random sampling".***

Suppose for a research work on the literacy level in Tamil Nadu data is collected for all places in Tamil Nadu. Adopting stratified random sampling method first the state is divided into different districts. A few districts are selected at random. Then from these selected districts are divided into Panchayat Unions. From the second stratum a few Panchayat unions are selected. Each selected Panchayat union is divided into Panchayat and a few Panchayat are selected at random in the next stage. Then each Panchayat containing a number of villages, a few villages are selected at random. In this method the state is divided into different strata and from each stratum random selection is made. Suppose we select at random 100 families from each village it would be called ***"Proportionate stratified random***" sampling. Suppose the number of families selected at random from each village is not same it is called ***"Disproportionate stratified random sampling".***

Merits

- Stratified random sampling has better representatives.
- It also gives more accurate information and there would be a better coverage of the population.

Demerits

- This method is requires lot of care and pre planning.
- Further the basis of segmenting the population should be scientific.

- Care should be taken to make selection from each stratum random which may not be practically possible.

➢ **Systematic Random sampling :**

In this method the sample is formed by selecting the first units at random and then selecting the remaining items at evenly spaced intervals. For example suppose from 2000 college students we have to select a sample of 50 students. Each of these 2000 students are given a serial number. First we determine the sampling interval (K). This is obtained by dividing the size of population by sample size (2000/50).we get the sampling interval (k) of 40. Then from serial number 0001 to 0040 we select at random a serial number. Suppose we have selected the students with the serial number 15, then with this we add a size of k (here it is 50) to select the second student. That is 15+50 = 60. So the second student selected bears the serial number 65. Adding size of k with the serial number we select the third student with the serial number 115 and the next one selected will have the serial number 165 and so on. In this manner we select 50 students who constitute the sample.

Merits

- It is very convenient and simple to adopt.
- The time and cost involved are relatively less.
- With a large population this method of sampling is easy to use.

Demerits

- It is less representative so once the first item is selected at random, subsequent items are all lying at uniform interval. So the selected items may lack complete representativeness.
- This method require correct understanding of the methodology as otherwise the sample selected will not be correct.

➢ **Multi – stage or Cluster Sampling:**

As the name of the sampling method suggests the samples are selected different stage. In this method the population is first divided into different stages. Then from the first stage a few items are selected at random based on a specific feature or characteristic. From these the second stage a few elements are selected at random possessing the characteristic, from which in the third stage a few items are selected at random satisfying the characteristic and so on to finally make the necessary selection of samples. All the samples selected at random at different stages will possess the common characteristic or will be homogeneous on some basis.

For example: suppose we have to select 1000 farmers from Tamil Nadu. Then in the first stage we will divide the state into district, from among which we will select two or three districts at random in which *agricultural operations* are predominant. Then in the second stage each selected district will be divided into different Taluks from which a few Taluks from each selected district will be selected at random. Only Taluks where agricultural occupation / operations are predominant are selected. Then from each Taluks selected a few Panchayat unions with agricultural operations will be selected. Each Panchayat union consists of a number of Panchayat and so a few will be selected based on the predominance of agricultural operations. From each Panchayat consisting of a number of villages a few will be selected where agricultural operations are performed in large scale. Then from these villages the required number of farmers (1000) is selected. Since the sampling is done at various stages it is called multi stages. It is also called cluster sampling because in each stage the attempt is to locate only those items which have the desired characteristics.

Merits

- It is highly flexible.
- It ensures better representativeness
- Results and conclusion based on the sample will hold good for the population.

Demerits

- In practice this method is found to be less accurate compared to other methods because any bias at any stage will get accumulated.
- Unless a person is fully aware of the various stages into which the population can be divided he cannot be effective in selecting the required number of samples.
- The characteristics or features to be present with samples at all stages may not be fulfilled in all cases.
- The bias of the person selecting the sample will get reflected in the process.

A. Non -Random [or] Non- Probability Sampling

There are different types of non-random sampling and some of the important ones are explained below.

- **Judgment Sampling:** In this method, the sample selection is purely based on the judgment of the investigator or researcher. This is because the researcher may lack information regarding the population from which he has to collect the sample. Population characteristics or qualities may not be known but sample has to be selected. In such instances judgment sampling method is used. The investigator on the field is allowed to select any items of his choice to constitute the sample.

Once the sample size is determined the investigator is free to select any item on the field. **For example** suppose 100 boys are selected from a college with 1000 boys. If nothing known about the students in the college then the investigator may visit the college and choose the first 100 boys he meets, Or he may select 100 boys all belonging to III year, or he might select 25 boys from commerce course, 25 boys from science course and 25 boys from the arts course and 25 from fine arts course. Hence the sample size is known the investigator uses his discretion and select the sample.

- **Convenience Sampling or CHUNK Sampling:** This method of sampling involves selecting the sampling elements using some convenient method without going through the rigors of sampling method. The researcher may make use of any convenient base to select the required number of samples. **For example,** suppose 100 car owners are to be selected. Then we may collect from the RTO's office the list of car owners and then make a selection of 100 from that to form the sample. But unless the list at the RTO's office is up to date the sample selected will be wrong. Further if an investigator is biased the sample selected may not be random.
- **Quota Sampling:**

In this method, the sampling size is determined first and then quota is fixed for various categories of population, which is followed while selecting the sample. Suppose we want to select 100 students then we might say that the sample should be according to the quota given below. Boys 50 %, Girls 50 %. Then among the boys 20 % college students, 40% plus two students, 30 % high school students and 10% elementary school students. A different or same quota may be fixed for the girls.Under this method the quota has to be determined in advance and intimated to the investigator. The quota for each segment of the population may be fixed at random or with a specific basis. Normally such a sampling method does not ensure representativeness of the investigator.

Sample Size

One of the most important issues to be settled while using sampling method is to determine the size of sample. More often than not researchers commit mistakes in deciding their sample size. There is a thumb rule which says that to satisfy statistical requirement the size of the sample should be minimum of 30 and above. In statistics any sample with 30 and more elements is considered large sample. Less than 30 elements constitute only small sample. It should be noted that there are several other considerations or factors which influence the sample size.

There are explained below.

1. **The size of population :**

Depending upon the size of population the size of sample has to be decided. If the population is very small (say for example only 50) then the sample size could be small. But it should be remembered that larger size of population, large should be sample size to achieve representativeness and accuracy.

2. **The Resource Available :**

What amount of time and financial resources are available to the researcher will determine the size of sample. With sufficient time and large volume of funds available, the sample size could be large otherwise it should be small.

3. **The extent of Accuracy Desired:**

One of the requirements of data analysis is the accuracy level. There is no choice about the level of accuracy that one wants to achieve or maintain. But while dealing with large population due to constraints on resources, sampling has to be adopted. In the case the level of accuracy that is desired must be spelt out. Suppose the choice is for achieving cent per cent accuracy, then sampling itself cannot be through of. Alternatively if the accuracy desired is 95 % then sample size should be large. Any level of accuracy less than this (95 %) may require only small size.

4. **Nature of Population**

The similarities and dissimilarities identified with population itself may affect the sample size. If the population contain a lot of heterogeneous sub population [i.e. small segments of population with different features or characteristics] then large sample size is required. For example if in a computer training institute, sample is to be selected drawing from students undergoing different course, then the sample size should be large. Alternatively suppose from a commerce college a sample is to be selected a small size is sufficient as there is no dissimilarity in the population.

5. **Method of Sampling Adopted**

Several sampling method have been elaborated in the previous section of this topic. Depending upon the method of sampling used the size of sample will be decided.

6. **Nature of Respondents**

Success or failure of a sample survey depends ultimately on the response of the informants. So the nature of respondents will influence the sample size. Suppose in a survey on the opinion of a policy of liberalization, introduced by the government, if the respondent are literate, the size of sample could be smaller. If the respondents are illiterate or less literate the size of sample should be large.

Sampling Error

Error is defined as, “an act, assertion, or belief that unintentionally deviates from what is correct, right, or true”. In a business research process, there is sure to be some error in the results because there is the involvement of human intelligence and the use of sampling methods that may not be always accurate. The absolute value of the difference between an unbiased point estimate and the corresponding population parameter is known as a sampling error. It arises because the data is collected from a part, rather than the whole of the population. The sampling error can be more reliable by increasing the sample size. Total survey errors are of two types: Random sampling error & non-sampling error.

Random Sampling Error

Random sampling error or sampling error is the difference between the sample results and the results of a census conducted by identical procedures. Although a representative sample is taken, there is always a slight deviation between the true population value and the sample value. This is because the sample selected is not perfectly representative of the test population. Therefore, a small random sampling error is evident. As the sampling error is the outcome of chance, the laws of probabilities are applicable to it. The sampling error is inversely proportional to the sample size. As the sample size increases, the sampling error decreases. Although sampling errors cannot be avoided altogether, they can be controlled through careful sample designs, large samples, and multiple contacts to assure representative response. Random sampling error represents how accurately the sample’s true mean value(x sample), is representative of the population’s true mean value(X population).

Non-Sampling Error

Non- sampling errors also known as systematic errors occur due to the nature of the study’s design and the correctness of execution. Non-sampling error includes non-observation errors and measurement errors. Non- observational errors occur when data cannot be collected from the sampling unit or variable. Measurement errors arise from various sources like respondents, interviewers, supervisors, and even data processing systems. Non-observation error is further divided into non-coverage and non-response error. In probability sampling, each element of the population has a non-zero chance of selection into the sample. Non-coverage error occurs when an element in the target population has no chance of being selected into the sample. Non-response error occurs when data cannot be collected from the element actually selected into the sample. This may be due to the refusal of the element to cooperate because of language barrier, health limitation, or non-availability of the element

during the survey period. Selection of faulty sampling frame may also result in a non-sampling error. Sampling frame error is said to occur when certain non-potential respondents are included in the sampling frame and certain deserving respondents are rejected.

Advantages of Sampling

1. Sampling saves time and labour.

2. It results in reduction of cost in terms of money and man-hour.

3. Sampling ends up with greater accuracy of results.

4. It has greater scope.

5. It has greater adaptability.

6. If the population is too large, or hypothetical or destroyable sampling is the only method to be used.

Limitations of Sampling :

1. Sampling is to be done only by qualified and experienced persons. Otherwise, the information will be unbelievable.

2. Sample method may give the extreme values sometimes instead of the mixed values.

3. There is the possibility of sampling errors.

Sampling techniques: Advantages and Disadvantages:

Technique	**Descriptions**	**Advantages**	**Disadvantages**
Simple Random	Random sample from whole population	Highly representative if all subjects participate.	Not possible without complete list of population members; potentially uneconomical. time-scale may be too long, data/sample could change
Stratified Random	Random sample from identifiable groups (strata), subgroups, etc.	It ensure that specific groups are represented, even proportionally, in the sample(s) (e.g., by gender), by selecting individuals from strata list	More complex, requires greater effort than simple random; strata must be carefully defined

Cluster	Random samples of successive clusters of subjects (e.g., by institution) until small groups are chosen as units	Possible to select randomly when no single list of population members exists.	Clusters in a level must be equivalent and some natural ones are not for essential characteristics (e.g., geographic: numbers equal, but unemployment rates differ)
Stage	Combination of cluster (randomly selecting clusters) and random or stratified random sampling of individuals	Can make up probability sample by random at stages and within groups; possible to select random sample when population lists are very localized	Complex, combines limitations of cluster and stratified random sampling
Purposive	Hand-pick subjects on the basis of specific characteristics	Ensures balance of group sizes when multiple groups are to be selected	Samples are not easily defensible as being representative of populations due to potential subjectivity of researcher
Quota	Select individuals as they come to fill a quota by characteristics proportional to populations	Ensures selection of adequate numbers of subjects with appropriate characteristics	Not possible to prove that the sample is representative of designated population
Snowball	Subjects with desired traits or characteristics give names of further appropriate subjects	Possible to include members of groups where no lists or identifiable clusters even exist (e.g., drug abusers, criminals)	No way of knowing whether the sample is representative of the population
Volunteer, accidental,	Either asking for volunteers, or the	Inexpensive way of ensuring sufficient numbers	Can be highly unrepresentative

convenience	consequence of not all those selected finally participating, or a set of subjects who just happen to be available	of a study	

UNIT – III

DATA COLLECTION

- Introduction of data
- What are the data
- Methods of data collection
- Tools for collection of data
- Data collection methods Pros and Cons.
- Collection of Primary Data
- Types of Primary Data
- Type of Primary Data Collection
- Structured data collection
- Non structured data collection
- Collection of Secondary data
- Selection of appropriate method of data collection
- Advantages of Secondary data
- Disadvantages of Secondary data
- Collection of data through questionnaires
- Essentials of good questionnaires
- Collection of data through scheduled
- Difference between questionnaires and scheduled
- Features of good questionnaires
- Demerits of questionnaires
- Guidelines for successful interview
- Observation of techniques
    - Definition of observation
    - Types of observation
- Pilot study
- Pre-testing
    - Meaning
    - Objectives
    - Advantages

INTRODUCTION OF DATA

The task of data collection begins after a research problem has been defined and research design/ plan chalked out. While deciding about the method of data collection to be used for the study, the researcher should keep in mind two types of data viz., primary and secondary.

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

WHAT IS DATA ?

One definition of data is: "known facts or things used as a basis for inference orreckoning":

- The OED.

Another is: " Facts given from which others may be inferred": - Chambers Dictionary.

Data into knowledge - a recap on fundamentals:

Data are facts, for example the number of items counted, or measurements of these items. To be of use we need to transform data into **knowledge** so that inferences can be made from them, such as decisions as to whether or not a component is capable of carrying out its allotted function.

METHODS OF DATA COLLECTION:

There are four main methods of data collection.

- **Census**. A census is a study that obtains data from every member of a population. In most studies, a census is not practical, because of the cost and/or time required.
- **Sample survey**. A sample survey is a study that obtains data from a subset of a population, in order to estimate population attributes.
- **Experiment**. An experiment is a controlled study in which the researcher attempts to understand cause-and-effect relationships. The study is "controlled" in the sense that the researcher controls (1) how subjects are assigned to groups and (2) which treatments each group receives. In the analysis phase, the researcher compares group scores on some dependent variable. Based on the analysis, the researcher draws a conclusion about whether the treatment (independent variable) had a causal effect on the dependent variable.
- **Observational Study**. Like experiments, observational studies attempt to understand cause-and-effect relationships. However, unlike experiments, the researcher is not able to

control (1) how subjects are assigned to groups and/or (2) which treatments each group receives.

DATA COLLECTION METHODS: PROS AND CONS :

Each method of data collection has advantages and disadvantages.

- **Resources** : When the population is large, a sample survey has a big resource advantage over a census. A well-designed sample survey can provide very precise estimates of population parameters - quicker, cheaper, and with less manpower than a census.
- **Generalizability** : Generalizability refers to the appropriateness of applying findings from a study to a larger population. Generalizability requires random selection. If participants in a study are randomly selected from a larger population, it is appropriate to generalize study results to the larger population; if not, it is not appropriate to generalize. Observational studies do not feature random selection; so it is not appropriate to generalize from the results of an observational study to a larger population.
- **Causal inference :** Cause-and-effect relationships can be teased out when subjects are randomly assigned to groups. Therefore, experiments, which allow the researcher to control assignment of subjects to treatment groups, are the best method for investigating causal relationships.

