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M.COM. PART – II
RESEARCH METHODOLOGY

SYLLABUS

1. Nature of Scientific Inquiry-Scientific Methods-Induction-Deduction-Hypothesis and Theory and their Interpretation-Nature and Scope of Social Research-Need for Multi-Disciplinary Inter-Disciplinary Approach in Commerce.
2. Planning of Research-Selection of a problem for Research-Sample design-Census and Sample Surveys-Sampling techniques-Sample size.
3. Research Design-Important Aspects of Research Design.
4. Methods of Data Collection-Sources of data-Use of secondary data-Methods of collecting primary data-Observation-Interviews-Questionnaires and Schedules.
5. Processing and Analysis of Data : Processing Operations – Types of Analysis-Presentation and Interpretation of Data-Editing, Classification and Tabulation-Interpretation.
6. Preparation of a Report-Types of Report-Research Report-Format-Principles of Writing Reports-Documentation-Foonoters and Bibliography.
7. Quantative Tools-Measures of Central Tendency-Dispersion-Measures of Correlation-Simple and Multiple Correlation-testing of Hypothesis-Tests based on t-P, Z and Chisquare-Time Series Analysis-Trend Measurement-Moving Averages.

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1

INTRODUCTION TO RESEARCH METHODOLOGY

Unit Structure:

1.1 INTRODUCTION:

Research work is traditionally defined as gathering of data to answer the questions and finding solution to problems. The research work may be asked to provide answer to questions of theoretical interest to particular discipline. This may include such questions which have no interest to the society.

In this chapter the aim is to provide a brief overview of research methodology along with simple model of research methodology. We will try to find out the importance of research methodology in handling the data.

The research in management and social science are concerned with human beings, which is attach to its surroundings. The organizational behaviour is an important part of the focus of research in management and social sciences and researcher must consider this part carefully to come to conclusions.

The concepts of validity and reliability provide the criteria by which we need to judge our choice of research methods. These criteria determine the credibility and academic value of research work.

The validity means success of a method in assessing what is to be assess. If method is valid than result can be taken as true. There are four main approaches for assessing validity, viz. face validity, content validity, predictive validity and construct validity.

The4 reliability is a criterion that refer to the consistency of the data stemming from the use of a particular research method. A measure is reliable to the extent that the repeated application of it under the same conditions gives the same result. However, whatever research method is used, it is always possible to consider carefully features of research design that make for reliability.

Research is commonly known as search for knowledge. It can be defined as search for systematic knowledge. Research is scientific and systematic investigation in relation to specific aspect. It is a movement from known to unknown.

Research is considered as careful investigation or inquiry to find out new facts in any branch of knowledge. It is an original contribution to the existing stock of knowledge making for its advancement. Therefore research is systemized effort to acquire new knowledge.

Research should not be considered as academic activity only, it also applies to all the respect of human activity. Research is basis for making process of decision effective and more meaningful. It includes the defining of research problem formulation of hypothesis, collection of data, analyzing of data and arriving to conclusions. After the conclusions are drawn, it is also necessary to find out testing of the conclusions in relation to the hypothesis.

Now research has acquired so much of prominence in all the activities, that no development can be thought without proper application of research.

Research is now take up by many professional. It is a way of thinking. It critically examine the various aspect of the professional work. It is a habit of questing. What you do and systematic examination of observed information to find answer, with a view to make appropriate change for effective use of the information.

1.2 DEFINITION:

Thinkers who have contributed in defining the research are given below:

1) Grinnel further adds:

‘Research is a structured inquiry that utilizes acceptable scientific methodologies to solve problems and creates new knowledge that is generally acceptable’.

2) Burns defines:

Research as a systematic investigation to find answer to a problem.

3) According to Kerlinger:

'scientific research is a systematic, controlled empirical and critical investigation of propositions about the presumed relationships about various phenomena.

4) Bulmer states:

'Nevertheless sociological research is primarily committed to establishing systematic, reliable and valid knowledge about the social world'.

On the basis of the definitions given above we can summarize that the **research is an organized inquiry designed and carried out to provide information for solving problem.** It is a careful inquiry to discover new information to expand the existing knowledge. It is an investigation, recording and analyzing evidences for on going knowledge. The main thrust of research is on going knowledge to solve the problem. Unless the problem is properly assessed no appropriate solution can be provided.

On account of fast industrialization in post-independence period in India business in general was facing various complex situations. This has resulted in requirement for more accurate managerial and administrative decisions based on facts. This has created need for business decisions to be taken on the basis of research findings.

1.3 CHARACTERISTICS OF RESEARCH:

From these definitions it is clear that **research is a process for collecting, analyzing and interpreting information to answer questions.** But to quality as research, the process must have certain characteristics. It must, as far as possible, be controlled rigorous, systematic, valid, verifiable, empirical and critical.

Let us briefly examine these characteristics for proper understanding.

a) Controlled:

There are many factors that affect on outcome. In a study of cause and effect relationships it is important to be able to link the effect (s) with the cause (s) and vice versa. **The concept of control implies that, in exploring set up your study in a way that minimizes the effects of other factors affecting the relationship.** This is possible in physical sciences, where as in

social sciences such controls as impossible, therefore attempts are made to quantity their impact.

b) Rigorous:

You must be scrupulous in ensuring that the procedures followed to find answer to questions are relevant; appropriate and justified. Again, **the degree of rigour varies between the physical and the social sciences.**

c) Systematic:

This implies that the procedures adopted to undertake an investigation follow a certain logic sequence. The different steps cannot be taken in a haphazard way. Some procedures must follow others.

d) Valid and Verifiable:

This concept implies that whatever you conclude on the basis of your findings is correct and can be verified by you and others.

e) Empirical:

This means that any conclusions drawn are based upon hard evidence gathered from information collected from real life experiences or observations.

f) Critical:

Critical scrutiny of the procedures used and the methods employed is crucial to a research inquiry. The process of investigation must be fool proof and free from drawbacks. The process adopted and the procedures used must be able to withstand critical scrutiny.

1.4 OBJECTIVES OF RESEARCH:

The research is being conducted with a purpose of discovering answer to the question by making an application of scientific procedures. **The main object of the research work is to take out the hidden** facts yet to be discovered. Every research study has its own purpose to be attended, therefore objectives of research can be broadly classified as academic and utility one.

A) Academic Objectives – It relates to development of new concept and addition to old concept. It means that urge for knowledge is main factor in this type of objectives of research.

B) Utility objectives- It relates to utility of research work, as research work, as research is accepted for more use to the society. It has to provide the base for policy formation in the society. This

type of research must be in a position to provide for achievements in attending organizational objectives.

As explained above the research provide base for investigation by which relationship between two variables can be established. It is only in systematic research where induction and deduction are possible.

Observation is main element in the research study by which decision making ability can be increased. Collection of primary an d secondary data is involved in the research process and now with these requirements objectives of research can be further classified into following:

1. Decision making objectives.
2. Environmental objectives
3. Market objectives
4. Customer objectives
5. Profit and promotional objectives.