TOOLS FOR COLLECTION OF DATA:

1. **Tests**– In the field of education, educational and psychological tests are used to measure the achievement of the students their personality traits and the like.
    a. **Achievement Test–A** standardized test of achievement of the students on any school subject is administered. If a teacher wants to test the achievement of the students in a specific area according to the need, the test called teacher made test is made use of.
    b. **Diagnostic Test** – This test us designed to ascertain a person's strength and weakness in one or more areas of the field in which he is tested. It tries to find out the nature of the difficulties which a student is experiencing.
    c. **Intelligence Test** – Psychologists an educationists have prepared a large number of intelligence tests for measuring the intelligence quotient (IQ). The intelligence quotient represents the ratio of the mental age of the child to his chronological age. This ratio is

multiplied by hundred for obtaining an integral value of quotient. The IQ gives and index of the ability.

d. **Aptitude Test** – An aptitude is a person's conditions, a pattern of traits and demand to be indicative of his potentialities. Aptitude tests are useful for class room research and research in trade and industry.

e. **Attitude Test** –An attitude is a personality disposition or a drive which determines behavior towards certain type of person, object, situation, institution or concept. An attitude is always directed towards something. Some persons have positive attitude towards untouchability.

f. **Personality Test** –Personality is the most characteristic integration of an individual's structures, modes of behaviors, interests, aptitude capacities, abilities and attitude. Personality tests are designed to measure the personality traits of the individuals. Some of the personality traints are co-operation discipline, leadership, orderliness, personal appearance, punctuality, patriotism, responsibility, self- confident and tem spirit.

2. **Cumulative Records Cards** –Cumulative records cards are very frequently used in educational research. If a researcher is interested in studying the achievements of a student in his hobbies, is personality traits, his practical and social activities, and his aptitudes, the cumulative records maintained in the school is referred to by the researcher.
3. **Schedule** –Schedule is the most important tool. It is similar to a questionnaire. It is administered by the researcher in person and it is filled up by the researcher. As the schedule is presented in person it need not be attractive. The techniques of preparing questionnaire are also applied to framing an interview schedule. Hence the researchers are advised to refer to the questionnaire for more details.
4. **Questionnaire**–Questionnaires are used primarily in making status studies of current practices and in conducting opinion polls and surveying attitudes.
5. **Pre-testing the Questionnaire** –Pretesting helps in enriching the design of the questionnaire and assists in testing the validity and reliability of

statistical techniques to be adopted. All aspects including layout, question sequence, word meaning, question difficulty, branching instructions and so on should be part of the pretest.

6. **Pilot Study** – A pilot study is a small scale replica of the main study. The Pilot study is a dress rehearsal and it provides guidance on the following:
    a. The adequacy of the sampling frame to be followed for the survey.
    b. The pilot study enables the researcher to acquire prior knowledge about the population to be sampled.

COLLECTION OF PRIMARY DATA

We collect primary data during the course of doing experiments in an experimental research but in case we do research of the descriptive type and perform surveys, whether sample surveys or census surveys, then we can obtain primary data either through observation or through direct communication with respondents in one form or another or through personal interviews. This, in other words, means that there are several methods of collecting primary data, particularly in surveys and that there are several methods of collecting primary data, particularly in surveys and descriptive researches. Important ones are : (i) observation method, (ii) interview method, (iii) through questionnaires, (iv) through schedules, and (v) other methods which include (a) warranty cards; (b) distributor audits; (c) pantry audits; (d) consumer panels; (e) using mechanical devices; (f) through projective techniques; (g) depth interviews, and (h) content analysis. We briefly take up each method separately.

PRIMARY DATA

Kotler and Armstrong say that " Primary data consists of information collected for the specific purpose at hand". In other words, primary data are those, which are collected afresh and for first time and thus happen to be original in character.

TYPES OF PRIMARY DATA

The two types of data are:

- Quantitative Data
- Qualitative Data

QUANTITATIVE DATA

As the term implies this is data which is expressed in numbers. Quantitative data is quite easy to collect, and a large amount of reliable and valid data can be collected largely by questionnaire in quite a short period of time. It is a fairly formal approach. This data arises

from what is termed “closed questions” because the respondent is restricted in the choice of answer the respondent can give.

E.g. Do you prefer to do your shopping in town centers or a purpose built shopping complex at the edge of town? (a) Town Centre [ ] (b) Shopping complex [ ] (c) Both [ ]

E.g. do you live in this town? YES [ ] NO [ ]

QUALITATIVE DATA

Qualitative data is obtained from group discussions or in-depth interviews and its findings are based on content rather than numeric analysis. Qualitative data is said to be much more subjective than its counterpart. Questions are open-ended and can lead to a free ranging and in-depth discussion on a specific point which provides a variety of rich data. There are no numbers or digits in this data and it is not subject to statistical interpretation.

E.g. What further facilities would you like to see in the leisure Centre and why?

TYPES OF PRIMARY DATA COLLECTION

1) **OBSERVATION METHOD**

The observation method is the most commonly used method especially in studies relating to behavioral sciences. In a way we all observe things around us, but this sort of observation is not scientific observation. Observation becomes a scientific tool and the method of data collection for the researcher when it serves a formulated research purpose is systematically planned and recorded and is subjected to checks and controls on validity and reliability. Under the observation method the information is sought by way of investigators own direct observation without asking from respondent.

Ex: In a study relating to consumer behavior the investigator instead of asking the brand of wristwatch used by the respondent may himself look for the watch.

ADVANTAGES :

1. The method eliminates subjective bias
2. The information obtained under this method relates to what is current happening it is not complicated either by past behavior or future intentions and attitudes.
3. This method is independent of respondent willingness to respondents as such is relatively less demanded of active co-operation on the part of the respondents as happens to be the case in interview or the questionnaire method.

4. This method is particularly suitable in studies, which deal with subjects who are not capable giving verbal reports of their feeling for one reason or the other.

DISADVANTAGES:

1. Its an expensive method
2. The information provided by this method is very limited.
3. Sometimes unforeseen factors may interfere with the observational task.
4. The fact that some people are rarely accessible to direct observation creates obstacle for this method to collect data effectively.

2. INTERVIEW METHOD

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

(a) Personal interviews

Personal interview method requires a person known as the interview are asking questions generally in a face-to-face contact to the other person or persons. (At times the interviewee may also ask certain questions and the interviewer responds to these, but usually the interviewer initiates the interview and collects the information.) This sort of interview may be in the form of direct personal investigation or it may be indirect oral investigation. In the case of direct personal investigation the interviewer has to collect the information personally from the sources concerned.

(b) Telephone Interviews :

This method of collecting information consists in contacting respondents on telephone itself. It is not a very widely used method, but plays important part in industrial surveys, particularly in developed regions. The chief merits of such a system are:

1. It is more flexible in comparison to mailing method
2. It is faster than other methods i.e., a quick way of obtaining information.
3. It is cheaper than personal interviewing method; here the cost per response is relatively low.
4. Recall is easy; callbacks are simple and economical.
5. There is a higher rate of response than what we have in mailing method; the non-response is generally very low
6. Replies can be recorded without causing embarrassment to respondents.
7. Interviewer can explain requirements more easily.

8. At times, access can be gained to respondents who otherwise cannot be contacted for one reason or the other.
9. No field staff is required.
10. Representative and wider distribution of sample is possible.

3) SURVEYS METHOD :

Surveys are concerned with describing, recording, analyzing and interpreting conditions that exist or existed. The researcher does not manipulate the variable or arrange for events to happen Surveys are only concerned with conditions or relationships that exist, opinions that are held, processes that are going on, effects that are evident or trends that are developing. They are primarily concerned with present but at times do consider past events and influences as they relate to current conditions.

1. Survey type researches usually have larger samples because percentages of responses generally happen to be low, as low as 20 to 30%, especially in mailed questionnaire studies. Thus, the survey method gathers data relatively from the large number of cases at a peculiar time; it is essentially cross-sectional.

2. Surveys are conducted in case of descriptive research studies, usually appropriate in case of social and behavioral sciences because many type of behavior that interest researcher cannot be arranged in realistic setting.

3. Surveys are example of field research and are concerned with hypothesis formulation and testing analysis of the relationship between non-manipulated variables.

4. Surveys may either be census or sample surveys. They may also be classified as social surveys, economic surveys, and public opinion surveys. Whatever be their type, the method of data collection happens to be either observation or interview or questionnaire or opinionative or some projective technique. Case method may as well be used.

5. In case of surveys, research design must be rigid, must make economical provision for protection against bias and must maximize reliability, the aim happens to be to obtain complete and accurate information.

6. Possible relationships between the data and the unknowns in the universe can be studied through surveys.

STRUCTURED DATA COLLECTION :

A structured data collection is a formal list of questions framed so as to get the facts. The interviewer asks the questions strictly in accordance with pre- arranged order. For e.g.

this method can be used when the information is based on the expenditures of the consumer on different types of clothing like. Cotton woolen or synthetic, etc.

This structured questionnaire can be of two types, disguised and non- disguised, based on whether the object or the purpose of the survey is revealed to the respondent. The main advantage of this method is that, the information can be collected in a systematic and orderly manner. However when it comes to personal questions, this method seems to be less effective.

NON-STRUCTURED DATA COLLECTION

It is a kind of data collection method where the data to be collected is not pre-arranged or not listed in a proper structured format. Therefore the entire responsibility is left on the researcher to ask the respondent, in the way he feels fit. The researcher only has certain main points on which he develops the questions to be asked. Such a method is devoid of rigidity and the researcher has sufficient amount of freedom to collect the data in the order he wants. Again here there are two main types of non-structured methods of data collection.

Survey Method of Data Collection

STRUCTURED /DISGUISED

The respondent is asked a structured set of questions in a preconceived format. However he is not made aware of the purpose of the survey. Such methods are useful in obtaining psychographic profiles, wherein, similar responses from a set of respondents would club them under a specific lifestyle segment.

Advantages

1) Since respondents are not aware of the objectives of the research, they do not give biased opinions.

2) The interview era bias is reduced on account of the structured nature of the questionnaire.

Disadvantages

1) The respondents may show disinterest as he does not know the purpose of the survey.

2) It cannot be compared with other similar studies which are structured but non-disguised i.e. it would be difficult to check the reliability and validity of the results.

NON-STRUCTURED/DISGUISED

Herein, the respondent is again not aware of the purpose of the survey. At the same time, the questions posed to him do not follow an already throughout sequence. Projective techniques are available to get the innermost motivations, fears and aspirations of the respondent. The data lends itself to a more qualitative analysis. **For e.g.** in the case study discussed in the adjoining column respondents were also asked to complete the following sentence in the latter part of the questionnaire.

Advantages

1) It is very interesting to the respondents who might participate willingly.

2) It is less time consuming & costly to collect the data as well as to analyze it since the number crunching involved is not there.

3) It is very useful to bring out the inner motivations and aspirations of the respondents.

Disadvantages

1) The respondents might not take the entire data collection effort very seriously; rather treat it as a game.

2) The qualitative research is totally dependent on the interpretations made by the researcher. It does not have any numerical analysis to support.

STRUCTURED/ NON-DISGUISED

Herein, the purpose of the survey as well as nature of the questions is made known to the respondents. The interviewer has little room for his own interpretations, as the questionnaire is fairly structured one to lend itself to statistical analysis. Most of the descriptive studies using the statistical survey method would fall under this category. **For e.g**. based on the exploratory survey in the form of secondary data analysis, in-depth interviews and focus group interviews and focus group interviews, in the case of fresh orange juice, the data collection method most suited was the structured non-disguised type.

NON-STRUCTURED/ NON- DISGUISED

The purpose of the survey is made known to the respondents and there is no rigidity in the questioning process. It is similar to the in-depth interviews and group interviews, which were discussed earlier. The flexibility in the questioning process allows attitudes and

opinions to surface very freely and allows the respondents to speak deeply about the subject matter. Opinions of the industry experts on how the industry would fare or economists on the direction of the growth of the economy or various financial institutions like IDBI, ICICI, or UTI etc., expressing their views on how the stock markets would be performing, are all illustrations of non-structured data collection methods. This method is gaining a lot of importance these days with a number these days with a number of experts being available on a variety of topics. Opinions of them would be crucial to consider before arriving at decisions

Observation Method of Data Collection

STRUCTURED / DISGUISED

In this case, the observers are told to record the actions of the respondents on a structured form but the respondents are not made aware that they are being observed. It is a structured, disguised study.

For e.g. observers may pose as customers to observe the sales made by salesman over counters in departmental stores selling a variety of brands of jeans, shirts, etc. in order to observe any type of brand push or persuasion by the sales person.

As a variation, he may position himself in the shop with permission by the management and observe the sales person interact with customers.

Advantages

1) The actual behavior of the person of interest is recorded (i.e. either salesman or customer); so chances of predisposition bias are low.

2) A natural setting is provided. For e.g. the arrangement of display options might be observed which one attracts the customer the most.

Disadvantages

1) It is not very ethical to observe people reactions by keeping them in the dark. It might be construed as spying.

2) The data recorded is totally dependent on the observer and his skills.

NON-STRUCTURED / DISGUISED

In this case, the observers are left free to observe the actions and responses of the respondents by using their own discretion to decide what may be of relevance and what not. This makes the exercise non-structured.

For e.g., social research observers may not be fully aware of what action options, could occur at the point of observations, so that flexibility of recording is necessary. Also, at times, reports on competitive activity on more than one parameter are required, all of which might be difficult to spell out in detail.

Advantages

1) The observer is not restricted and is free to observe the happenings in detail.

2) The actual behavior of the respondent is recorded with no predisposition bias.

3) It is very time-consuming and expensive. The purpose of research is lost if it takes too long.

Disadvantages

1) The observer may miss out important activities and record less relevant ones.

2) Observer bias is very high.

STRUCTURED / NON-DISGUISED

The respondent is aware that he is being observed and the observer too is instructed to make the records, as per a predetermined structure.

The situation is similar to that in the experiments, which had been described where, control groups do not exist. The settings for such studies are usually not the natural atmosphere but a laboratory/ artificial setting. Use of mechanical/electronic devices like papilla meters/laser scanners in super markets/channel switch recorders to observe consumer behavior is being increasingly made in a structured manner with the respondent fully aware of the same.

For e.g. if the respondent is questioned about the choice/preferences of brand before he enters a shop and the actual brand purchased by him afterwards to gauge whether he has been influenced by the salesman, it is a structured non-disguised observation.

Advantages

1) The ethical issue of not informing the respondent is taken care of.

2) The structure in the study makes it less prone to manipulation and the data collected more reliable and valid.

Disadvantages

1) The respondent is predisposed and so a bias creeps in to actions.

2) The interaction between the respondent and the observer may influence the actions.

NON-STRUCTURED / NON-DISGUISED

The respondent is aware that he is being observed and the observer is free to make his observations, without using any preconceived format.

In many social research conditions involving rural areas, the observer might have to explain the rural folk the reasons why he is there and conceive them how the study will be useful to them. It may be required on the part of the researcher, to stay with the respondents to make any meaningful observations. Situations at orphanages, mental asylums, old-age homes or even public hospitals would benefit from such approach.

For e.g. if the issue of providing and using clean drinking water is to be studied at the village level, actual observation of collection and usage has to be made in each of the homes or else, they may report wrong actions.

Advantages

1) The method offers a high degree of flexibility to the observer and also takes care of the ethical issues.

2) Delicate social issues like child labor use of drugs, women welfare, use of hygienic food, water, dowry deaths are suited to such treatment.

Disadvantages

1) It is very expensive and time-consuming and lends itself to qualitative analysis only.

2) The analysis is totally dependent on the observer skills and interpretations. The time taken and the unstructured nature of the survey may frustrate the observer.

COLLECTION OF SECONDARY DATA

Secondary data means data that are already available i.e., they refer to the data which have already been collected and analyzed by someone else. When the researcher utilizes secondary data, then he has to look into various sources from where he can obtain them. In this case he is certainly not confronted with the problems that are usually associated with the collection of original data. Secondary data may either be published data or unpublished data. Usually published data are available in:

(a) Various publications of the central, state are local governments;

(b) Various publications of foreign governments or of international bodies and their subsidiary organizations;

(c) Technical and trade journals;

(d) Books, magazines and newspapers;

(e) Reports and publications of various associations connected with business and industry, banks, stock exchanges, etc.;

(f) Reports prepared by research scholars, universities, economists, etc. in different fields; and

(g) Public records and statistics, historical documents, and other sources of published information. The sources of unpublished data are many; they may be found in diaries, letters, unpublished biographies and autobiographies and also may be available with scholars and research workers, trade associations, labour bureaus and other public/ private individuals and organizations. Researcher must be very careful in using secondary data. He must make a minute scrutiny because it is just possible that the secondary data may be unsuitable or may be inadequate in the context of the problem which the researcher wants to study. In this connection Dr. A.L. Bowley very apply observes that it is never safe to take published statistics at their face value without knowing their meaning and limitations and it is always necessary to criticize arguments that can be based on them. By way of caution, the researcher, before using secondary data, must see that they possess following characteristics:

1 .Reliability of data:

The reliability can be tested by finding out such things about the said data: (a) who collected the data? (b) What were the sources of data? (c) Were they collected by using proper methods (d) At what time were they collected?(e) Was there any bias of the compiler?(t)What level of accuracy was desired? Was it achieved?

2. Suitability of data:

The data that are suitable for one enquiry may not necessarily be found suitable in another enquiry. Hence, if the available data are found to be unsuitable, they should not be used by the researcher. In this context, the researcher must very carefully scrutinize the definition of various terms and units of collection used at the time of collecting the data from the primary source originally. Similarly, the object, scope and nature of the original enquiry must also be studied. If there searcher finds differences in these, the data will remain unsuitable for the present enquiry and should not be used.

3. Adequacy of data:

If the level of accuracy achieved in data is found inadequate for the purpose of the present enquiry, they will be considered as inadequate and should not be used by the researcher. The data will also be considered inadequate, if they are related to an area which may be either narrower or wider than the area of the present enquiry. From all this we can say that it is very

risky to use the already available data. The already available data should be used by the researcher only when he finds them reliable, suitable and adequate. But he should not blindly discard the use of such data if they are readily available from authentic sources and are also suitable and adequate for in that case it will not be economical to spend time and energy in field surveys for collecting information.

Definition of Secondary data

"Secondary data consists of information that already exists somewhere, having been collected for another purpose" - (Kotler &Armstrong). In other words, secondary data are those which have been collected by someone else and which have already been passed through statistical process

There are two sources of this data:

INTERNAL SOURCES - this is data which is available within the company, although companies do not make full enough use of the information that is routinely collected

EXTERNAL SOURCES - this is data which has been published for commercial reasons. A key source of secondary data is the library service and most good libraries have a wide range of sources. Some government data is available free, other secondary data can be very expensive.

It is important in a research project to know what data is available since this will guide the structure and format of the fieldwork in the primary data collection stage. It is possible that secondary data sources can provide the complete answer to the problem under scrutiny. The least it will do is save time and money in directing the scope of the field work. It can also influence the choice of data collection methods used in the field work.

Example of Internal Sources of Secondary Data

Internal sources of data are found within the organization. Most organizations have masses of data which should be well handled and organized. Sales figures, past and present, broken down by product, product range or brand Sales figures broken down by market segment to observe trends in the market. The relationship between sales figures and the cost of sales force expenditure, and promotional activities, including packaging. Information about competitors, their products and the segments they serve. The data should be so comprehensive that it should be possible to predict how they will respond to changes in your company strategy.

Many organizations employ sales personnel who have direct access to the customer, and are sources of both formal and informal information. Both types must be recorded

weekly and submitted appropriately. Sales people work in a variety of situations, in business to business markets, in offices taking orders over the telephone, in over-the-counter sales or by visiting customers at their premises. They have access too much information about customers, and their needs, and to what is happening in the market overall. Attendance at conferences, exhibitions and meetings also gives opportunities to observe competitor personnel, and their behavior.

Examples of External Sources of Secondary Data

In addition to your university library there are some key libraries which can provide substantial and specific sources of information.

City libraries such as Manchester or Birmingham are excellent sources. There are many more.

London libraries include Statistics and Market Intelligence Library

- Science Reference Library
- City Business Library

The leading Business Schools' libraries such as:

- London Business School
- Manchester Business School

General Business Information Guide

- Business Information Year Book

Country Information

- Europe World Year Book

Trade and Organization Information

- Directory of British Associations

Statistical Sources (government publications)

- Guide to Official Statistics (HMSO)
- Regional Statistics (HMSO)

Other sources of official information include:

- Annual Abstract of Statistics (population, manufactured goods, etc.)
- Monthly Digest of Statistics (monthly, but similar to above)

National Press

- The Financial Times: The Times

SELECTION OF APPROPRIATE METHOD OF DATA COLLECTION

1. **Nature, scope and object of the data collection :**

Elsewhere it was pointed out that if the objectives of the study are clear the type of data to be collected could be easily determined. If the research topic is of current nature like impact of earthquake in Gujarat. Then primary data is the automatic choice. Suppose the topic is the pattern of foreign trade in India. To get a clear picture over the few decades historical data (i.e. secondary data) should be used.

2. Budget constraints :

With liberal availability of funds primary data could be the choice. Otherwise secondary data is to be collected.

3. Availability of Time :

The time frame fixed for the research work will directly influence the choice between primary and secondary data. If sufficient time is available the researcher could probe into the past with secondary data and capture the present using primary data.

4. Degree of accuracy desired

A very important condition is the level of accuracy of the data collected. In case of compilation of data regarding the deviation from the standard measurements in a work shop, the data should be 100% accurate. Similarly the data regarding the patient condition explained through various parameters should be very accurate. On the other hand data required for a social research on poverty even 95 % accuracy is accepted. So greater the level of accuracy wanted primary data should be selected.

5. Period of study

A study based on historical data, require secondary data source while the study on the patient status in a hospital require primary data.

ADVANTAGE OF SECONDARY DATA

- It is highly economical, as less expenditure is incurred in the collection of secondary data. But in the case of collection of primary data enormous amount has to be spent at various stages of data collection starting from designing the tool of data collection up to the stage of tabulation of data.
- The secondary data facilitate the researcher to complete the research project promptly, since he need not spent much of his time in collecting data. When a research project is based on primary data enormous time has to be spent in designing the tool of data collection, collecting the data from the field and processing the collected data.

- The secondary data help the researcher to formulate the research problem. The secondary data enable the researcher as well to prepare the tool of data collection and formulate hypotheses for the study.
- The researcher could find research gap in the area of study with the help of the secondary data. The review of literature helps him to select the problem for an investigation.
- Finally secondary data can be used as a basis for comparison with the primary data that the researcher has just collected.

DISADVANTAGE OF SECONDARY DATA

- It is very difficult to assess the accuracy of the secondary data. If is also difficult to know with what care secondary data have been collected and tabulated.
- A severe limitation in the use of secondary data is that they may be somewhat out of date. A good deal of time is spent in the collection, processing, tabulation and publishing of these data. By the time the data are made available to the researcher they may have become out dated due to excessive time consumed in their collection.
- Finally the secondary data are not available to the researcher in the form he wants to have. For example the age of the households may be
    - Below 18
    - 18- 28
    - 28-38
    - 38-48
    - Above 58

  If the researcher wants to group the household into (i) below 20 (ii) 20 -30 and so on, it cannot be done with the help of the secondary data.

COLLECTION OF DATA THROUGH QUESTIONNAIRES

This method of data collection is quite popular, particularly in case of big enquiries. It is being adopted by private individuals, research workers, private and public organizations and even by governments. In this method a questionnaire is sent (usually by post) to the persons concerned with a request to answer the questions and return the questionnaire. A questionnaire consists of a number of questions printed or typed in a definite order on a form or set of forms. The questionnaire is mailed to respondents who are expected to read and understand the

questions and write down the reply in the space meant for the purpose in the questionnaire itself.

1. **General form**

So far as the general form of a questionnaire is concerned, it can either be structured or unstructured questionnaire. Structured questionnaires are those questionnaires in which there are definite, concrete and pre-determined questions. The questions are presented with exactly the same wording and in the same order to all respondents. Resort is taken to this sort of standardization to ensure that all respondents reply to the same set of questions. The form of the question may be either closed (i.e., of the type 'yes' or 'no') or open (i.e., inviting free response) but should be stated in advance and not constructed during questioning.

2. **Question sequence**

In order to make the questionnaire effective and to ensure quality to the replies received, a researcher should pay attention to the question-sequence in preparing the questionnaire. A proper sequence of questions reduces considerably the chances of individual questions being misunderstood. The question-sequence must be clear and smoothly-moving, meaning thereby that the relation of one question to another should be readily apparent to the respondent, with questions that are easiest to answer being put in the beginning. The first few questions are particularly important because they are likely to influence the attitude of the respondent and in seeking his desired cooperation. The opening questions should be such as to arouse human interest. The following type of questions should generally be avoided as opening questions in a questionnaire:

1. Questions that put too great a strain on the memory or intellect of the respondent;
2. Questions of a personal character
3. Questions related to personal wealth, etc.
4. Question formulation and wording:

With regard to this aspect of questionnaire, the researcher should note that each question must be very clear for any sort of misunderstanding can do irreparable harm to a survey. Question should also be impartial in order not to give a biased picture of the truest ate of affairs. Questions should be constructed with a view to their forming a logical part of a well thought out tabulation plan. In general, all questions should meet the following standards—(a) should be easily understood; (b) should be simple i.e., should convey only one thought at a time; (c) should be concrete and should conform as much as possible to the respondent's way of thinking.

ESSENTIALS OF A GOOD QUESTIONNAIRE:

To be successful, questionnaire should be comparatively short and simple i.e., the size of the questionnaire should be kept to the minimum. Questions should proceed in logical sequence moving from easy to more difficult questions. Personal and intimate questions should be left to the end. Technical terms and vague expressions capable of different interpretations should be avoided in a questionnaire. Questions may be dichotomous (yes or no answers), multiple choice (alternative answers listed) or open-ended.

COLLECTION OF DATA THROUGH SCHEDULES :

This method of data collection is very much like the collection of data through questionnaire, with little difference which lies in the fact that schedules (Proforma containing a set of questions) are being filled in by the enumerators who are specially appointed for the purpose. These enumerator as long with schedules, go to respondents, put to them the questions from the Proforma in the order the questions are listed and record the replies in the space meant for the same in the Proforma. In certain situations, schedules may be handed over to respondents and enumerators may help them in recording their answers to various questions in the said schedules. Enumerators explain the aims and objects of the investigation and also remove the difficulties which any respondent may feel in understanding the implications of a particular question or the definition or concept of difficult terms. This method requires the selection of enumerators for filling up schedules or assisting respondents to fill up schedules and as such enumerators should be very carefully selected.

The enumerators should be trained to perform their job well and the nature and scope of the investigation should be explained to them thoroughly so that they may well understand the implications of different questions put in the schedule. Enumerators should be intelligent and must possess the capacity of cross-examination in order to find out the truth. Above all, they should be honest, sincere, and hardworking and should have patience and perseverance. This method of data collection is very useful in extensive enquiries and can lead to fairly reliable results. It is, however, very expensive and is usually adopted in investigations conducted by government agencies or by some big organizations. Population census all over the world is conducted through this method.

DIFFERENCE BETWEEN QUESTIONNAIRES AND SCHEDULES

Both questionnaires and schedule are popularly used methods of collecting data in research surveys. There is much resemblance in the nature of these two methods and this fact has made many people to remark that from a practical point of view, the two methods can be

taken to be the same. But from the technical point of view there is difference between the two. The important points of difference are as under.

BASIS	QUESTIONNAIRES	SCHEDULE
Usage	Respondent he records the answers obtained.	Researcher / enumerator record the answer obtained.
Cost	Relatively cheaper as if is sent by mail to the targeted respondents	Costlier as the investigator has to be appointed trained and meet every informant at the latter's place.
Coverage	Wide coverage possible as it can be sent to any place by post.	Relatively limited coverage as the investigator cannot be sent to every place.
Degree of response	Less as all the respondent answers the questions the way it is understood	Relatively good, as the investigator is more focused and obtain details personally.
Quality of response	Not good as the respondent answers the questions the way it is understood.	Relatively better as the investigator guides the respondents in understanding the questions in right context.
Identify of respondent	It is not known clearly who answered the questionnaire and this in turn might affect accuracy of information obtained.	It is clearly known as the enumerator himself clients the information. So the accuracy of information is more.
Time taken for reply	It cannot be established as the respondent may reply at his convenience.	It is possible to plan the enquiry and depute the investigators accordingly and collect information within a targeted time.
Personal contact	It is completely absent and to that extent there is no scope for giving any clarification to respondents.	It is absolutely possible and so the quality of response is better. The investigator can help the respondent to understand the questions clearly.
Pre-condition for use	The respondent should be a literate and cooperative.	The literacy status of the respondent is not a limitation. The investigator can explain the question and obtain the response.
Sample coverage	It is possible to cover a wide range of sample elements as the questionnaire is only sent by post	This is not possible as the investigator has to personally contact each respondent.
Accuracy of information	It is not likely to be high, and it depends on the structure of the questionnaire itself.	Relatively accuracy is better in this method as the investigator can determine the accuracy on the field and adopt appropriate methods to ensure accuracy.

Presentation requirement	Questionnaire should be designed properly and made attractive to encourage the respondents to fill it.	No such requirement is a condition.
Scope for application of other methods of data collection.	This is not possible as the questionnaire is sent to the respondent.	There is a lot scope for the investigator to apply observation method or interview method of data collection, along with the use of schedule.

FEATURES OF A GOOD QUESTIONNAIRE

The following are the points to be given importance while designing a questionnaire.

1) Questionnaire should be printed / cyclostyled /Xeroxed.
2) The first part of the questionnaire should specify the object or purpose for which the information is required.
3) An assurance to the respondent that the information furnished would be kept confidentially must be given.
4) Some introduction about the person / organization that is collecting the information is to be given. Sometimes this is given as a letter enclosed with the questionnaire.
5) Questions should be constructed using simple language and technical jargons, terms, concepts should all be avoided.
6) Questions should never be lengthy. It is wiser not to combine a number of questions in one question itself.
7) Each question should be specific and clear
8) Personal questions on wealth, habit etc could be avoided.
9) Questions should be given in a sequence. For example question relating to marital status should precede the question about the number of children.
10) Questions should not require any referencing before replying.
11) Questions should not force the respondent to recall from his memory anything to answer.
12) Questions needing computation / calculations / consultation should be avoided.
13) Questions on sentiments / belief / faith should be avoided.
14) Repetition of question should be eliminated.