1. Decision making objectives:

Decision making is now influenced by research. The project identification and implementation is based on the research conducted. There cannot be any business policy which is not affected by research findings. Controlling, which is the main function in the management, can effectively be organized through research study.

2. Environmental objectives:

All the decisions in the business are taken in relation to the environment in which business operates. All the factors affecting business like state, investor, worker, customer and the competition requires systematic investigation before any decision is to be taken.

3. Market objectives:

The market objectives of research are defined as market research. This includes the market share of products, profit margin of the organization and total sales volume of the company. On the basis of the careful investigation of the available market information, relevant market strategies can be drawn regarding new product development, product selling approach and product modification.

4. Customer objectives:

The need of the customer is assessed, well in advance even before product is planned. The utility of product is decided on the basis of the quality of the product, in relation to the requirements of the customers. It is in this respect that the inquiry is conducted to find out the level of satisfaction of customers.

5. Profit and promotional objectives:

In most of the companies profit maximization is the main objective to be attended by them. This requires investigations and consultations to be conducted. Surveys are also conducted to work out the variables in support of the promotional activities. The research provide strong base for these activities. The development of business entity is based on corporate image which is outcome of the relationship between internal and external factors of the companies.

1.5 NATURE OF RESEARCH:

Research is process in which in-depth study of the problem is carried out. This requires investigation to be conducted based on collections and compilation of data along with its interpretation and presentation.

Research is properly conducted, it helpful in decision making process. There cannot be any research exercise which will not yield any additional input to knowledge. As such research involved critical examination of facts which leads to formation of new concepts of modification of old concepts.

The research activities will **help us in testing of hypothesis** and establishing relationship between variables by this we can identify the methods for solution of the research problems.

The research is a fact finding process, which influences the decisions to be taken. This also provides an opportunity to check the effectiveness of the decision taken. The research is a scientific process and it is required to conducted in proper sequences, which includes activities right from identification of research problem, formulation of hypothesis, testing of hypothesis, observation and relationship of variables and drawing of conclusions.

1.6 IMPORTANCE OF RESEARCH

All development and progress in the society is an out come of a research work. The development of logical thinking is promoted by conducting the research activities.

Research provides base for the policies formation of the Government related to agriculture, industries and infra structural services in the region.

In this context investigation in the structure of economy is conducted through compilation of data and analysis of facts. Research provides for predicting of future prospects of the region.

Research has special importance in relation to solving various problems of business and industries. Market research, operation research and motivation research are conducted in the business for various requirements.

The importance of research can also be ascertain through its application in socio political sector in order to find out solution to social and political problem of the society.

1.7 RELEVANCE OF RESEARCH:

Though **research is extensively used everywhere in business for planning, forecasting and decision making**, but it may lose its relevance of business competition in the society.

Therefore in under developed countries normally having no competition it may considered as luxury and for this very reason it may be neglected in the society. In the existing stage of business competition, where problems are becoming more complex, research, is becoming more relevant that before. Usefulness of research can very well be seen in the managerial functions.

Research establishes the relationship between variables and functional areas. It is an effective tool for forecasting. It also provides necessary help for the optimum utilisation of the available resources. The formulation and implementation of policies and strategies will be more effective, when they are based on the research studies.

Research is main source of decision making as it helps the process of thinking, analyzing and interpretation of the business situations. It provides base for innovations product development and product modifications.

1.8 RESTRICTIONS IN RESEARCH

The research suffered with certain restrictions in spite of its relevance and usefulness. **The social research is subject to changes in the society. As the social structure changes, the decisions taken can not be implemented as it is. There are several other factors which influence the decision**. Unless these factors are properly analyzed decision may be biased.

Sometimes the authorities are also not serious about the implementation of the decision taken. It business activities are carried on the basis of custom and traditions than in such case research study becomes irrelevant.

The research activities are vary expensive, therefore it may not be viable for small and medium scale unit to take advantages of the facilities.

1.9 RESEARCH PROCESS:

There are various approaches to research work. Every research project is different from each other on account its time and place in which it is to be conducted. But all the research projects will have common understanding of the society and have common steps through which research is conducted.

In order to have proper research work, every research project work, every research project has to have research problem identified. **The research process will consist of particular objective which should be clearly stated and there should be a hypothesis which has to be proceed right or wrong**. In addition to this each research project will have research design which indicates as to how required data will be collected, analyzed and interpreted.

The research process consists of series of various actions, which are necessary to effective research work. It includes all such stages required to carry out research work. This must specify desired steps involved in conducting research work.

It is necessary to understand that there is no specific sequence or established order in which research work is carried out. Therefore in research process there are certain guidelines regarding steps involved in research work.

The stages in research process are listed as, selecting research problems and stating of hypothesis, formulating of research design, collecting, analyzing and interpreting of data.

These steps can summarized as under
1. Formulate the research problem
2. Get the background information.
3. Refine your search topic
4. Consider your research option.
5. Select the appropriate tool (i.e. sampling procedure)
6. Use the tool effectively
7. Locate your material (i.e. data for research)
8. Analyses the material located (i.e. data analysis)

9. Organize and write report.
10. References and bibliography.

The stages which are explained above are depended on each other. It is clear from the above steps sequence in the research process, which are describe as under-

1. Formulation of research problem
2. Review of the existing literature
3. Formation and development of working hypothesis
4. Preparation of research design
5. Determining sample design
6. Data collection
7. Project execution
8. Data analysis
9. Testing of hypothesis
10. Data interpretation
11. Report of the research work.

In order to understand the research process perfectly brief description of each of the stages will be of more help to researchers

1. Formulation of research problem:

The research problem relates to statement of problem and relationship between two variables under study. Research has to identify the problem first and later on its required to single out the problem.

This will give scope to researcher to decide general area of interest or subject matter of that researcher who has no knowledge about subject matter will not be in a position to collect and analyze data.

Therefore researcher is suppose to have proper knowledge of later stages before be perform the earlier stages. Research process is system of interdependent related stages. Before giving brief description of the various stages involved in research process it is necessary to understand the difference between research method and research process.

2. Review of the existing literature:

Research can not be conducted without reviewing of existing literature may be conceptual or empirical in nature. Conceptual literature is concerned with concept on theories empirical literature is concerned with earlier studies of similar nature already conducted. This review of existing studies provides base to understand how to plan for the study.

3. Formation and development of working hypothesis:

After the formation of the research problem and reviewing of the available existing literature now hypothesis is required to be explained by the researcher. The normal assumptions which are the base of the study which may be tentative in nature are considered as hypothesis

4. Preparation of research design:

The research design is prepared by the research after the formulation of research problem, reviewing of literature and developing of hypothesis. If is an outline on a conceptual structure within its limit research work is suppose to be carried on. The research design is prepared with an object of collecting relevant data with the minimum efforts and with minimum of expenditure, just to control wasteful expenditure.

5. Determining sample design:

The success of the research study is largely based on proper identification of the sample to be selected for the study. the method for selecting is normally known as sample design. It is a sample plan already decided before later is collected from given population brief description of these techniques of various sampling is given below.