15) In case of any instruction is required for filling up the questionnaire, such instructions should be given separately specifying the question number and the related instructions. For example the application for university examination is given with instruction sheet regarding fees to be paid, mode of payment, subject code etc.
16) Sufficient space should be given for answering questions.
17) The questionnaire should be made attractive as otherwise the respondents may not be motivated to answer.
18) If any diagramed or map is used then it should be printed clearly.
19) Questions which cross check the response could be built in to the questionnaire.
20) Instructions regarding how to return the filled up questionnaire must be given. It is desirable that a self-addressed sufficiently stamped envelope is sent along with the questionnaire to enable the respondents to send the filled up questionnaire.

DEMERITS OF QUESTIONNAIRE

- It is always found that the response rate in questionnaire is very poor compared to using schedules.
- Bias of the respondent cannot be determined easily
- Only if the respondents are educated, questionnaire could be used for collecting information.
- Follow up non-response or unfilled questionnaire only adds to the cost of need.
- Accuracy of response cannot be ensured.
- A lot of care is required to design and structure a questionnaire. Hence unless a scholar is good at drafting a questionnaire this method cannot be adopted for data collection.

GUIDELINES FOR SUCCESSFUL INTERVIEWING

Interviewing is an art and one learns it by experience. However the following points may be kept in view by an interviewer for eliciting the desired information:

- Interviewer must plan in advance and should fully know the problem under consideration. He must choose a suitable time and place so that the interviewee may be at ease during the interview period. For this purpose some knowledge of the daily routine of the interviewee is essential.

- Interviewer's approach must be friendly and informal. Initially friendly greetings in accordance with the cultural pattern of the interviewee should be exchanged and then the purpose of the interview should be explained.
- All possible effort should be made to establish proper rapport with the interviewee people are motivated to communicate when the atmosphere is favorable.
- Interviewer must know that ability to listen with understanding, respect and curiosity is the gateway to communication and hence must act accordingly during the interview. For all this the interviewer must be intelligent and must be a man with self-restraint and self-discipline.
- To the extent possible there should be a free flowing interview and the questions must be well phrased in order to have full cooperation of the interview. But the interviewer must control the course of the interview in accordance with the objective of the study.
- In case of big enquires where the task of collecting information is to be accomplished by several interviews, there should be an interview guide to be observed by all so as to ensure reasonable uniformity in respect of all salient points in the study.

OBSERVATION TECHNIQUE

Observation as a method of data collection is used very frequently, whenever collection of data through other methods is difficult. For example it is not always possible to conduct interviews with every person to collect required information. Similarly using questionnaire or schedule for data collection is not free from limitations, especially when the response to questionnaire is very poor. In such occasions observation is more useful for collection data. There are occasions when no other method can be adopted for data collection. For instance suppose a scholar wants to study the life style of a hill tribe. It is certainly not possible to use a questionnaire or schedule or conduct interview. Only alternative available is observation or schedule or conduct interview. Only alternative available is observation as the respondents would not reply and question orally or in written. There are also instance when apart from the data collected through questionnaire / schedule or interview, one has to have a clear understanding of the surroundings or environment etc. This is possible only by adopting observation technique.

Definition of observation

Observation may be defined as "sensible application of sense organs in understanding less explained or unexplained phenomena. Using the sense organs one could see and understanding things. One could listen to what is being explained to understanding anything.

Whenever a researcher is unable to compile information through any other method, then he has to effectively apply his sense organs to observe and explain. So it may be said that observation involves recording of information applying visual understanding backed by alert sense organs.

A few more examples will make clear the meaning and usefulness of observation. Suppose the reaction of people to a day light robbery committed is to be studied. A person who is present on the spot when the robbery takes place would be able to notice and feel several things which even a video recording may fail to bring out. Similarly a very popular film star is visiting a place. The reaction of the people to his visit cannot be completely brought out in any other manner except observation. The sharing of joy or sorrow way of living habits, practices etc, can be understood better through observation.

TYPE OF OBSERVATION

Observations are many types. They are structured observation, unstructured observation, participant observation, non- participant observation, controlled observation and uncontrolled observation. Each one of types is explained below.

1. **Structured observation**

When observation takes place strictly in accordance with a plan or a design prepared in advance, it is called structured observation. In such a type the observer decides what to observe, what to focus on, what type of information or activity should be given importance, which is all to be observed, what conditions are to be fulfilled to carry out observation etc in advance.

Merits:

- Filtering what is relevant and focusing on it.
- Avoiding waste of time
- Studying only the target group
- Minimizing the bias of the observer

Demerits

- Unless a person is well trained he cannot be effective in undertaking structured observation
- It is possible that vital aspects are missed as they were not conceived all the time of designing the observation.

- By limiting the independence of the observer, crucial things might be left out from being observed.

2. Unstructured observation

In this type of observation there is no advance designing of what, how, when, who, etc., of observation. The observer is given the freedom to decide on the spot to observe everything that is relevant. For example while observing the life style of a hill tribe in their place, the observer may be able to observe several interesting things like how they discuss their plans, how they entertain themselves, how they train the youngster, how they settle quarrels, who takes decision etc. some these may not be observed if structured observation is adopted. The main strength of the unstructured observation is that at the time of observation everything is taken note of and the researcher than segregates the related and relevant details. Of course one important quality required of the observer is that he should be well trained and experienced.

3. Participant observation :

In this method the observer is very much present in the midst of what is observed. For example suppose a researcher is studying the life style of a hill tribe, then he might understand the life style of the tribe better only when he stays with them. By being on the spot, he would be able to continuously observe and note everything that is happening around him. But he may not interfere, with anything that is happening. He is a participant in the sense he is physically present on the spot to observe and not influencing the activities.

Merits

- The observer will not miss anything which is relevant
- There is every scope for him to clarify things which he cannot understand
- He can interact with people to get more information
- There is no need to depend upon hearsay or reported information

Demerits

- An inexperienced observer may not know what is relevant and what is not relevant.
- He tends to focus more on things of interest to him, than what is relevant.
- There is lot of scope for his bias to intervene in his interpretation of what is observed
- The conduct or behavior or reaction of the target audience may be influenced by his presence.

4. Non participant observation:

This is a method in which the observer remains detached from whatever is happening around and does not involve himself in any activities taking place. He is present only to observe and not to take part in the activities. Sometimes he may even remain anonymous. This is the target audience does not know his presence at all. For example the plain clothes man (policemen not in uniform) are deputed on observation duty whenever a processing takes place or whenever any important political personality participate in the public meeting or a place where a murder is committed. The object of such action is only to notice what is happening not to be involved in what is happening. The most important strength of this method of observation is that the observer would collect first hand information without being noticed or influenced by any one. If the observer is honest and sincere then the data collected through such observation is very valuable.

5. Controlled observation:

This is slightly modified version of unstructured observation. In this case the observer performs his work in an environment or situation, while is very much planned or designed or set. For example sometimes to test the effectiveness and alertness of airport security system a mock event (like hijacking or fire accident) is carried out. Then how the security staff reacts to such mock event is observed. Based on this the weakness in the system are noticed and steps taken to eliminate them.

PILOT STUDY

Pilot study is preliminary study conducted on a limited scale before the original studies are carried out in order to gain some primary information, on the basis of which the main project would be planned and formulated.

ADVANTAGES OF PILOT STUDY

1. Helps in the respondent selection procedure.
2. Provides trainings the motivation to interviews.
3. Inculcates seriousness and honesty in interviewer.
4. Provides opportunities to learn about local culture and build self-confidence.
5. Provides a trial or rehearsal to test interviewers work.
6. Improves the efficiency of the survey organization.
7. Identifies the needs.
8. Facilitates to estimate the project cost and time.

PRE-TESTING

Meaning of pre testing

It is necessary to go further and to try out systematically all the various features of the main inquiry. This may take the form first of a series of small "pre-tests" on isolated problems of the design and then when the broad plan of the enquiry is established of a pilot study.

Objects of pre-testing

The object of pre testing is to detect the discrepancies that have crept in and to remove them after necessary modifications in the schedule/ questionnaire.

Even if the schedule is technically foolproof, it may prove a hard nut if the level of intelligence of the respondent is quite poor. Accordingly to avoid ultimate loss and failure every schedule is tested of few individuals belonging to the group studied.

Advantage of pre-testing

1. **Reveals the strength and weakness of the questionnaire :**

It reveals to the investigator in advance questions which are not understood or are misunderstood by the respondents or which arouse defensiveness in them. This is an indication of weakness of the questionnaire which should be removed.

2. **Helps to decide questionnaire form and structure :**

It helps to decide the proper from and structure of each question –weather is should be dichotomous, multiple choice, open end or some other combination. If the response to a question is to be given against a scale, how many points should be provided on the scale? Can respondents distinguish scaled positions on a response continuum, make nominal distinction.

3. **Resolves many problems of measurement :**

It helps to resolve many mechanical problems of measurement. For example the sequence of questions may require change where it is found that the answer to an early question tends to affect the response to a later one.

4. **Improves the design and effectiveness of the questionnaire :**

It helps to improve questionnaire design in terms of format, quality of instructions need for filter or screening questions, amount of spacing required on the page and the use of special symbol for color coded pages for directing the interviewer physically through the questionnaire.

5. **Provides estimates of required resource for the survey:**

It gives firm estimates of the amount of time, money, personal and equipment required to process the main study data efficiently and successfully.

QUESTION BANK

5 MARK QUESTIONS:

1. Explain the methods of data collection? (NOV/DEC 2011)
2. What is primary data and what is secondary data?
3. What is meant by Questionnaire? (NOV/DEC 2011)
4. What is meant by Schedule?
5. Discuss the term Pilot Study?
6. What is pre-testing?

10 MARK QUESTIONS:

1. Explain the different sources of primary and secondary data?
2. State the difference between Questionnaire and Schedule?
3. Distinguish between primary and secondary data?

UNIT – IV

DATA PROCESSING AND ANALYSIS

- Introduction of processing and analysis
- Meaning of processing
- Elements / types of analysis
- Meaning of Analysis
- Procedures for analysis
- Meaning of Interpretation
- Technique of Interpretation
- Essentials and prerequisites for Interpretation
- Hypothesis
    - Introduction
    - Meaning
    - Definition
    - Need for Hypothesis
    - Sources of Hypothesis
    - Formulation of Hypothesis
    - Characteristics of Hypothesis
    - Types of Hypothesis
    - Hypothesis testing producers
    - Testing of Hypothesis
    - Methods of testing Hypothesis
    - Procedures for testing Hypothesis

INTRODUCTION OF PROCESSING & ANALYSIS

The data, after collection, has to be processed and analyzed in accordance with the outline laid down for the purpose at the time of developing the research plan. This is essential for a scientific study and for ensuring that we have all relevant data for making contemplated comparisons and analysis. Technically speaking, processing implies editing, coding, classification and tabulation of collected data so that they are amenable to analysis.

PROCESSING

With this brief introduction concerning the concepts of processing and analysis, we can now proceed with the explanation of all the processing operations.

1. Editing:

Editing of data is a process of examining the collected raw data (especially in surveys) to detect errors and omissions and to correct these when possible. As a matter of fact, editing involves a careful scrutiny of the completed questionnaires and/or schedules. Editing is done to assure that the data are accurate, consistent with other facts gathered, uniformly entered, as completed as possible and have been well arranged to facilitate coding and tabulation.

2. Coding:

Coding refers to the process of assigning numerals or other symbols to answers so that responses can be put into a limited number of categories or classes. Such classes should be appropriate to the research problem under consideration. They must also possess the characteristic of exhaustiveness (i.e., there must be a class for every data item) and also that of mutual exclusively which means that a specific answer can be placed in one and only one cell in a given category set. Another rule to be observed is that of unique dimensionality by which is meant that every class is defined in terms of only one concept

3. Classification:

Most research studies result in a large volume of raw data which must be reduced into homogeneous groups if we are to get meaningful relationships. This fact necessitates classification of data which happens to be the process of arranging data in groups or classes on the basis of common characteristics. Data having a common characteristic are placed in one class and in this way the entire data get divided into a number of groups or classes. Classification can be one of the following two types, depending upon the nature of the phenomenon involved.

4. Tabulation:

When a mass of data has been assembled, it becomes necessary for the researcher to arrange the same in some kind of concise and logical order. This procedure is referred to as tabulation. Thus, tabulation is the process of summarizing raw data and displaying the same in compact form

(i.e., in the form of statistical tables) for further analysis. In a broader sense, tabulation is an orderly arrangement of data in columns and rows. Tabulation is essential because of the following reasons.

1. It conserves space and reduces explanatory and descriptive statement to a minimum.

2. It facilitates the process of comparison.

3. It facilitates the summation of items and the detection of errors and omissions.

4. It provides a basis for various statistical computations.

ELEMENTS/TYPES OF ANALYSIS

As stated earlier, by analysis we mean the computation of certain indices or measures along with searching for patterns of relationship that exist among the data groups. Analysis, particularly in case of survey or experimental data, involves estimating the values of unknown parameters of the population and testing of hypotheses for drawing inferences. Analysis may, therefore, be categorized as descriptive analysis and inferential analysis (Inferential analysis is often known as statistical analysis). "

Descriptive analysis is largely the study of distributions of one variable. This study provides us with profiles of companies, work groups, persons and other subjects on any of a multiple of characteristics such assize Composition, efficiency, preferences, etc."

(a) Multiple regression analysis:

This analysis is adopted when the researcher has one dependent variable which is presumed to be a function of two or more independent variables. The objective of this analysis is to make a prediction about the dependent variable based on its covariance with all the concerned independent variables.

(b) Multiple discriminant analysis:

This analysis is appropriate when the researcher has a single dependent variable that cannot be measured, but can be classified into two or more groups on the basis of some attribute. The object of this analysis happens to be to predict an entity's possibility of belonging to a particular group based on several predictor variables.

(c) Multivariate analysis of variance:

(Or multi-ANOVA): This analysis is an extension of two-way ANOVA, wherein the ratio of among group variance to within group variance is worked out ona set of variables.

(d)Canonical analysis:

This analysis can be used in case of both measurable and non-measurablevariables for the purpose of simultaneously predicting a set of dependent variables from their joint covariance with a set of independent variables.

ANALYSIS

Analysis and interpretation are giving meaning to the collected information by comparing them with the existing information. **For example** a survey undertaken in Madras shows that the per capital income in Madras in 1984 was say Rs.7, 000 /-. This information is not useful unless it can be associated with the income of the other cities.

Analysis is placing the collected data in some order or format so that the data acquire a meaning. Raw data become information only when they are placed in meaningful form. Interpretation involves drawing conclusions from the gathered data.

PROCEDURE FOR ANALYSIS

There are three tasks to be performed if the collected data are to be used in the most effective manner.

a) An intensive review must be made of all the data collected for project with reference to the study's objectives and hypotheses.
b) These data are then analyzed with the help of techniques selected earlier.
c) The results emerging from these analyses are then related to the study's hypotheses and objectives.

The collected data have to be analyzed fully. For example a large detergent manufacturer made a study of market trend for his two products namely A and B. The researcher collected data regarding the sale of these two projects for the year 1990 and 1991. On the basis of the data collected an analysis has been made. The analysis thus made is not relevant since it has not been taken into account the total bleach sales for the industry, the activities of the competitor and the causes for the decline in sales.

Types of analysis

The analysis may be descriptive analysis and casual analysis.

a) Descriptive analysis

Descriptive analysis is largely the study of distribution of one variable. This analysis is in other words called one dimensional analysis. This analysis shows the benchmark data and measures the state or condition at any particular time. This analysis is the prelude to bivariate and multivariate analysis. The descriptive analysis may be bivariate analysis and sequential analysis.