I. Deliberate sample:

This technique involve deliberate selection of sample which represent the whole universe.

II. Simple random sampling:

As this sample is controlled by probability, there is every equal chance for all the items of the universe to get selected.

III. Systematic sampling:

This is most simple and practical way of sampling. It is covered under the techniques of probability sampling.

IV Stratified sampling:

This is also a technique of probability sampling, which is used for the population not having homogeneous group.

V. Quota sampling:

This is an important from non-probability technique of sampling quota sampling is considered as judgement sampling.

VI. Custer sampling:

This is a probability sampling technique cluster refers to a group and in this sampling technique first the population is grouped, then specific group is selected for the study.

VII. Area sampling:

The area sampling is just like a cluster sampling when geographical area under the investigation is very large than the total area is divided into non-overlapping small area.

6. Data collection:

The data is collected as per the requirement of the study. this may be primary or secondary in nature. If the secondary is sufficient enough to assess the research problem then there is no necessity for primary data to be collected. As per the requirement of the research study appropriate data is a basic need of research. This primary data can be collected by observation, interview, questionnaire and schedule.

7. Project execution:

The project execution is very important stage in the research process. It should be executed in a systematic manner. Therefore periodical and occasional check is essential for verification of the data collected.

8. Data analysis:

In research process after the data is collected it is required to analyse the meaning of objective. The collected data is processes through various operations. So in order to make raw data meaningful these operations will help us to draw proper conclusions.

9. Testing of hypothesis:

It is only after the analysing data, researcher can go further in testing of his hypothesis in which he can ascertain the fact to support or disagree with the hypothesis.

10. Data Interpretation:

After hypothesis is tested than researcher can go further for drawing of general inferences so that he can arrive at making of statement. The ability of any research is largely based on its capacity of making general statement.

11. Report writing:

Report writing is final job to be done by the researcher. Research work which is conducted by him is finally presented in form of research report. Report must be written in systematic manner, which normally should have following parts.

I. Preliminary part
II. Main text of the report
III. Conclusion part
IV. Reference material

1.10 DIFFERENCE BETWEEN RESEARCH METHOD AND RESEARCH PROCESS

Research Method	Research Process
1. Formulation, analysis of information needed.	1. Chose broad topic. Get over view of topic, narrow down the topic.
2. Identification and appraisal of the likely resources	2. Formulate question to guide research plan for research
3. Tracing and locating individual resources	3. Find analyze and evaluate the resources
4. Examining and selecting individual resources	4. Evaluate, evidence take note, compile the bibliography.
5. Recording and storing of information	5. Established conclusions and organized information
6. Interpretation and analysis	6. Interpretation and analysis
7. Shape presentation and communication	7. Create and present final project
8. Evaluation of assignment	8. Reflection- satisfactory presentation.

1.11 QUESTIONS:

1. What do you mean by Research Methodology? Explain it's significance and describe compile the different types of research.

2. Explain the steps in research process with the help of flow chart of the research process.

2

SCIENTIFIC METHOD

Unit Structure:

2.1 INTRODUCTION:

In order to get better research results, there is a need to use scientific techniques in carrying out research. The scientific methods mean the use of technique of science in research. If the research is conducted is an objective and systematic manner, it can benefit the firms more. In India, many firms have not realized the importance of scientific research so far. Therefore, they are conducting RM in a non-scientific manner. In other words, it can be said that some Indian firms are still using the traditional method, viz., intuition, hunches, Judgement, experience, etc. for marketing decision-making. In the present chapter, we have attempted to highlight the importance and process of scientific method for RM as compared to traditional methods. The concept of hypothesis and inductive v/s deductive logic has also been discussed.

2.2 METHOD TO ELIMANATE UNCERTAINITY:

Business they days is full of risk and uncertainty. The most important function of a business manager is to minimize the risk and uncertainty through effective decision-making. In many business situations, through the risk and uncertainty cannot be

totally eliminated yet, they can be minimized through scientific decision. There are several methods of reducing uncertainty. The major methods used by Indian managers are (i) tenacity, (ii) authority, (iii) intuition, and (iv) science. Each are of these methods have been explained in ensuring text.

i) Method of Tenacity:-

Tenacity is the stubborn attitude adopted by a decision-maker. The method of tenacity in eliminating uncertainty and avoiding clutter of conflicting concept in mind, it is observed, does not have its parallel. Also this method is the easier to follow. The decision-maker using this method refuses to use other method because the latter conflict with his ideas and beliefs. His mind is closed for contradictory evidence. Frequent verbal reiteration of these ideas may strengthen the original beliefs. The decision-maker does not want to be confused by tact. He has set views and wishes them to remain consistent and unchanged. When faced by conflicting evidence, he refuses to listen or to change.

Such a tenacious hold on beliefs is guaranteed to reduce uncertainty. The person who follows this method is not designed by internal doubts. However, the results can be disastrous for the organization. For example, consider the case of marketing manager who blindly believes that increased advertising expenditures will result in increased sales faced by evidence to the contrary that increased advertising expenditures may have no effect on sales, he refuses to change his belief, clinging instead with a great tenacity to his firm view that if only more money could be spent on advertising, sales would certainly rise. The result is a waste of advertising expenditures and lower morale among the marketing group in the organization due to conflicting results.

ii) Method of Authority:-

Method of authority is also a highly effective and unmatched method of avoiding uncertainly of executives. In this case, the executive while faced with a decision-making situation avoid to make decision himself alone. He rather approaches tha higher authority and puts and challenge of decision-making to the later. The higher authority might be highly respected sources such as individual a book, company policy, traditional authority level in a company, tribunal, etc. When the decision, occasionally, happens to be wrong, the concerned executive passes on the blame to the respected sources he has conferred for this purpose. For example, when an executive, who considers advertising as the only factor responsible to increase sales, may consult a book justifying advertising as booster to sales and if the sales despite advertising decline, the blame is put to the book. In a similar manner, the decision-maker can pass on his responsibility to higher respected

authority like general manager, company policy, as stated in company's manual etc. in order to avoid uncertainty.

In India, this method is very much in practice in the government department and the public sector organizations where the blame for wrong decision is passed on to others.

iii) Method of Intuition:-

Intuition is widely used as a technique of marketing decision-making. Intuition is the used of "gut feeling" in selecting a particular course of action. Webster defines intuition as the "the power of knowing or the knowledge obtained without recourse to inference or reasoning." While making decision on the basis of intuition a marketing manager may say, "I do not think we should introduce this new product line; my intuition tells me that it would to succeed." Is he right? He might be, but if he is, it is only through chance. Valuable past experience may have had a hand in this intuitive feeling but to judge by intuition is a course of action still highly prone to error and totally non-scientific.