Bivariate analysis

The bivariate analysis is placing the collected data into tabular form so that the real meaning of these data can be derived. The starting point of Bivariate Analysis is to develop simple dimensional data. Then put the data into two or more categories. This analysis is explained with the help of a survey. A study was undertaken among Madurai City residents to determine their movie going habits. A sample of 1000 persons was randomly interviewed. Out of 1000 sample members 267 (26.70 %) are regular movie goers and 733 (73.30 %) are not regular movie goers.

Sequential analysis:

The data presented in a table reveals one factor at a time. This analysis is called sequential analysis. A further analysis of the data regarding movie goers showed that the college students were more frequent movie goers than non college students.

Category	**College students**	**Non – college students**	**Totals**
Regular movie goers	130 (37 %)	137 (21 %)	267
Not regular movie goers	220 (63 %)	513 (79 %)	733
Total	**350 (100 %)**	**650 (100 %)**	**1000**

Casual analysis:

This analysis explains how one variable affects another. Some external factor products a change in the dependent variable. We may also analysis to find out whether two variables (dependent and independent). There are different ways by which we might determine whether such correlations do exist or not.

These thinks (sales, consumption and preference) can be influenced or affected by product quality, advertising, price or other things which can be controlled by the manager. The variable such as sales, consumptions and preference are dependent variables. Changes in brand's price, package and advertising may affect the brands sales. These variables are called independent variables.

INTERPRETATION

Interpretation means drawing inferences from the collected facts after the analytical study. According to C.William Emory interpretation has two major aspects namely establishing continuity in research through linking the results of a given study with those of another and the establishment of some relationship with the collected data.

TECHNIQUES OF INTERPRETATION :

Interpretations are not an easy job and it requires a great skill on the part of the investigator. The investigator gets the required expertise to apply the technique.

The techniques of interpretation are given below.

- **Relationship between variables**

The basic object of every analytical research is to find out the relationship between any two variables. There may be three types of relationship.

- Symmetrical relationship
- Reciprocal relationship
- Asymmetrical relationship

The interpretation of data can be made with the help of these relationships.

- **Percentages**

Percentages are used in making comparison between two or more series of data. They are also used to describe the relationship. The following table shows the uses of percentages.

Sales of two types of cars in Tamil Nadu

Cities in Tamil Nadu	**Car X**	**Percent**	**Car Y**	**Percent**
Madras	300	30	400	20
Madurai	200	20	500	15
Coimbatore	200	20	500	25
Trichirapalli	150	15	350	17.5
Tirunelveli	150	15	450	22.5
	1000	**100**	**2200**	**100**

- **Average**

There are three forms of averages such as arithmetic mean, median, mode. Though there are other measures of central tendency, the above three measures are commonly used. Instead of using long statistical tables, the use of average makes the interpretation very simple.

- **Dispersion**

Dispersion refers to the amount or the magnitude of the spread. Measures of dispersion include range; inter quartile range, average deviation and standard deviation. These measure help to interpret the data more scientifically.

ESSENTIALS AND PRE-REQUISITES FOR INTERPRETATION

Interpretation of all the collected data and information are always possible. Some of the pre-conditions or essentials of interpretation may be mentioned as:

1) **Accurate data:** one of the most important prerequisites of interpretation and analysis is the availability of accurate and reliable data. Accuracy of data provides all the benefits of consistency and helps one to arrive at a true conclusion.
2) **Sufficient data:** another important pre requisite of accurate interpretation is the existence of sufficient and reliable data. The main reason for it is the basic truth that unless we have sufficient data, we may never achieve the objectives of proper interpretation and analysis.
3) **Proper type of classification and tabulation**: for attaining the objective of accurate interpretation in most of the cases, the investigators are required to base their calculations estimations and judgments on data represented in a properly classified and tabulated form.
4) **Absence of heterogeneous data:** for a uniform and accurate result the data must be homogeneous. The reason is that if the data are not homogeneous or heterogeneous it may fail to yield the desired result. For in such cases the application of statistical methods is not only impeded but may even fail to mold it to the proper channel.
5) **Possibility of statistical treatment:** it is a matter of common belief that every data or information is not suited to statistical treatment. In particular, if the subject concerned is related to quality or if the information available is scanty, they may not be regarded as suitable for statistical treatment.
6) **Consistency of information**: inconsistent information and data are always subject to inaccurate results. In mathematical and statistical treatment, however emphasis is always laid on having stable and accurate results.

HYPOTHESIS

INTRODUCTION HYPOTHESES

Ordinarily, when one talks about hypothesis, one simply means a mere assumption or some supposition to be proved or disproved. But for a researcher hypothesis is a formal question that he intends to resolve. Thus a hypothesis may be defined as a proposition or a set of proposition set forth as an explanation for the occurrence of some specified group of phenomena either asserted merely as a provisional conjecture to guide some investigation or accepted as highly probable in the light of established facts.

MEANING OF HYPOTHESIS

Once the researcher knows what his problem is, he can make a guess or number of guesses. The guesses he makes are the hypotheses which either solve the problem or guide him in further investigation. Hypothesis stands somewhat at the midpoint of research. From this midpoint one can go back to the problem and also look forward to the date. If the hypotheses are proved, the solution can be found. If it is not proved, alternatively hypotheses need to be formulated and tested.

DEFINITION

According to Lundberg "a hypothesis is tentative generalization, the validity of which remains to be tested. At the elementary level, it may be a mere hunch, guess, and imaginative data, which becomes the basis for action or investigation."

According to Goode and Hatt "hypothesis is proposition, which can be put to test to determine validity."

NEED FOR A HYPOTHESIS

A question frequently raised by every researcher is whether hypothesis is necessary for every research. A broad answer for this question is "NO". Depending upon the nature of the research study the need for a hypothesis will be explained. For instance in studies concerned with the basic objective of finding out or explaining the relationship between two or more variable, hitherto unexplained or to be tested to prove, a hypothesis is certainly required. But research studies undertaken mainly in the form of an inquiry into the happening of an incident or an event or submission of report to the government or any other organization etc, hypothesis are felt not necessary. Because in such cases the focus or the objectives are well defined and so the researcher knows that he has to only report his findings. There is little scope for interpretation or denying what has happened.

SOURCES OF HYPOTHESIS

Hypotheses may be developed from various sources. Some of the important sources are the following.

a. A hypothesis arises from intuition. These hypotheses have no clear connection with the large body of social science. The intuition is associated with an individual, who is influenced by environment.
b. A hypothesis also arises from other studies. The findings of a study may be formulated as hypothesis. The hypotheses followed in one study previously can be used in the present study.

c. Theory is a fertile seed bed of hypothesis. For example individuals who are arising in status are likely to be favorably inclined towards individual and objects that are helping their uplift in life. The researcher may identify the variables which influence the status of the said individuals.
d. Personal happiness provides scope for hypotheses. The phenomenon of personal happiness has been studied in great detail. Happiness has been correlated with income, education, occupation, social class and so on.

FORMULATION OF HYPOTHESIS

Hypothesis formulation is one of the difficult exercises undergone by every researcher. As hypothesis provides the necessary direction to the researcher, it assumes significance. A researcher may form hypothesis based on the assumptions, observation, shrewd guess or profound hunch. After this stage when the hypothesis has to be tested it becomes difficult for the researcher. Based on his observation, a researcher develops a opinion and due to his interest he may collect data and analyse the same to draw conclusions a body of knowledge. If rejected even then it is valuable. It is often said that if a researcher succeeds in formulating hypothesis, he succeeds in his research. In order to develop the ability to formulate hypothesis, a researcher should understand the characteristics of a good and usable hypothesis. These are explained below.

CHARACTERISTICS OF HYPOTHESIS

The following are some of the important characteristics of hypothesis.

- **Clarity**

The hypothesis must be conceptually clear. As Kurien stated, when the researcher attempts to establish relationship among various facts and translate these relationships into concepts, he succeeds in formulating the hypothesis. Hence when a hypothesis is conceptually clear it provides a clear direction to the researcher.

- **Scope for verification**

Hypothesis should be amenable for verification and empirical analysis. Though hypotheses can be verified in terms of moral judgments, yet such verification process will be questionable. In simple terms any hypothesis, which lends itself for rigorous test with related data, could be considerable as a usable hypothesis.

- **Specific**

The hypothesis should be very specific and not a general statement. It is very clearly stated and can be tested with relevant data. On the other hand it is very difficult to test the hypothesis.

- **Testable**

Hypothesis formulated should be testable with the available technique of analysis. Even while formulating a hypothesis, a researcher should ascertain the relevant techniques with which it could be tested. Unless the researcher is familiar with such techniques the hypothesis formed may remain untested.

- **Linked to theory**

Hypothesis should facilitate establishing relationship with a body of theory. That is guided by likes and dislikes, researcher often formulate hypothesis without examination whether the inquiry will help to oppose or support the existing theoretical basis.

TYPES OF HYPOTHESIS

- **Crude hypotheses**

A crude hypothesis is formed to initiate the process of research. When the researcher is commencing his research work, he needs some guidelines or focus. For this purpose he might develop a hypothesis based on the available evidence or data. It does no lead to higher theoretical research in the nature of a law or a theory. Such a hypothesis is called crude hypothesis.

- **Refined hypothesis**

Redefined hypothesis is one which is more significant in research and the degree of significance depends on the level of abstraction. The refined hypothesis may be hypothesis that states the existence of empirical uniformities. Hypothesis that are concerned with complex ideal types and hypothesis that are concerned with the relation of analytical variables.

- **Working hypothesis**

Working hypothesis is usually formed in the process of verifying the relationship among various variables included in research. It provides useful guideline to the researcher in determining the nature of data to be collected, volume of data required, the sample technique to be used, analytical tools to be selected etc. once the necessary data or facts are collected for the purpose of empirical verification, this types of hypothesis becomes redundant.

- **Statistical hypothesis**

Statistical hypotheses are those which are formulated based on the sample data of facts. They serve the usual purpose of testing any expected relationship among variables. Once these hypotheses are tested or verified the conclusion about the population is drawn. For example with sample data, when a tentative statements is made it is tested for acceptance or rejection. Once it is accepted with the sample data, it is used for making inferences and drawing conclusions.

- **Null hypothesis**

The term null hypothesis is very frequently used in research but mostly without knowing the meaning of it. Null hypothesis is formulated only to test whether there is any relationship between variables related to the problem being studied. Usually the null hypothesis is formed as a negative statement. For example suppose a researcher wants to examine whether there is any relationship between eye colour of husbands and wives he might collected the data from a large number of husbands and wives. To test the data he would form a null hypothesis like there is no relationship between eye colour of husbands and wives. This negative statement is then tested using relevant data and analytical technique. To give another example suppose an organization has sales data region wise and salesman wise. Suppose it wants to find out whether the mean sales differ significantly region wise and salesman wise.

HYPOTHESES TESTING PROCEDURE

The first step in testing the hypothesis is setting up of hypothesis. The conventional approaches are to set up two hypotheses instead of one. If one hypothesis is true the other is false. Alternatively if one hypothesis is rejected then the other is accepted. These hypotheses are:

a. Null hypothesis and
b. Alternative hypothesis

Following the sampling theory approach we accept or reject a hypothesis on the basis of sampling information alone. Any sample we draw will vary from the population. We must judge whether these differences are statistically significant or insignificant.

Second step in choosing a statistical technique. There are many statistical tests which are frequently used in hypothesis testing. They are Z-test, T-test, F-test and x2. The researcher should be able to choose the appropriate test. When the hypothesis pertains to a large sample (30 and more) the Z-test is used. When the sample is less than 30 the T-test can be used. The choice of test will depend upon a number of consideration such as number,

variables involved, types of data, the size of the sample and whether the samples are independent or related.

The third step is the selection of desired level of significance. The confidence with which an experimenter rejects or retains a hypothesis depends upon the level of significance. The significance level is expressed in percentage such as 5 %, 1% etc. when the researcher accepts 5 % level, he will be making a wrong decision about 5% of the time. By rejecting the hypothesis at the same level, he runs the risk of rejecting a hypothesis in 5 out of every 100 occasions.

The fourth step is the performance of computation necessary for the test. The calculation includes testing statistical and the standard error. At this stage it is worthwhile to bear in mind that when a hypothesis is tested there are four possibilities.

1) The hypothesis is true but our test leads to its rejections.
2) The hypothesis is false but our test leads to its acceptance.
3) The hypothesis is true and our test leads to its acceptance.
4) The hypothesis is false and our test leads to its rejection.

The fifth step in hypothesis is to draw statistical decision involving the acceptance or rejection of hypothesis. This will depends on whether the computed value of the test falls in the region of acceptance or in the region of rejection at a given level of significant. If a hypothesis is tasted at 5 % level and the observed set has probabilities less than 5 %, we considered that the difference between the sample statistics and hypothetical parameter is significant.

TESTING OF HYPOTHESES

Basic concepts in the context of testing of hypotheses need to be explained.

(a) Null hypothesis and alternative hypothesis

In the context of statistical analysis, we often talk about null hypothesis and alternative hypothesis. If we are to compare method A with method B about its superiority and if we proceed on the assumption that both methods are equally good, then this assumption is termed as the null hypothesis. As against this, we may think that the method A is superior or the method B is inferior, we are then stating what is termed as alternative hypothesis.

(b) The level of significance

This is a very important concept in the context of hypothesis testing. It is always some percentage (usually 5%) which should be chosen wit great care, thought and reason. In case we take the significance level at 5 per cent, then this implies that Ho will be rejected

(c) Decision rule or test of hypothesis

Given a hypothesis Ho and an alternative hypothesis Ha, we make a rule which is known as decision rule according to which we accept Ho (i.e., reject Ha) or reject Ho (i.e., accept Ha). For instance, if (Ho is that a certain lot is good (there are very few defective items in it) against Ha) that the lot is not good (there are too many defective items in it), then we must decide the number of items to be tested and the criterion for accepting or rejecting the hypothesis. We might test 10 items in the lot and plan our decision saying that if there are none or only1 defective item among the 10, we will accept Ho otherwise we will reject Ho (or accept Ha). This sort of basis is known as decision rule.

(d) Type I and Type II errors

In the context of testing of hypotheses, there are basically two types of errors we can make. We may reject Ho when Ho is true and we may accept Ho when in fact Ho is not true. The former is known as Type I error and the latter as Type II error. In other words, Type I error means rejection of hypothesis which should have been accepted and Type II error means accepting the hypothesis which should have been rejected. Type I error is denoted by α (alpha)known as α error, also called the level of significance of test; and Type II error is denoted by β (beta) known as β error. In a tabular form the said two errors can be presented as follows:

Decision	Accept Ho	Reject Ho
Ho (true)	Correct Decision	Type I error (a error)
Ho(False)	Type II Error (β Error)	Correct decision

(e) Two-tailed and One-tailed tests:

In the context of hypothesis testing, these two terms are quite important and must be clearly understood. A two-tailed test rejects the null hypothesis if, say, the sample mean is significantly higher or lower than the hypothesized value of the mean of the population. Such a test is appropriate when the null hypothesis is some specified value and the alternative hypothesis is a value not equal to the specified value of the null hypothesis.