Why many managers resort to intuition instead of research? Actually there are several conditions that may cause a manager to rely on intuition instead of more objective methods of decision-making. The main conditions are as follows:

a) Lack of Time: A manager may lack necessary time to make a scientific decision. He may not have adequate time to conduct RM in a scientific manner. Decision on certain issue may be required quickly but scientific research within a very short time is impossible. So the manager has to resort to using intuition.

b) Lack of Money: Lack of money is another reason for using intuition that research. There may not be sufficient funds in the budget to conduct a research study on problem at hand. Sometimes the manager feels that he can save money but acting on intuition.

c) Lack of expertise: Lack of research expertise is still another reason for relying on intuition. The executive may not be capable of conducting or even getting it conducted through others owing to lack of expertise (that is necessary knowledge, qualifications and experience)

d) Ignorance: A manager may be unaware of the potential benefits of property conducted research. Therefore, he may rely upon the traditional method for decision-making.

In India many executives resort to intuitive decision-making because of one or more of the above mentioned reasons. The

method of intuition is also a very common method of avoiding uncertainty and clutter of conflicting concepts in mind. The intuition generally plays a dominant role in decision-making when quick decisions are needed. The intuition method for quick decision-making is used repeatedly to guarantee stable beliefs. The method represents an appeal to self evident propositions. So apparently true that the understanding of their meaning becomes the conviction of their truth. According to the method of intuition, a proposition is accepted or rejected in accordance with the "gut feeling" of the decision-maker.

Although some managers also said to have good intuitions than others, yet the correct decisions made by such managers are the result of careful research involving analysis existing facts. The decision-making entirely by intuition is a matter of taking chances this method is neither scientific nor sound. No organization can afford to leave vital decision-making to chance taking or intuition because a log of risk is associated with that. For example, for increasing sales a decision-maker may spend a huge amount on a advertising on the basis of intuition and decision may happen to be correct many a time but it is only a matter of taking chance and sometimes such a decision may prove to be entirely deceitful in the changed environmental conditions (viz., increase in competition, obsolescence of the product, etc.). the sale may decline tremendously despite heavy expenditure incurred on advertising (on the basis of intuition) and the company may have to suffer a great loss. Therefore, it is always better for the management to spend some amount on scientific research than to depend entirely on intuition.

2.3 SCIENTIFIC METHOD:

Science is the knowledge ascertained by observation and experiment critically tested, systematized, and brought under general principles. When we apply principle of science to reduce uncertainty in marketing problems, the technique is called scientific method. Scientific method is a set of prescribed procedures for establishing the connecting general laws about events and for predicting events yet unknown. This method is an impartial, consistent, and systematic process that may be employed in solving business problems.

While applying the scientific method to the research problems, we ask well structured and likely truthful questions from the respondent. We devise a hypothesis to be tested during the research. We set the objectives and underlying assumptions. Then we draw logical consequences of these assumptions. We collect data and test the technique for relevance and reliability. The statistical tests are applied to data and results are interpreted. The

evaluation of the truth claims of the assumptions and the fidelity of the hypothesis is conducted. Also the domains in which the assumptions and the techniques hold are determined and the new problems are raised by the stated research. Thus in a sequence we take the above mentioned listed steps one by one to apply scientific method for solving the research problems.

This method is significantly different from other three method discussed above. Tenacity, authority and intuition are all flexible approaches and there is no scope for correcting decisions if they go wrong. But scientific method provides for correcting decisions event at the last stage of execution. The previously discussed methods do not recognize that there is an inherent possibility of error. On the other hand, the scientific method encourages and demands manager to be sceptical in evaluating his proposal. In scientific approach, no information is accepted as true unless it has been carefully evaluated and tested by the best available evidence. The method of authority, tenacity and intuition are subjective whereas there is hardly any scope for subjectivity in scientific method. In other words, scientific decisions are objective and verifiable. Therefore, it is not wrong to establish that decision made by the scientific method is always correct. To make it viable and effective, research must be conducted with the help of scientific method. Owing to this reason, we have laid a greater emphasis on the scientific method to marketing research.

2.4 STEPS IN SCIENTIFIC RESEARCH:

While applying the scientific method to making research problems, four steps are taken: **(i) observation, (ii) formulation of hypothesis, (iii) prediction of future, and (iv) testing of hypothesis**.

Although application of scientific method is taken as granted in the natural sciences yet, in the social sciences, doubts regarding its application are usually expressed. But there is no basis for doubts expressed and objection raised in connection with its application to social science problems. The universal application of the scientific method to all disciplines (including management) is established as follows.

“The scientific method of investigation and analysis is used by all scientists. The subject matter being studied does not determine whether or not the process is called scientific. It makes no difference whether the investigation is in field traditionally held to be sciences such as chemistry and physics, or in the various areas of human relations including business and the other social sciences. The activity of an investigator is scientific if he correctly uses the scientific method. The investigator is a scientist; he is

correctly uses the scientific method in his thinking and searching for information."

It is evident from the above that the four steps of scientific method can be applied to marketing research problems as well. Let us apply these steps to an example concerning.

Example:

At Punjab, India ltd. A woollen hosiery manufacturing company is marketing manager examines from the available historical data that the sales restable since a long period of time. **The marketing manager is interested to improve the long-term sales outlook for his firm**. Following steps may be taken to improve the sales in the long run: (i) it may be observed whether the competitors who manufacture acrylic hosiery items have increasing sales; (ii) it may be assumed that the flatness in sales trend in the past is owing to the fact that the firm manufacture woollen hosiery which is getting replaced by the acrylic based and cotton based hosiery item; (iii) it may be predicted that sales will increase if the firm starts manufacturing acrylic based or cotton based hosiery items of comparable or better quality than that of competitors; and (iv) the above set hypothesis may be tested by producing some acrylic based hosiery and cotton some acrylic based hosiery and cotton based items and testing them in the market.

In the above example, the marketing manager might have observed that sales with acrylic and cotton hosiery goods will increase. On the other hand, if he finds a decrease in sales, he might predict that there are some other problems like that of lesser expenditure on advertising, ineffective pricing, distribution, or product policies, etc. so with the help of scientific method, he will be able to isolate the cause of stable sales. Further, he may find the solution of that particular problem and provide a desired boost to the sales. All this is carried out with the help of a scientific approach using the above mentioned four steps have been described in detail. Thus, a clear relationship between scientific method and marketing research has emerged.