METHODS OF TESTING HYPOTHESIS

Hypothesis testing determines the validity of the occupation with a view to choose between two conflicting hypothesis about the value of population parameter. Hypothesis testing helps to decide on the basis of a sample data whether a hypothesis population is likely

to be true or false. Statisticians have developed several tests of significance for the purpose of testing of hypothesis, which can be classified as:

- Parametric test
- Non- parametric test

PARAMETRIC TEST

Parametric tests usually examine certain properties of the population (parent) from which we drew samples. Assumptions like observation come from a normal population sample size is large, assumption about population parameters like mean, variance etc., must hold good before the parametric test can be used. The following are some of the important parametric test.

- F-test
- t-test
- $\chi 2$ -test

F - TEST

It is based on F – distribution and is used to compare the variance of the two independent samples. This test is also used in the context of analysis of variance for judging the significance of more than two sample means at one and the same time. It is also used for judging the significance of multiple correlation coefficients.

The F- test is named in honor of the great statistician R.A.Fisher.The object of the F – test is to find out whether the two independent estimate of population variance differ significantly or whether the two samples may be regarded as drawn from the normal population having the same variance.

T – TEST

Theoretical work on t-distribution was done by W.S.Gosset. t- test is based on "t" distribution and is considered an appropriate test for judging the significance of a sample mean or for judging the significance of difference between the means of two samples in case of small sample(s) when population variance is not known.

The t-distribution is used when sample size is 30 or less and the population standard deviation is unknown.

CHI-SQUARE TEST

The $\chi 2$ test is one of the simplest and most widely used parametric as well as non-parametric test in statistical work. The symbol $\chi 2$ is the Greek letter Chi, the Chi-square test was first used by Karl Pearson.

The Chi-square test value is often used to judge the significance of population variance i.e we can use the test to judge if a random sample has been drawn from a normal population with mean and with a specified variance.

Conditions for the application of $\chi 2$ test

The following conditions should be satisfied before $\chi 2$ test can be applied.

- Observations recorded and used are collected on a random basis.
- All the items in the sample must be independent.
- No group should contain very few items say less than 10. In case where the frequencies are less than 10, regrouping is done by combining the frequencies of adjoining groups so that the new frequencies become greater than 10. Some statisticians take this number as 5, but 10 is regarded as better by most of the statisticians.
- The overall number of items must also be reasonable large. It should normally be at least 50, howsoever small the number of groups may be.
- The constraints must be liner. Constraints which involve linear equations in the cell frequencies of a contingency table are known as linear constraints.

Important characteristics of $\chi 2$ test

- This test is based on frequencies and not on the parameters like mean and standard deviation.
- The test is used for testing the hypothesis and is not useful for estimation.
- This test possesses the additive property.
- This test can also be applied to a complex contingency table with several classes and as such is a very useful test in research work.
- This test is an important non parametric test as no rigid assumption are necessary in regard to the type of population no need of parameter values and relatively less mathematical details are involved.

Uses of Chi – square test

The chi square test is used broadly for purpose listed below.

- Test of goodness of fit for one way classification or for one variable only.
- Test of independence or interaction for more than one row or column in the form of a contingency table concerning several attributes.
- Test of population variance though confidence intervals suggested by $\chi 2$ test.
- Test of homogeneity.

A hypothesis is an assumption about relations between variables. It is a tentative explanation of the research problem or a guess about the research outcome. Before starting the research, the researcher has a rather general, diffused, even confused notion of the problem. It may take long time for the researcher to say what questions he had been seeking answers to. Hence, an adequate statement about the research problem is very important. What is a good problem statement? It is an interrogative statement that asks: what relationship exists between two or more variables? It then further asks questions like: Is A related to B or not? How are A and B related to C? Is a related to B under conditions X and Y? Proposing a statement pertaining to relationship between A and B is called a hypothesis.

PROCEDURE FOR TESTING HYPOTHESIS :

To test a hypothesis means to tell (on the basis of the data researcher has collected) whether or not the hypothesis seems to be valid. In hypothesis testing the main question is: whether the null hypothesis or not to accept the null hypothesis? Procedure for hypothesis testing refers to all those steps that we undertake for making a choice between the two actions i.e., rejection and acceptance of a null hypothesis. The various steps involved in hypothesis testing are stated below:

1) Making a Formal Statement :

The step consists in making a formal statement of the null hypothesis (H_o) and also of the alternative hypothesis (H_a). This means that hypothesis should clearly state, considering the nature of the research problem. For instance, Mr. X of the Civil Engineering Department wants to test the load bearing capacity of an old bridge which must be more than 10 tons, in that case he can state his hypothesis as under:

Null hypothesis H_O: $\mu = 10$ tons

Alternative hypothesis H_a: $\mu > 10$ tons

Take another example. The average score in an aptitude test administered at the national level is 80. To evaluate a state's education system, the average score of 100 of the state's students selected on the random basis was 75. The state wants to know if there is a significance difference between the local scores and the national scores. In such a situation the hypothesis may be state as under:

Null hypothesis H_O: $\mu = 80$

Alternative hypothesis H_a: $\mu \neq 80$

The formulation of hypothesis is an important step which must be accomplished with due care in accordance with the object and nature of the problem under consideration. It also

indicates whether we should use a tailed test or a two tailed test. If it, is the type greater than, we use alone tailed test, but when H_a is of the type "whether greater or smaller" then we use a two-tailed test.

2) Selecting a Significant Level

The hypothesis is tested on a pre-determined level of significance and such the same should have specified. Generally, in practice, either 5% level or 1% level is adopted for the purpose. The factors that affect the level of significance are:

- The magnitude of the difference between sample ;
- The size of the sample;
- The variability of measurements within samples;
- Whether the hypothesis is directional or non – directional (A directional hypothesis is one which predicts the direction of the difference between, say, means). In brief, the level of significance must be adequate in the context of the purpose and nature of inquiry.

3) Deciding the Distribution to Use

After deciding the level of significance, the next step in hypothesis testing is to determine the appropriate sampling distribution. The choice generally remains between distribution and the t distribution. The rules for selecting the correct distribution are similar to those which we have stated earlier in the context of estimation.

4.Selecting a Random Sample & Computing an Appropriate Value

Another step is to select a random sample(S) and compute an appropriate value from the sample data concerning the test statistic utilizing the relevant distribution. In other words, draw a sample to furnish empirical data.

5) Calculation of the Probability

One has then to calculate the probability that the sample result would diverge as widely as it has from expectations, if the null hypothesis were in fact true.

6) Comparing the Probability

Yet another step consists in comparing the probability thus calculated with the specified value for α, the significance level. If the calculated probability is equal to smaller than α value in case of one tailed test (and α/2 in case of two-tailed test), then reject the null hypothesis (i.e. accept the alternative hypothesis), but if the probability is greater than accept the null hypothesis. In case we reject H_0 we run a risk of (at most level of significance) committing an error of type I, but if we accept H_0, then we run some risk of committing error type II.

UNIT – V

REPORT WRITING

- Introduction of Report Writing
- Meaning and purpose of a reporting
- Significance of Report Writing
- Contents of Research Report
- Format or layout or section of a research report
- Important terms
- Qualities of a good report
- Types of report
- Steps in drafting of a research report
- Precautions for writing research reports
- Research process

UNIT – V

REPORT WRITING

INTRODUCTION OF REPORT WRITING

After collecting and analyzing the data, the researcher has to accomplish the task of drawing inferences followed by report writing. This has to be done very carefully, otherwise misleading conclusions maybe drawn and the whole purpose of doing research may get vitiated. It is only through interpretation that the researcher can expose relations and processes that underlie his findings. In case of hypotheses testing studies, if hypotheses are tested and upheld several times, the researcher may arrive at generalizations. But in case the researcher had no hypothesis to start with, he would try to explain his findings on the basis of some theory.

MEANING AND PURPOSE OF A REPORTING

Research reports are written to communicate the result of research, field work and other activities. Often a research report is the only concrete evidence of research and the quality of the research may be judged directly by the quality of the writing and how well the findings are conveyed.

The research report enables to demonstrate the writers ability to conduct a literature search on a selected topic, critically review the literature, compare, contract and integrate the findings, identify areas for further research and design a study to investigate are at least one of those areas.

Report can be written in such a language that it is understood clearly by the audience. The readers will be motivated to read the research report for a variety of reasons, in general they will read to,

- Learn about research related to their particular research interests.
- Keep abreast of research in the discipline in general.
- Keep current with research related to their teaching interests and
- Keep informed about the scientific, literature in related disciplines.

SIGNIFICANCE OF REPORT WRITING

Research report is considered a major component of the research study for the research task remains incomplete till the report has been presented and/or written. As a matter of fact even the most brilliant hypothesis, highly well designed and conducted research study, and the most striking generalizations and findings are of little value unless they are effectively communicated to others. The purpose of research is not well served unless the

findings are made known to others. Research results must invariably enter the general store of knowledge. All this explains the significance of writing research report. There are people who do not consider writing of report as an integral part of the research process. But the general opinion is in favor of treating the presentation of research results or the writing of report as part and parcel of the research project. Writing of report is the last step in a research study and requires a set of skills somewhat different from those called for in-respect of the earlier stages of research. This task should be accomplished by the researcher without most care; he may seek the assistance and guidance of experts for the purpose.

CONTENTS OF RESEARCH REPORT :

The researcher must keep in mind that his research report must contain following aspects:

1. Purpose of study
2. Significance of his study or statement of the problem
3. Review of literature
4. Methodology
5. Interpretation of data
6. Conclusions and suggestions
7. Bibliography
8. Appendices.

These can be discussed in detail as under:

(1)Purpose of study :

Research is one direction oriented study. He should discuss the problem of his study. He must give background of the problem. He must lay down his hypothesis of the study. Hypothesis is the statement indicating the nature of the problem. He should be able to collect data, analyze it and prove the hypothesis. The importance of the problem for the advancement of knowledge or removed of some evil may also be explained. He must use review of literature or the data from secondary source for explaining the statement of the problems.

(2) Significance of study:

Research is re-search and hence the researcher may highlight the earlier research in new manner or establish new theory. He must refer earlier research work and distinguish his own research from earlier work. He must explain how his research is different and how his research topic is different and how his research topic is important. In a statement of his problem, he must be able to explain in brief the historical account of the topic and way in which he can make and attempt. In his study, to conduct the research on his topic.

(3) Review of Literature

Research is a continuous process. He cannot avoid earlier research work. He must start with earlier work. He should note down all such research work, published in books, journals or unpublished thesis. He will get guidelines for his research from taking a review of literature. He should collect information in respect of earlier research work. He should enlist them in the given below:

1. Author/researcher
2. Title of research /Name of book
3. Publisher
4. Year of publication
5. Objectives of his study
6. Conclusion/suggestions

Then, he can compare this information with his study to show separate identity of his study. He must be honest to point out similarities and differences of his study from earlier research work.

(4) Methodology

It is related to collection of data. There are two sources for collecting data; primary and secondary. Primary data is original and collected in field work, either through questionnaire interviews. The secondary data relied on library work. Such primary data are collected by sampling method. The procedure for selecting the sample must be mentioned. The methodology must give various aspects of the problem that are studied for valid generalization about the phenomena. The scales of measurement must be explained along with different concepts used in the study.

While conducting a research based on field work, the procedural things like definition of universe, preparation of source list must be given. We use case study method, historical research etc. He must make it clear as to which method is used in his research work. When questionnaire is prepared, a copy of it must be given in appendix.

(5) Interpretation of data

Mainly the data collected from primary source need to be interpreted in systematic manner. The tabulation must be completed to draw conclusions. All the questions are not useful for report writing. One has to select them or club them according to hypothesis or objectives of study.

(6) Conclusions / Suggestions :

Data analysis forms the crux of the problem. The information collected in field work is useful to draw conclusions of study. In relation with the objectives of study the analysis of data may lead the researcher to pin point his suggestions. This is the most important part of study. The conclusions must be based on logical and statistical reasoning. The report should contain not only the generalization of inference but also the basis on which the inferences are drawn. All sorts of proofs, numerical and logical, must be given in support of any theory that has been advanced. He should point out the limitations of his study.

(7) Bibliography :

The list of references must be arranged in alphabetical order and be presented in appendix. The books should be given in first section and articles are in second section and research projects in the third. The pattern of bibliography is considered convenient and satisfactory from the point of view of reader.

(8) Appendices :

The general information in tabular form which is not directly used in the analysis of data but which is useful to understand the background of study can be given in appendix.

FORMAT (OR) LAYOUT (OR) SECTIONS OF A RESEARCH REPORT

(A) Preliminary Sections :

- Title page
- Certificate
- Declaration
- Acknowledgements
- Preface or forward or abstract
- Tables of contents
- List of tables (if any)
- List of figures (if any)

(B) Main body of the Report

1. Introduction

- Statement of the problem
- Significance of the study
- Purpose
- Definition of important terms
- Objectives

- Hypothesis
- Methodology
- Period of study
- The study of area
- The data
- Chapterisation

2. **Review of the Literature :**
    - Critical analysis of the previous research
    - Brief restatement of the present study.
3. **Design of the Study**
    - Procedures used
    - Methods of gathering data
    - Description of data.
4. **Presentation and Analysis of Data**
    - Text
    - Tables
    - Figures.
5. **Summary and Conclusions**
    - Brief restatement of the study
    - Description of procedure used
    - Main findings and conclusions
    - Recommendations for further research.

(C). Reference Sections:

- Bibliography
- Appendix
- Index.

Some of the above important terms are explained below:

- **Title page :**

The title page of the research report normally contains four main pieces of information's.

- The report title
- The name of the person, company or organization for whom the report has been prepared

- The name of the author and the company or university which originated the report
- The date of the report was completed.

Title of the report

It is a good idea to develop a "working title" for the project as the initial draft of the report is prepared. Be sure that the title is accurate; it needs to reflect the major emphasis of the paper and prepares readers for the information presented. Also the title developed should be interesting to readers and should make them want to read the rest of the report.

Abstract

"An abstract is an accurate representation of the contents of a document in an abbreviated form". An abstract can be the most difficult part of the research report to write because it is in the abstract that the subject matter would be introduced the work done would be given and selected results are presented, all in one short (about 250 words) paragraph. As a result an abstract is usually written last. It serves an important function in a research report, it communicates the scope of the paper and the topics discussed to the readers and in doing so it facilitates research.

The most common type of abstract is the informative abstract. An informative abstract summary the key information from every major section in the body of the report and provides the key facts and conclusions from the body of the reports.

Table of contents

Most reports will contain a table of contents that lists the reports contents and demonstrates how the report has been organized. Each major section is listed in the table of contents. Additional descriptive headlines are used sometimes throughout the report and for the table of contents. Using descriptive headings can help readers to see how the reports are organized if the section headings are not clear enough.

Introduction

The introduction prepares readers for the discussion that follows by introducing the purpose, scope and background of the research. The audience for the reports largely determines the length of the introduction and the amount of details included in it. Enough details should be included so that someone knowledgeable in the field can understand the subject and research.

It is very important to mention the purpose of the research and report it in the introduction. The following questions will helps to think about the purpose of the research and reason for writing a report.

- What did the research discover or prove?
- What kind of problems was investigated?
- Why was this work on this problem carried out? If the problem was assigned why did the instructor assign this particular problem, what does one learn from working on it?
- Why was this report written?

The body of the report

The body is usually the longest part of the research report, and it includes all of the evidence that readers need to have in order to understand the subject. This evidence includes details, data, and results of tests, facts and conclusions. In general the body of the research report will include three distinct sections:

- A section on theories, models and the hypothesis.
- A section in which the materials and methods used in research are discussed and
- A section in which the results of research are presented and interpreted.

Theories, models and Hypotheses :

This section may be included to discuss the theories and models upon which the research project is based. This section can be very important, especially for research articles, formal reports, or scientific papers but sometimes it will not be required for lab reports and other homework assignments. Regardless of whether this section on theories and models are included, the research will include models and theories that other researcher has developed; instead the theoretical basis for the projects will be introduced.

In this section the hypothesis and the theories and models that are used to develop it should be explained, the competing hypothesis, theories and models including their strengths and weakness should be defined and explained and the specific points where they agree or disagree should be compared and contrasted.

Materials and Methods :

The materials and methods section is similar to an instruction manual. It should describe the apparatus and the procedure that are used in the experiments. This section should be clearly and specially written, another researcher should be able to exactly duplicate the research performed by following the procedures outlined in this section.

All materials and methods sections should address the following questions.

- How was the experiment designed?
- On what subjects or materials was the experiment performed?
- How were the subjects / materials prepared?
- What machinery and equipment were used in the experiment?
- What was sequence of events that were followed, the subjects / materials that were handled and the date recorded?

Methodology :

It must be written clearly so that it would be easy for another researcher to duplicate your research if they wished to. It is usually written in a passive voice (example the participants were asked to fill in the questionnaire attached in appendix 1) rather than the active (example I asked the participants to fill in the questionnaire attached in appendix 1). It is written in past tense. Ensure that any material that has been used from another source should be clearly cited as reference. Any diagram, chart, or graph used should be labeled and numbered.

Results :

In this section of the report detailed results of the research should be given along with experimental date, observations and outcome. All preceding sections of the report lead to the results section of the report and all subsequent sections will consider what the result mean(discussion, conclusion, recommendations etc). The most common way to organize information in a research report is to list it chronologically. This method of organisation allows you to present information in the sequence that events occurred.

Figures and Tables :

Most scientific reports will use some types of figures and or tables to convey information to readers. Figures visually represent data and include graphs, charts, photographs and illustrations. Tables organize data into groups. Figures and tables should helps to simplify information, so one should consider using them when words are not able to convey information as efficiently as a visual aid would be able to.

It is important to choose the correct way to represent the data depending on the type of audience for the report. Tables or lists are simple way to organize the precise data points themselves in one on one relationship. A graph is best at showing the trend or relationship between two dimensions or the distribution of data points in a certain dimension. A pie chart is best at showing the relative areas, volume or amounts into which a whole area has been divided.

Additionally all tables and figures should be self contained they should make complete sense on their own without reference to the text be cited in the text it will be very confusing to the audience to suddenly come upon a table or figure that is not introduced somewhere in the text. They will not have a context for understanding its relevance to the report, numbers such as table 1 or figure 10 should be included which will help to distinguish multiple tables and figures from each other and include a concise title, it is a good idea to make the most important features of the data the title of the figures and tables.

Discussion

This section of the report is important because it demonstrates the meaning of the research. In this section results are interpreted and the current research results are discussed in relation to the finding of earlier research. This section of the research report begins with a discussion of the data and then the data are analyzed. How the data addresses the research problems or hypothesis should be outlined in the introduction and subsequently what can be inferred from the data as they relate to other research and scientific concepts should be discussed.

Conclusions :

The conclusion is important because it is here that the significance and meaning of the research is conveyed to the reader by concisely summarizing the findings and generalizing their importance. It is also a place to raise questions that remain unanswered and to discuss ambiguous data. The conclusion follows naturally from the interpretation of data so in some cases a separate section “Conclusions” will not be required, but the discussion can be ended with the conclusions. The unanswered question may be raised and the ambiguous data could be discussed. Raising questions or discussing ambiguous data does not mean that the work is incomplete or faulty rather it connects the research to the larger work of science and parallels the introduction in which questions are raised.

Recommendations :

This section appears in a report when the results and conclusions indicate the further work needs to be done. If a recommendations section is included there is another opportunity gives to demonstrate how the research fits within the larger perspective of science and the section can serve as a starting points for future dialogue on the subject.

References :

It is important to include a references section at the end of a report in which other sources of information have been used. Reference sections are important because they

allow other researchers to build on or to duplicate the research. Without references reader will not be able to tell whether tie information provided is credible and they will not be able to find it for themselves.

The information to be included in the reference list are the followings

- Authors name or authors names
- Title of the documents
- Identification information

Appendices :

Some information may be relevant to the supply of research but needs to be kept separate from the main body of the report to avoid interrupting the line of development of the report. Such information should be place in an Appendix. Anything can be place in an appendix as long as it is relevant and as long as reference is made to it in the body of your report. An appendix should include only one set of data but additional appendixes are acceptable if several sets of data are needed that do not belong in the same appendix. Each appendix should be labeled with a letter A, B, C and so on.

QUALITIES OF A GOOD REPORT

A good research report should have certain basic and essential characteristics and qualities.

1. **Clarity :**

The report must have sufficient clarity in thought as well as in the language used. It is better to use simple sentences. The language should be clear and the reader must be able to grasp it immediately. Each idea should be conveyed in a separate paragraph and if necessary each paragraph should be divided into small paragraphs.

2. **Concepts:**

Every concept should be clearly defined. There should be no ambiguity. If a concept or term is used in a particular sense it is better to maintain it throughout the report.

3. **Clarification of the Problems :**

A good writer should clarify the problem. The writer may indicate the difficulties experienced while defining the problem and how the difficulties were solved.

4. **Language :**

The language used should be simple, direct and positive sentences should be used. Unnecessary words should be avoided. Present rather than post tense should be used unless the report refers to the past events. There should be no spelling mistakes and

grammatical error. Correct punctuation marks should be used and that too in accordance with the standard rules.

5. **Chapterisation :**

The report writer should follow a proper chapter scheme. A good report should have chapters, sections sub sections. Each section and sub section should have headings.

6. **Presentation :**

This is a very difficult task. According to some scientists even social science report should be presented as a scientific documents and a good report writer should not worry about a lay person. All scientific terms should be explained clearly.

7. **Use of data in the Report :**

A good report writer should use only relevant and essential data. If all the available data are included the report would be boring and also make the report bulky. Essential and non-essential data should be separated.

8. **Size of the Report :**

The report should be neither too long nor too short. A short report may not contain all essential data. A bulky report might discourage the readers from reading it. Therefore the report should be of a reasonable size. It is better that appendices, tables, figures etc., are given separately so that the size of the main report is reduced considerably.

9. **Footnotes and citations :**

Report writers are often tempted to use footnotes to a great extent, thinking that it would make the report interesting. Footnotes should be given at the end of the page. The footnotes should be properly numbered and all the necessary details such as name of the authors, title of the articles, page number etc should be given.

TYPES OF REPORTS

1. **TECHNICAL REPORT / THESIS**

This is a comprehensive full report of the research process and its outcomes. It is primarily meant for academic community i.e., the scientists of the researcher's discipline and other researcher. It is a formal long report covering all the aspects of the research process a description of the problem studied, the objectives of the study, methods and techniques used a detailed account of sampling, filed and other research procedures, sources of data, tools of data collection, methods of data processing and analysis, detailed finding and conclusions and suggestions.

The technical report is essentially technical in nature and scope and couched in technical language. It follows a specified pattern and consists of several prefatory sections with appropriate headings and paragraphs.

2. POPULAR REPORT

These types of report are designed for an audience of executive / administrators and other non-technical users. The requirement of this audience is different. The reader is less concerned with methodological details but more interested in studying quickly the major findings and conclusion. He is interested in applying the finding to decisions.

The organisation of this report is very important. The presentation can be more forceful and persuasive without, of course any distortion of fact. It should be clear, brief and straight forward. Complicated statistical techniques and tables need not be used. Instead pictorial devices may be extensively used.

The format of this report is different from that of a technical report. After a brief introduction to the problem and the objectives of the study an abstract of the findings, conclusions and recommendations is presented. The methodological details, data analysis and their discussion are presented in the second part.

3. INTERIM REPORT

When there is a long time lag between data collection and the presentation of the results in the case of a sponsored project, the study may lose its significance and usefulness and the sponsor may also lose interest in it. One of the most effective's ways to avoid such eventualities is to present an interim report.

This short report may contain either the first results of the analysis or the final outcome of the analysis of some aspects / completely analyses. Whatever may be the coverage of the interim report if fulfills certain functions. It facilitates the sponsoring agency to take action without waiting for the full report.

4. SUMMARY REPORT

A summary report is generally prepared for the consumption of the lay audience namely the general public. The preparation of these types of report is desirable for any study whose findings are or general interest.

5. RESEARCH ABSTRACT

This is short summary of the technical report. It is usually prepared by a doctoral students on the eve of submitting's his thesis. Its copies are sent by the university along with the letters of request to the examinations invited to evaluate the thesis.

6. RESEARCH ARTICLE

This is short summary of the technical report. It is usually prepared by doctoral students on the eve of submitting his thesis. Its copies are sent by the university along with the letters of request to the examiner invited to evaluate the thesis.

7. RESEARCH ARTICLE

This is designed for publication in a professional journal. If a study has two or more aspects that can be discussed independently. It may be advisable to write separate articles that can be discussed independently. It may be advisable to write separate articles rather than to crowd too many things into single articles.

A research articles must be clearly written in concise and unambiguous language. It must be logically organized, progressing from a statement of the problems and the purpose of study, though the analysis of evidence, to the conclusions and implications.

- **Introduction:**

  A statement of the nature of problem and a brief review of previous studies pertinent to the development of the specific questions or hypotheses to be tested.

- **Method:**

  A brief statement of what was done where and how it was done and a statement of the specific techniques and tools used.

- **Results:**

  A presentation of the salient findings with tables or charts.

- **Discussion**

  A discussion of the findings in relation to the hypothesis or questions originally posed.

- **Conclusion**

  A presentation of the contribution of the study of theory and or practice and the board implications of the findings.

STEPS IN DRAFTING A RESEARCH REPORT

The three cardinal rules of report writing are accuracy, brevity and clarity. They are not easily mastered. It is said that hard writing makes easy reading. The report writer must constantly strive to make his reader's task as easy as the subject matter permits. A report has four stages. They are

- Preparation
- Arrangement of ideas
- Writing

- Revision

1. PREPARATION

The researcher must first decide what information he wants to convey and how the various points are related to one another. He has to prepare a detailed outline indicating what is to be said in the thesis without worrying about how it is being said. Once the outline is prepared the researcher has to see whether any idea is omitted and whether the ideas are grouped said.

2. ARRANGEMENT OF IDEAS

Arrangements of ideas and systematic presentation will evoke the interest to the reader. The researcher has to decide the order in which he wishes to present the data. The various points can be brought out by appropriately employing centre headings, sub headings, underlying, bold face type, etc. Besides there must be uniformity and consistency in the presentation of ideas and punctuation, capitalization, abbreviations, footnotes, quotations, acknowledgement and bibliography must be uniform.

3. WRITING

A well presented study often impresses the reader more than another study which may have greater scientific quality but a weaker presentation. The researcher should consider the following pre writing considerations.

- What is the purpose of the report?
- Who will read the report?
- What is the gap in knowledge on the subject between the reader and the writer?
- What are the circumstances and limitations under which the researcher writes his thesis?
- How will the report be used?

A researcher usually presents the evidence in three forms such as textual, tabular, and graphical.

The textual form is a running narrative of the facts in an explanatory or descriptive manner. A sincere effort should be made to minimize length so that the reading will be interesting and effective. If the data are quantitative, tables and graphs can be used.

The quantitative data can be presented in the form of tables. A table may be formal or informal. A formal table should be confined to a single page if possible. If should be numbered with Arabic numeral and must have a descriptive title. Avoid complex and unwieldy tables. The writer should assemble all the text materials relating to a given table in one spot.

The graphic form appeals to the reader's visual sense and permits a ready interpretation of complicated set of relationship.

a) Standard of writing

Research reports are different from other academic writings. In essays the richness of words usage is often encouraged. Research reports on the other hand are designed to convey information of a more precise nature and the reporter has to choose the word more carefully and avoid ineffective communication. There should be frequent use of section and paragraph headings, numbering and listing where appropriate. Headings provide the reader with a constant should typically provide very wide margins on sides as well as the top and the bottom of the paper.

b) Style of writing

i. **Let your sentences be short.** The reading difficulty rests on two factors- words and relationship. Longer sentences use more words and more cords cause more relationships requiring more efforts by the reader.

ii. **Prefer the simple to the complex.** The use of plain and simple language, short words and brief sentences is the modern and best way of writing English. If the right word is a big word go ahead and use it. But if a shorter word does the job, use it. For example

Complex words	**Simple words**
Utilization	Use
Initial	First
Optimum	Best

iii. **Prefer familiar words.** If the reader does not understand the words you use , his attention will go elsewhere. Therefore use familiar words.

For example : use "central agency " instead of "nodal agency"

iv. **Avoid unnecessary words.** Unnecessary words tire the reader and dull his attention.

39 words	**17 words**
It is the responsibility of each and every department head to properly arrange the affairs of his organizations in such a manner that each salaried employee including himself will which he is duly entitled.	Each department head must see that he and each salaried employee under him gets his full vacation.

v. **Use action words.** Wordiness dilutes the vigour of any action verb. Below are few examples of diluted verb. Below are few examples of diluted verbs.

Instead of this	**Try this**
Make a comment	Comment
Make a decision	Decide
Are in receipt of	Received

vi. **Voice.** The English language has two voices – active and passive. It requires more words to make a statement in the passive voice than it does in the active voice. The passive voice trends to slow down readings.

Example :

Active voice : Tom writes the letter (4 words)

Passive voice : The letter is written by Tom (6 words)

vii. **Smothered verb :** A verb is smothered when it is buried inside another word and thus loses it power to state a clear relationship.

Example : Research resulted in the production of more economic packing (smothered verb)

Research produced more economic packing

viii. **Punctuations :** carefully use the punctuations such as the full stop, the comma, the semi colon, the colon, the question mark, the exclamation mark, the bracket and the dash (-)

4. REVISION

The research report should normally go through three drafts. The objective of the first draft is comprehensiveness and fullness of facts. When the researcher has completed his first draft let him laid it aside for a day or two. Then he should criticize it objectively as if it were the work of another.

- Make cursory examinations of the draft. He has to examine whether the design of the report is appropriate and the heading is proper.
- Check the title, table of contents, introduction and conclusion.
- Examine the text in details and weigh every statement critically.
- Read the text about to yourself or preferably to somebody else. Does it read easily or smoothly? Can our listener follow you?

- Check your illustrations. Does each illustration convey its message clearly? Are the captions precise and informative?
- If possible submit the draft to a person qualified to give constructive criticism.
- It is often desirable to have a friend to read the draft critically and ask question which will show where greater detail or clarity is needed,

In the second draft the report should be improved both in the form and the language by considerable trimming and pruning. Ideas and sentences have to be realigned so that the report sets clarity, order, coherence and naturalness.

The final draft concentrates on the finish and the final touches on documentation to make the report authoritative and convincing.