Relation between scientific method and marketing research :

Sr. No.	Scientific Method Stages	Used during the following marketing research steps
1	Observation	Problem definition situation analysis informal investigation
2	Formulation of hypothesis	Situation analysis informal investigation formal research planning
3	Prediction of the future (action implications)	Situation analysis information investigation formal research (planning)
4	Testing of hypothesis	Formal research (unless management is satisfied with an earlier but more intuitive solution)

2.5 DISTINCTION BETWEEN SCIENTIFIC METHOD AND NON-SCIENTIFIC METHOD:

There are following five points of difference between the two methods: (i) the objectivity of the investigator; (ii) the systematic manager of measurement; (iii) the accuracy of measurement; (iv) the degree to which the investigation is continuing and exhaustive; and (v) the method of analysis and interpretation of data. The distinction between the two is brought about in table 2.2

Distinction between Scientific and Non-scientific Method :

Sr. No.	**Scientific Method**	**Non-Scientific Method**
1	Objectivity of the investigator: The scientific method is **more objective** because it attempts to eliminate the preconception or desires of the investigator from the results, making them unbiased	The non-scientific method is **more subjective** because it based its judgement on pre-conceived notions authoritative statement or intuition, making the results more biased
2	**Systematic procedure:** the scientific method proceeds in a **systematic manner** with pre-designed steps for this purpose	This non-scientific method is carried out in a **haphazard manner**
3	**Accuracy procedure:** The results in a scientific method can be measured more accurately with the help of electronic measuring devices which are available for most of the research conducted scientifically. Most of the data is quantitative and hence measurable	The results in a non-scientific method **cannot be measured accurately** because accurate measuring devices do not lend themselves owing to unsystematically conducted research and scattered or sporadic presence of data. Also most of the data are qualitative in nature.

4	Continuing and exhaustive nature is of investigation scientific method considers all the fact that are pertinent to the problem at hand. Evidences are found to support the existing conclusion repeatedly. The scientist is never sure that he has found the ultimate truth.	Non-scientific method does not consider all the facts will regard to problems at hand. It is not continues like scientific method because the results are not scientific and same cannot be taken up further researches.
5	Method of analysis and interpretation: a number of statistical techniques are applied to analyse the data	The sophisticated statistical took may not be applicable because of the sporadic nature of data and its qualitative nature.

It is evident from the above table that the first three steps of the scientific method are concerned with the problem definition, situation analysis, informal investigation and formal research planning. It is the testing of hypothesis, the fourth step, which deals with the rest of the research process, viz. research design, field work analysis and results presentation. Thus, the scientific method covers within its told the whole of MR process. Also, that this method lays more emphasis on problem definition step than an others.

2.6 DIFFICULTIES IN APPLYING SCIENTIFIC METHOD : BUSINESS RESEARCH

It is easy to explain conceptual frame work of scientific method but may not be that simple to apply it in practical situations. The researchers may encounter some difficulties while attempting to apply the scientific method. There are six main difficulties facing the researchers? Viz. (i) complexity of subject; (ii) difficulty of obtaining accurate measurements; (iii) process of measurement may influence results; (iv) difficulty of using experiments to text hypothesis; (v) difficulty of making accurate predictions; and (vi) problematic objectivity of investigator. Each of these difficulties have been discussed in the ensuring text.

i) Greater Complexity of Subject:-

The subject of business is very complex and diverse. The complexity and diversity increase wherein attempt is made to study customers' wants value, beliefs and attitudes. These aspects exit not only in customer's conscious but also in his sub-conscious mind. All these factors are concerning the human behaviour. It becomes difficult to measure these factors owing to their changing nature. Therefore, all these factors of behaviour are considered as uncontrollable. It is very difficult to develop an exact science to measure these fast changing, uncontrollable factors. For example, a customer may purchase Beer A for three times and shift to Beer

B on the fourth purchasing occasion. This example shows that the human behaviour goes on changing. If we want to study some behavioural aspects, viz. attitudes of customers behaviour becomes by the time study results are ready to be presented.

ii) Difficulty of obtaining accurate measurement:-

Scientific method tries to measure the variables precisely and accurately. But customer responses like satisfactory, very satisfactory, most satisfactory etc. are difficult to measure even with the help of well-designed techniques, namely, Likert, Thurstone, or other scales of attitude measurement.

It is also difficult to determine whether the respondent is responding correctly. For example, a consumer may like and purchase a different brand or may not respond in affirmative manner just to satisfy the investigators objective. Therefore, it may be difficult to measure the actual truth concerning the respondents.

iii) Influence of measurement process on results:-

It is much easier to measure the behaviour of rate and rabbits kept in cages as compared to measuring of human being's purchasing behaviour. When the respondents come to know that they are being observed with regard to a particular product purchase or aspect, they improve upon their otherwise crude behaviour during the time of observation. Therefore, the results obtained air different than the actual behaviour. In such situation, the scientific method fails to avoid the influence of the measurement process on the study results.

iv) Difficulty of using experiments of test hypotheses:-

Testing of hypothesis is the core of the scientific research. For this purpose, accurate measurement of the systematically collected data in a controllable laboratory environment is needed. In natural sciences, the experiments are conducted by controlling all but one factor which is allowed to vary and its effect is measured. The accurate measurement may be a problem in marketing. In marketing, experimentation is not easy because experiments are to be conducted in the open market place. Where so many uncontrollable cost their influence on the experiment. For example, in a study of measuring the effect of advertising on consumers purchase behaviour. In this case, the factors others than advertising may be changing values of consumers. These influencing factors may be personal selling and sales promotion efforts. Thus, it may be concluded that it is difficult to conduct experiments in marketing. Due to openness of the market place, exact data cannot be obtained. Without the exactness in data, the hypothesis cannot be accurately tested.

v) Difficulty in making accurate prediction:-

It is easier to predict the behaviour of a rate or a rabbit kept in a cage toward certain variable. But in marketing, predicting a customer's behaviour is difficult. There exists hardly any technique to exactly measure the result and one can imagine the reliability and validity of prediction based on inaccurately measured information. Moreover, human behaviour changes very fast, by the time study results and presented, the previous behaviour may undergo a variation. This invalidated the predictions in marketing. It is similar to the meteorologist attempt to predict the weather conditions. The meteorologist's prediction may be wrong sometimes but people believe it to be correct. Similarly, we have to believe on the marketing forecast because business activity is based on the forecasts.

vi) Problematic objectivity of the investigator:-

Major cornerstone of physical research is its objectivity, the objectivity lack in marketing research. Most of the times, the investigators may manipulate results rather that particularly administering the questionnaires or conducting interviews. Because there hardly exists any systematic check for this.

It is not objectivity lacks only owing to the conscious manipulation on the part of researcher. Sometimes, the objectivity may be experienced by the bias entering the research results during the interviews. It may be due to the unconscious wron wording of questions, administering the questionnaire wrongly or use of leading questions.

The bias can be removed to a greater extent if the investigator is warned in advance that there will be surprise checks to maintain objectivity. The unconscious bias can be removed substantially by better selection and training of the investigators before the research begins. However, time and financial constraints may not allow the proper selection and training during a research project report.

In a nutshell, the objective of explaining the above mentioned difficulties faced during the application of scientific method to research problems is not to discourage the marketing researchers. It is an attempt to create an awareness that such problems may exist. By getting aware of these difficulties, the research may take a corrective action in advance and become prepared to face these difficulties.

2.7 INDUCTIVE V/S DEDUCTIVE LOGIC:

A research may use inductive or deductive logic while conducting analysis of problem at hand. **Inductive logic refers to**

the method of research where the researcher starts with the general information concerning his problem and draws specific conclusions after analysis. For example, while developing advertising message for products many creative people proceed inductively. They collect opinions of consumers' dealers, experts and competitors to spot ideas. Suppose a hair spray company carries out consumer research annually to determine consumer dissatisfaction with existing brands. If it is found that consumers would like stronger holding power, the company would use this appeal, assuming that company's brand promises good holding power or can be reformulated to meet this claim.

Inductive logic may be described as the "system of synthesis" because it carries out a large-scale analysis of general information gathered preferably through census method and draws specific conclusions. The Government of India conducts census after every ten years starting from 1951 and collects and analyses data an each Indian citizen to draw specific conclusions about the overall Indian population like their sex ratio, per capita income, etc. Similarly, individual researcher also collects and analyses maximum available data on the problem and draws specific conclusions. This is more true in the case of exploratory research. Suppose, the researcher has a problem at hand "MIS practice in public sector in India." This is an exploratory research problem and researcher would proceed inductively.

On the other hand, deductive logic refer to a situation where the researcher begins his analysis of specific data and draws wide ranging general conclusions. It is also clear from the dictionary meaning of the word 'deduce' which means to infer from what precedes or from premises. In this approach, the researcher divided\s the whole in to smaller parts and analyses each of these to each conclusions. For example, while generating advertising appeals. Maloney developed a possible frame work. He suggested that the buyer may be expecting any four types of award from an offering; rational, sensory, social and ego satisfaction. And they may visualize these rewards from results of use experience. Product in use is incidental to use experience. By multiplying these four attributes by three, he gets twelve combinations to develop the messages. In this case, he started from specific and came to the general conclusions also called reverted tunnel approach.

Similarly, a researcher will proceed according to deductive logic if he has the research problem, i.e. "10 per cent decrease in sales is due to 2 percent decrease in advertising expenditure." Generally, deductive logic is applicable in descriptive and experimental researches. In practice, it is the nature of problem which determines the type of logic required for its solutions.

2.10 REVIEW QUESTIONS:

1. Describe why intuition is used mostly in marketing decision-making in Indian situations. Give examples to explain your answer.
2. Highlight various methods of eliminating uncertainty in marketing decision making. Give merits and demerits of each
3. Differentiate between scientific and non-scientific methods of research as used in marketing area. Does the scientific method cover all the steps mentioned in MR process?
4. What do you understand by the term scientific method? What steps are used while applying scientific method to market problems?
5. What do you mean by the term Inductive logic and deductive logic? Highlight their used in marketing research projects by giving suitable examples.

3

SOCIAL SCIENCE RESEARCH

Unit structure :

3.1 INTRODUCTION:

Sciences are broadly divided into natural (or physical) sciences and social sciences. **Social sciences include various disciplines dealing with human life, human behaviour, social groups and social institutions. They consist of Anthropology, Behaviour Science, Commerce, Demography, Economics, Education, Geography, History, Law, Linguistics management, Political Science, Psychology, Public Administration**. Sociology and Social Work. Though these sciences are treated as separate branches of knowledge for the purpose of study, they are interdependent studies of the different aspects of the same object, viz. man. By applying scientific method of study, the social sciences have grown and advanced man's knowledge of himself.

Social Sciences are not exact science like physical sciences, as they unlike the latter, deal with human beings. Human nature and man's environment are so complex that it is more difficult to comprehend and predict human behaviour than the physical phenomena. No two persons are alike in feelings drives or emotions. No one is consistent from one moment to another. The behaviour of human beings is influenced by biological, psychological, socio-cultural, temporal and environmental factors. It is difficult to see the underlying uniformities in the diversity of complex human behaviour. A controlled experiment, which is sine qua non of an empirical science, in general well high impossible in social sciences.

3.2 MEANING OF SOCIAL SCIENCE RESEARCH:

"Social science research is a systematic method o exploring, analysing and conceptualizing human life in order to extend, correct or verify knowledge of human behaviour and social life." In other words, social science research seek to find explanations to unexplained social phenomena, to clarify the doubtful and correct the misconceived facts of social life.

3.3 OBJECTIVES OF SOCIAL SCIENCE RESEARCH:

The aim of social science research, like research in physical sciences, **is to discover new facts**.

It tries **to understand the human behaviour** and its interaction with the environment and the social institutions.

It tries **to find out the casual connection between human** activities and natural laws governing them.

Another purpose of social science research is **to develop new scientific tools, concepts and theories which** would facilitate reliable and valid study of human behaviour and social life.

3.4 FUNCTIONS OR USES OF SOCIAL SCIENE RESEARCH:

The functions of social science research are varied they are:

1 Discovery of facts and their Interpretation:- Research provides answer to questions of what, where, when, how and why of man, social life and institutions. They are half truths pseudo-truths and superstitions. Discovery of facts and their interpretation help us discard such distortions and thus enlighten us and

contribute to our understanding of social reality research strengthens our desire for truth and opens up before our eyes, hidden social mysteries.

2 Diagnosis of problems and their analysis:- The developing courtiers have innumerable problems such as poverty, unemployment, economic imbalance, economic inequality, social tension, low productivity, technological backwardness, etc. The nature and dimensions of such problems have to be diagnosed and analysed; social science research plays a significant role in this respect. An analysis of problems leads to an identification of appropriate remedial actions.

3 Systematization of knowledge:- The facts discovered through research are systematized and the body of knowledge is developed. Thus research contributes to the growth of various social sciences and theory building.

4 Control over social phenomena:- Research in social science areas equips us with first-hand knowledge about the organizing and working of the society and its institutions. This knowledge gives us a greater power of control over the social phenomena.

5 Prediction:- Research aims at findings an order among social facts and their casual relation. This affords a sound basis for prediction in several cases. Although the predictions cannot be perfect because of the inherent limitations of social sciences, they will be fairly useful for better social planning and control.

6 Development planning:- Planning for socio-economic development calls for baseline data on the various aspects of our society and economy, resource endowment, peoples needs and aspirations, etc. systematic research can give us the required data base for planning and designing developmental schemes and programmes. Analytical studies can illuminate critical areas of policy and testing the validity of planning assumptions. Evaluation studies point the impact of plan, policies and programmes and throw out suggestions for their proper reformulation.

7 Social Welfare:- Social research can unfold and identify the causes of social evils problems. It can thus help in taking appropriate remedial actions. It can also give us soun guidelines for appropriate positive measures of reform and social welfare.

3.5 SCOPE OF SOCIAL SCIENCE RESEARCH:

The fields of social science research are virtually unlimited and the material of research endless. Every group of social

phenomena, every phase of human life and every stage of past and present development are material for the social scientists.

Inter-disciplinary Approach:-

Social science research calls for inter-disciplinary approach for human life cannot be compartmentalized into psychological, social economic or political aspects. Man lives in a social economic and political world and thrive on its varied relationships. It is inconceivable that the study of bare and isolated events on any one aspect of man's life would yield any meaningful results. A discipline-specific study of a social problem from an angle of say economics or sociology or political science only cannot give a correct and total view of the problem. As Gunnar Myrdal points out, in reality there are no economic, sociological or psychological problems, but simply problems and they are complex. Myrdal's most enduring contribution of circular cumulative causation stresses that no social science by itself is sufficiently self-contained to deal with any social problem. It is affected cumulatively by economical, sociological, psychological, legal, historical forces and factors. For example, the problem of poverty cannot be just studied as a mere economic problem or a social problem or a political issue. The approaches and theories of all these disciplines must be blended to provide meaningful and valid approach to the problem. This inter-disciplinary approach facilitates better understanding of the complex level of social-psychological-economic-political forces, intricately intervention in modern life.