PRECAUTIONS FOR WRITING RESEARCH REPORTS

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

- While determining the length of the report (since research reports vary greatly in length), one should keep in view the fact that it should be long enough to cover the subject but short enough to maintain interest. In fact, report-writing should not be a means to learning more and more about less and less.
- A research report should not, if this can be avoided, be dull; it should be such as to sustain reader's interest.
- Abstract terminology and technical jargon should be avoided in a research report. The report should be able to convey the matter as simply as possible. This, in other words, means that report should be written in an objective style in simple language, avoiding expressions such as "it seems," "there may be" and the like.
- Readers are often interested in acquiring a quick knowledge of the main findings and as such the report must provide a ready availability of the findings. For this purpose, charts, graphs and the statistical tables may be used for the various results in the main report in addition to the summary of important findings.
- The layout of the report should be well thought out and must be appropriate and in accordance with the objective of the research problem.
- The reports should be free from grammatical mistakes and must be prepared strictly in accordance with the techniques of composition of report-writing such as the use of quotations and use of abbreviations in footnotes and the like.

RESEARCH PROCESS

Before embarking on the details of research methodology and techniques, it seems appropriate to present a brief overview of the research process. Research process consists of series of actions or steps necessary to effectively carry out research and the desired sequencing of these steps.(1) formulating the research problem; (2) extensive literature survey;(3) developing the hypothesis; (4) preparing the research design; (5) determining sample design;(6)collecting the data; (7) execution of the project; (8) analysis of data; (9) hypothesis testing;(10) generalizations and interpretation, and (11) preparation of the report or presentation of the results ,i.e., formal write-up of conclusions reached .A brief description of the above stated steps will be helpful.

1. Formulating the Research Problem :

There are two types of research problems, viz., those which relate to states of nature and those which relate to relationships between variables. At the very outset the researcher must single out the problem he wants to study, i.e., he must decide the general area of interest or aspect of a subject-matter that he would like to inquire into. Initially the problem may be stated in a broad general way and then the ambiguities, if any, relating to the problem be resolved. Then, the feasibility of a particular solution has to be considered before a working formulation of the problem can be set up. The formulation of a general topic into a specific research problem, thus, constitutes the first step in a scientific enquiry

2. Extensive Literature Survey:

Once the problem is formulated, a brief summary of it should be written down. It is compulsory for a research worker writing a thesis for a Ph.D. degree to write a synopsis of the topic and submit it to the necessary Committee or the Research Board for approval. At this juncture the researcher should undertake extensive literature survey connected with the problem. For this purpose, the abstracting and indexing journals and published or unpublished bibliographies are the first place to go to. Academic journals, conference proceedings, government reports, books etc., must be tapped depending on the nature of the problem. In this process, it should be remembered that one source will lead to another. The earlier studies, if any, which are similar to the study in hand should be carefully studied. A good library will be a great help to the researcher at this stage.

3. Development of working Hypotheses :

After extensive literature survey, researcher should state in clear terms the working hypothesis or hypotheses. Working hypothesis is tentative assumption made in order to draw out and test its logical or empirical consequences. As such the manner in which research hypotheses

are developed is particularly important since they provide the focal point for research. They also affect the manner in which tests must be conducted in the analysis of data and indirectly the quality of data which is required for the analysis. In most types of research, the development of working hypothesis plays an important role. Hypothesis should be very specific and limited to the piece of research in hand because it has to be tested

a) Discussions with colleagues and experts about the problem, its origin and the objectives in seeking a solution;

(b)Examination of data and records, if available, concerning the problem for possible trends, peculiarities and other clues;

(c) Review of similar studies in the area or of the studies on similar problems; and

(d) Exploratory personal investigation which involves original field interviews on a limited scale with interested parties and individuals with a view to secure greater insight into the practical aspects of the problem

4. Preparing the Research Design:

The research problem having been formulated in clear cut terms, the researcher will be required to prepare a research design, i.e., he will have to state the conceptual structure within which research would be conducted. The preparation of such a design facilitates research to be as efficient as possible yielding maximal information.. Research purposes may be grouped into four categories, viz., (i) Exploration, (ii) Description,(iii) Diagnosis, and (iv) Experimentation. A flexible research design which provides opportunity for considering many different aspects of a problem is considered appropriate if the purpose of the research study is that of exploration. But when the purpose happens to be an accurate description of a situation or of an association between variables, the suitable design will be one that minimizes bias and maximizes the reliability of the data collected and analyzed.

5. Determining Sample Design

All the items under consideration in any field of inquiry constitute a ‘universe’ or ‘population’. A complete enumeration of all the items in the ‘population’ is known as a census inquiry. It can be presumed that in such an inquiry when all the items are covered no element of chance is left and highest accuracy is obtained.

- **Deliberate Sampling:** Deliberate sampling is also known as purposive or non-probability sampling. This sampling method involves purposive or deliberate selection of particular units of the universe for constituting a sample which represents the universe

- **Simple Random Sampling:** This type of sampling is also known as chance sampling or probability sampling where each and every item in the population has an equal chance of inclusion in the sample and each one of the possible samples, in case of finite universe, has the same probability of being selected.
- **Systematic Sampling:** In some instances the most practical way of sampling is to select every 15th name on a list, every 10th house on one side of a street and so on. Sampling of this type is known as systematic sampling. An element of randomness is usually introduced into this kind of sampling by using random numbers to pick up the unit with which to start.
- **Stratified Sampling:** If the population from which a sample is to be drawn does not constitute a homogeneous group, then stratified sampling technique is applied so as to obtain a representative sample. In this technique, the population is stratified into a number of non-overlapping subpopulations or strata and sample items are selected from each stratum.
- **Quota Sampling:** In stratified sampling the cost of taking random samples from individual strata is often so expensive that interviewers are simply given quota to be filled from different strata, the actual selection of items for sample being left to the interviewer's judgment.
- **Cluster Sampling and Area Ssampling:** Cluster sampling involves grouping the population and then selecting the groups or the clusters rather than individual elements for inclusion in the sample. Suppose some departmental store wishes to sample its credit card holders.
- **Multi- Stage Sampling:** This is a further development of the idea of cluster sampling. This technique is meant for big inquiries extending to a considerably large geographical area like an entire country. Under multi-stage sampling the first stage may be to select large primary sampling units such as states, then districts, then towns and finally certain families within towns.
- **Sequential Sampling:** This is somewhat a complex sample design where 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. This design is usually adopted under acceptance sampling plan in the context of statistical quality control

6. Collecting the Data:

In dealing with any real life problem it is often found that data at hand are inadequate, and hence, it becomes necessary to collect data that are appropriate. There are several ways

of collecting the appropriate data which differ considerably in context of money costs, time and other resources at the disposal of the researcher .Primary data can be collected either through experiment or through survey

- **By Observation:** This method implies the collection of information by way of investigator's own observation, without interviewing the respondents. The information obtained relates to what is currently happening and is not complicated by either the past behaviour or future intentions or attitudes of respondents.
- **Through Personal Interview:** The investigator follows a rigid procedure and seeks answers to a set of pre-conceived questions through personal interviews. This method of collecting data is usually carried out in a structured way where output depends upon the ability of the interviewer to a large extent
- **Through Telephone Interviews:** This method of collecting information involves contacting the respondents on telephone itself. This is not a very widely used method but it plays an important role in industrial surveys in developed regions, particularly, when the survey has to be accomplished in a very limited time
- **By mailing of Questionnaires:** The researcher and the respondents do come in contact with each other if this method of survey is adopted. Questionnaires are mailed to the respondents with a request to return after completing the same. It is the most extensively used method in various economic and business surveys.
- **Through Schedules:** Under this method the enumerators are appointed and given training. They are provided with schedules containing relevant questions. These enumerators go to respondents with these schedules. Data are collected by filling up the schedules by enumerators on the basis of replies given by respondents. Much depends upon the capability of enumerators so far as this method is concerned.

7. Execution of the Project:

Execution of the project is a very important step in the research process. If the execution of the project proceeds on correct lines, the data to be collected would be adequate and dependable. The researcher should see that the project is executed in a systematic manner and in time. If the survey is to be conducted by means of structured questionnaires, data can be readily machine-processed. In such a situation, questions as well as the possible answers may be coded. If the data are to be collected through interviewers, arrangements should be made for proper selection and training of the interviewers. The training may be given with the help of instruction manuals which explain clearly the job of the interviewers at each step.

Occasional field checks should be made to ensure that the interviewers are doing their assigned job sincerely and efficiently.

8. Analysis of Data:

After the data have been collected, the researcher turns to the task of analysing them. The analysis of data requires a number of closely related operations such as establishment of categories, the application of these categories to raw data through coding, tabulation and then drawing statistical inferences..

- **Coding Operation** is usually done at this stage through which the categories of data are transformed into symbols that may be tabulated and counted.
- **Editing** is the procedure that improves the quality of the data for coding. With coding the stage is ready for tabulation.
- **Tabulation** is a part of the technical procedure wherein the classified data are put in the form of tables. The mechanical devices can be made use of at this juncture. A great deal of data, especially in large inquiries, is tabulated by computers.

9. Hypothesis-Testing:

After analysing the data as stated above, the researcher is in a position to test the hypotheses, if any, he had formulated earlier. Do the facts support the hypotheses or they happen to be contrary? This is the usual question which should be answered while testing hypotheses. Various tests, such as Chi Square test , T-test, F -test, have been developed by statisticians for the purpose. If the researcher had no hypotheses to start with, generalizations established on the basis of data may be stated as hypotheses to be tested by subsequent researches in times to come.

10. Generalizations and Interpretation:

If a hypothesis is tested and upheld several times, it may be possible for the researcher to arrive at generalization, i.e., to build a theory. As a matter of fact ,the real value of research lies in its ability to arrive at certain generalizations. If the researcher had no hypothesis to start with, he might seek to explain his findings on the basis of some theory. It is known as interpretation. The process of interpretation may quite often trigger off new questions which in turn may lead to further researches.

11. Preparation of the Report or the Thesis:

Finally, the researcher has to prepare the report of what has been done by him. Writing of report must be done with great care keeping in view the following:

1 .The layout of the report should be as follows:

(i) The preliminary pages; (ii) the main text, and (iii) the end matter. In its preliminary pages the report should carry title and date followed by acknowledgements and foreword. Then there should be a table of contents followed by a list of tables and list of graphs and charts, if any, given in the report. The main text of the report should have the following parts:

(a) Introduction: It should contain a clear statement of the objective of the research and an explanation of the methodology adopted in accomplishing the research. The scope of the study along with various limitations should as well be stated in this part

(b) Summary of findings: After introduction there would appear a statement of findings and recommendations in non-technical language. If the findings are extensive, they should be summarized

(c) Main report: The main body of the report should be presented in logical sequence and broken-down into readily identifiable sections.

(d) Conclusion: Towards the end of the main text, researcher should again put down the results of his research clearly and precisely

2. Report should be written in a concise and objective style in simple language avoiding vague expressions such as 'it seems,' 'there may be', and the like.

3. Charts and illustrations in the main report should be used only if they present the information more clearly and forcibly.

4. Calculated 'confidence limits' must be mentioned and the various constraints experienced in conducting research operations may as well be stated.

QUESTION BANK

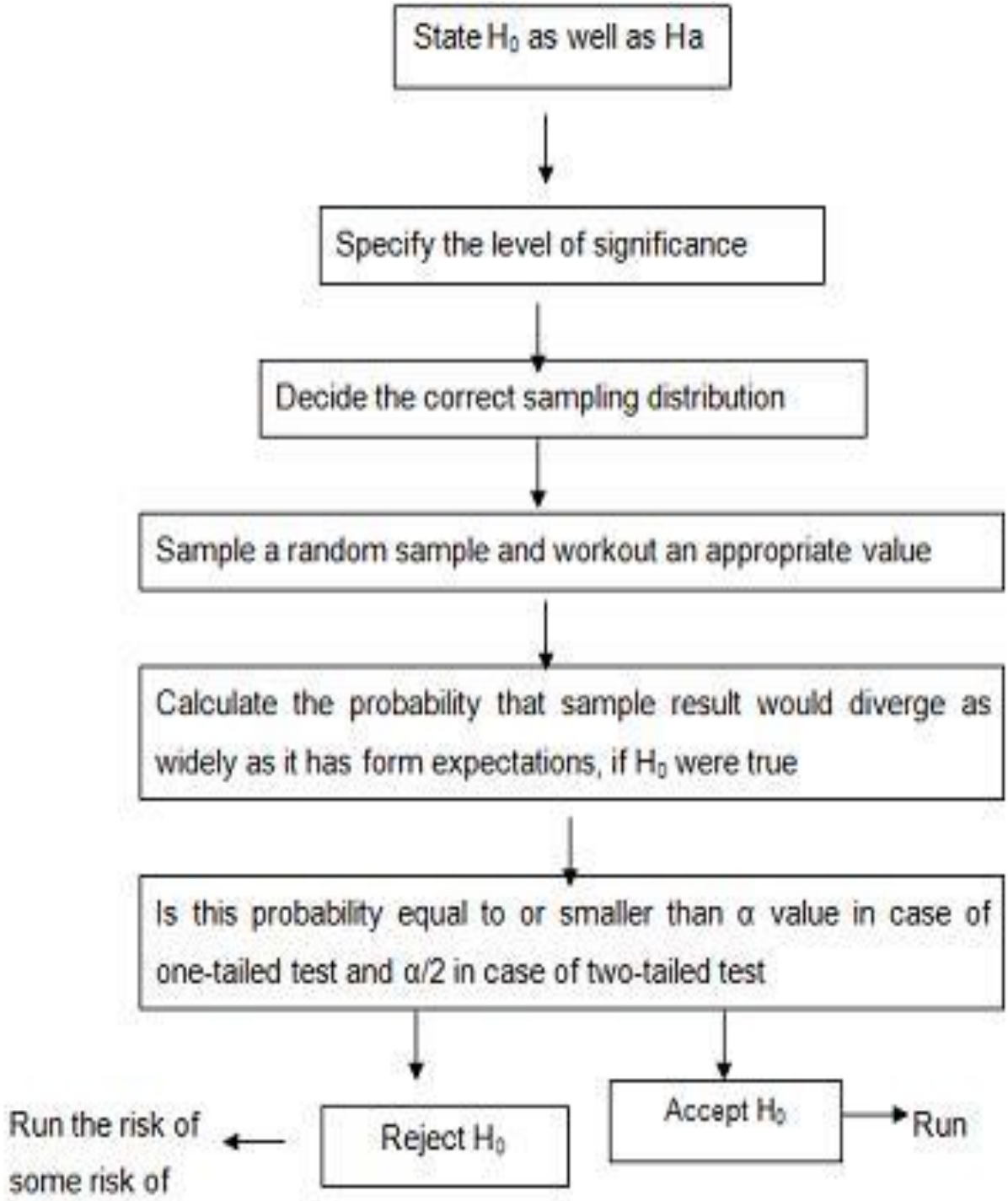
5 MARK QUESTIONS:

1. What is Research Report?
2. Explain the purpose of research?
3. State the types of research report?

10 MARK QUESTIONS:

1. Explain the content of research report?
2. Enumerate the different types of research report?
3. Explain the qualities of a good research report?
4. Give the steps in drafting the research report?

Flow Diagram for Testing Hypothesis



QUESTION BANK

5 MARK QUESTIONS:

1. What is processing of data?
2. What is Analysis of data?
3. What is Interpretation?
4. What is Hypothesis? (NOV/DEC 2011)

10 MARK QUESTIONS:

1. Explain the types of analysis of data?
2. State the procedure for testing of Hypothesis? (NOV/DEC 2011)
3. Enumerate the methods of testing of Hypothesis?