3.6 OBJECTIVITY:

3.6.1 MEANING:-

Objectivity means the willingness and ability to examine evidence dispassionately. It is first condition of research objectivity means basing conclusion on facts without any bias and value judgement. The conclusion should be independent one's personal beliefs, likes, dislikes and hopes. Both the data and the inference drawn from their analysis must be free from bias and prejudices.

3.6.2 FACTORS AFFECTING OBJECTIVITY:-

It is very difficult to achieve objectivity in social science research. This difficulty arises out of the adverse influences of (1) personal prejudices and bias (2) value judgement (3) ethical dilemma and (4) complexity of social phenomena.

a) Personal prejudices and biases emanate from habits of thought, temperamental weaknesses, skeptical attitude, wishful thinking, vested interest, etc. prejudice and biases and like

fantasies to believe what is comforting to believe. These make on to believe something without considering evidence.

b) Value related problem From the social context within which research occurs. A researchers attitudes towards socio-economic issues are influenced by his values. His judgement is coloured by the ism capitalism or communism or socialism, etc to which he belongs and the writer/philosopher who inspired him. Even great social scientists project their values and views in their theories.

c) Personal preconceptions:- Personal Preconceptions may not only have a distorting effect on the data but are also highly insidious, because they are so "subtle, so implicit, so deeply noted that it is difficult for us to discern them in ourselves, or when they are called to our attention, to avoid rationalizing them, instead of exampling them objectively.

d) Ethical dilemmas arises of the researcher's relations with other participants in the research process. There are four types of interpersonal relations that pose potential ethical dilemmas; (1) relations with those sponsoring the research, (2) relations with those permitting access to sources of data, (3) relations with the investigators connected with the project, and (4) relations with research subjects themselves.

e) Social Phenomena are too complex for easy comprehension, and too vast to provide precise verifiable knowledge. A physical scientist is confined to the four walls of a laboratory, and the can conduct controlled experimentation. On other hand, laboratory of social scientists is as vast as the entire society and it is not amenable for controller's experimentation.

Although strict objectivity is next to impossibility, it is possible for a reflective researcher of social life to attain a reasonable level for objectivity consistent with logical and systematic thinking. Achieving reasonable objectivity in social science research.

Approaches of Objectives :

The following **approaches and measures may contribute** to some degree of objectivity:

1 Patience and self-control:- A researcher must have utmost patience and self-control. He should not be overwhelmed by personal likes and undisciplined imagination and wishful thinking. He must discipline himself to avoid prejudging the phenomenon under study.

2 Open mind:- A researcher often succumbs to the habit of thinking and personal notions that leads him to presuppose that certain facts are truths. He must have an open mind to subject his research process and interpretations to the critical review of other scientists. Only by such interaction can corrections be made.

3 Use of standardised concepts:- The concepts should be precisely defined and used consistently so as to avoid misconceptions and confusion.

4 Use of quantitative method:- Appropriate statistical and mathematical techniques of analysis may be used as they are free from subjective bias.

5 Co-operative research:- Group research will be more objective than an individual research. Group interaction will reduce the influence of personal bias.

6 Use of random sampling:- In drawing a sample of units of study, random sampling technique may be used, as it is free from personal prejudices.

3.7 LIMITATIONS OF SOCIAL SCIENCES RESEARCH

Research in social sciences has certain limitations and problems when compared with research in physical sciences. They are discussed below:

a) Scientists a part of what is studied:-

The fact that social scientist is part of the human society which he studies gives rise to certain limitations.

Man must have to be his won guinea pig. as pointed out by Jalian Huxley. This has a number of methodological consequences. For example, it restricts the scope for controlled experiments. It limits the scope for objectivity in social science research as explained earlier. (see section 2.2 above).

3.8 COMPLEXITY OF THE SUBJECT MATTER

The subject matter of research in social science, viz. human society and human behaviour is too complex varied and changing to yield to the scientific categorization, measurement, analysis and prediction. The multiplicity and complexity of causation make it difficult to apply the technique of experimentation.

Human behaviour can be studied only be other human beings, and this always distorts fundamentally the facts being

studied so that there can be no objective procedure for achieving the truth.

Human Problems:-

A social scientist faces certain human problems, which the natural scientist is sparred. These problems are varied and include refusal of respondents improper understanding of questions by them their loss of memory, their reluctance to furnish certain information, etc. All these problems cause biases and invalidate the research findings and conclusions.

Personal Values:-

Subjects and clients, as well as investigators, have personal values, which are apt to become involved in the research process. One should not assume that these are freely exploitable. The investigator must have respect for the client's values.

Anthropomorphization:-

Another hazard of social science research is the danger of the temption to anthropomorphize about humans, it results in using observation obtained by sheer intuition or empathy in conceptualizing in anthropomorphic manner.

Wrong Decisions:-

The quality of research findings depends upon the soundness of decisions made by the social scientist on such crucial stages of his research process as definition of the unit of study operationalization of concepts, selection of sampling techniques and statistical techniques. Any mistake in any of these decisions will vitiate the validity of his findings.

3.9 ETHICS IN SOCIAL SCIENCE RESEARCH:

3.9.1 Introduction :

Research in social science often involves use of unethical practise. Issues of ethics arise primarily out of researcher's relations with (a) sponsors of research (b) those who permit access to sources of data, and (c) research participants/respondents.

3.9.2 Ethical Issues of Research Sponsorship :

Research may be funded by either research promotional bodies like research foundation. Indian council of social science research and similar councils and university grants commissions or research users like planning commission, government departments and business undertakings and financial institutions. In the former case, the funding takes the form of research grant and the researcher himself takes initiative. He forwards his research proposal to the promotional body for research grant. The granting

agency does not prohibit the publication of the results for consumption by the scientific community.

A contracted research:- Undertaken for a sponsoring user organization specific the nature of the work to be done the time period for its completion and the conditions relating to the use of results given the highly structured and restricted nature of contract research and the explicitly stated intention of the sponsors the primary ethical questions posed are: whether the researcher wants to operate within the confines of such restriction and whether he is willing to accepts the restrictions regarding the publication of the research findings. The researcher must decide these issues before accepting the assignment.

3.9.3 APPROVAL OF ACCESS OF DATA :

A social science research may require collection of data from the document and records of an institution or from its employees. The permission from the head of the institution has to be sought. The ethical issues that arise in this context are:

- Should be nature of the research project and its objective be indicated to the permission granting authority?
- What should be the degree of anonymity to be accorded to the institution concerned?
- Should be procedure for handling data in ways assuring the degree of anonymity guaranteed be stated?
- Should the findings of the study be made available to the institution concerned? If so, in what form they should be made available?

These is no hard and fast rule for deciding these questions. They have to be settled mutually by the researcher and the head of the institution concerned.

3.9.4 Ethical Issues Relating to be Respondents / Subjects :

Of all the ethical issues, the issues concerned with the respondents are far more important. The respondents constitute the research subjects. They are individuals from whom data are obtained, the major categories of ethical issues relating to the research subjects are:-

1 sometimes people are made to participate in a research project without their knowledge of consent. For example, in social-anthropological studies of rural or tribal communities, the research may conduct his research without the knowledge of the people concerned fearing that their awareness of the research may affect the naturalness of their responses or behaviour. The researcher

who involves the research subject in research thus infringes upon their right to make their own decision to participate or not to participate.

Ideally speaking, the research subjects consent should be obtained after giving them enough information about the proposed research. But often, the consent any be wholly or partially forced. For instance, the employer may direct his employees to cooperate with a research project, or strong incentives may be offered to tempt the participants to give consent such coercions restrict the research subjects freedom to decide whether or not to participate in a research.

2 In some researches, the consent of respondents is obtained without informing them of the purpose of the research, such concealment naturally curtails the free choice of the respondents.

3 In some researches, the researcher may find it necessary to give incorrect information about the proposed research to potential subjects in order to manipulate their perceptions and behaviour such deceptions are regarded as questionable practices.

4 In studies relating to human values, the social scientists may create opportunities for research subjects to lie steal or cheat. It is appropriate to expose research subjects to such moral hazards? Opinions differ.

5 Another questionable/non-ethical practice is to expose participants to physical or metal stress with a view to studying their reactions. For example, in a mock-hijacking of an air craft or a mock-panic situation in a crowd without a fore-warning, people are subject to physical or mental stress.

6 A behavioural scientist may dig out information from respondents on private or personal matters such as marital life of religious faith or personal opinions by employing techniques of participant observation, in-depth interviews or disguised projective test such practices amount to invasion of privacy.

7 finally, there is the ethical relating to the obligation of maintaining the anonymity of the research respondents and keeping research data in confidence anonymity might be violated through reports and publication. Despite the practice of using pseudonyms, the identity of the community or institutions becomes known indirectly.

Although a respondent’s name remains anonymous, his data contribute to the averages/percentages reported for the group to which he belongs. Should the respents be told before hand of the uses to which their data will be put?

3.9.5 Ethical Dilemmas or Benefits of Research :

The above categories of ethical difficulties arise in social science research. The crucial question that arises is: “should a social scientist adopt some unethical practices out of necessity or abandon his proposed research? It is not easy to decided this question one of the alternatives ethics or research has to be sacrificed. However, in the larger interest of developing useful knowledge, it is desirable to strike a balance between the moral cost of unethical practices and the potential benefits of research. No doubt that, researchers has an obligation to the research subjects. But they have a greater social responsibility to find facts relevant to the solution of pressing human problems and thus to promote social welfare. An evaluation of such potential benefits of research and the moral cost of unethical practices will provide the clue to the choice when the benefits far exceed the moral cost, it is desirable to go ahead with the research, even it calls for some unethical practice like concealing facts, invasion of privacy of respondents, etc. however, participants should not be exposed to physical or mental stress. Professional association must devise codes of ethics to be followed while obtaining information from individuals.

3.10 QUESTIONS

1) What do you mean by Social Science Research? Discuss its objectives and functions.
2) Explain the scope of social science Research.
3) Write a note on

4

TYPES AND METHODS OF RESEARCH

Unit structure :

4.1 INTRODUCTION:

Although any typology of research is inevitable arbitrary, research may be classified crudely according to its major intent or the methods. According to the intent, research may be classified as

- Pure Research
- Applied Research
- Exploratory Research
- Descriptive Study
- Diagnostic Study
- Evaluation Study
- Action Research

According to the methods of study, research may be classified as:

- Expectational Research
- Analytical Research
- Historical Research
- Survey

The nature of classification:-

The above classification is not a watertight demarcation. It is just an approach to differentiate the distinctive approaches to research for the purpose of better understanding the different types of research are of course, not sharply distinguishable from one another. There may be overlapping between one type/method and another. For example, pure research may involve experimentation or case study or analytical study; evaluation studies may apply experimental or survey methods; experimental research is necessary an analytical study; survey research may involve quasi experimental approach or analytical approach; and so on.

In the following sections, the meaning, nature and the other aspects of each of the above types and the methods of research are discussed choice of type/method of research.

The quality of Research:-

Project depends, among the other things, upon the suitability of the method selected for it. Hence care should be taken in selecting the appropriate method of research for any project. A thorough knowledge of types and methods of research is essential for this purpose.

4.2 PURE AND APPLIED RESEARCH:

Pure Research:-

Pure research is undertaken for the sake of knowledge without any intention to apply it in practice, e.g., Einstein's theory of relativity, Newton's contribution, Galileo's contribution etc.

Pure research is also known as basic or fundamental research. It is undertaken out of inetlectual curiosity or inquisitiveness. It is not necessarily problem-oriented. It aims at extension of knowledge. It may lead to either discovery of a new theory or refinement of an existing theory. The development of various sciences owes much to pure research. The findings of pure research enrich the storehouse of knowledge that can be drawn upon in the future to formulate significant practical researchers. In the words of Dixy, " natural knowledge pursued for its own sake without any direct view to future utility will often lead to results of most unexpected kind and of very highest practical importance." Thus, pure research lays the foundation for applied research. The findings of pure research formed the basis for innumerable scientific and technological inventions like steam engine, machines automobiles, electronic gadgets, electronic data

processing, telecommunication, etc, which have revolutionized an enriched out human life.

Applied Research:-

Applied research is carried on to find solution to a real life problem requiring an action or policy decision. It is thus problem oriented and action action-directed. It seeks an immediate and practical result, e.g., marketing research carried on for developing a new market or for studying the post-purchase experience of customers.

There is vase scope for applied research in the fields of technology, management, commerce, economics and other social sciences. Innumerable problems are faced in those areas. They need empirical study for finding solutions.

Though the immediate purpose of an applied research is to find solutions to a practical problem, it may incidentally contribute to the development of theoretical knowledge by leading to the discovery of new facts or testing of a theory or to conceptual clarity.

The interplay between Pure and Applied Research:-

The distinction between pure and applied research is not absolute, but at best only relative, for pure research may have significant potential for its application to the solution of a practical problem now or later (e.g. application of Newton's Low of Gravity in space research); and applied research may end up making a scientific contribution to the development of the theoretical knowledge (e.g., Elton Mayo's Howthorne Study's contribution to Behavioural Science).

The terms, 'pure' and 'applied' just represent the polar ends of a continuum, "Research studies have differing degrees of 'purity' and 'applicability', depending on whether their purpose is solely to advance knowledge in a field or to solve some functional problem."[2]

Goode and Hatt have highlighted the mutual contribution between pure and applied research.

Contribution of Pure Research:-

1) By developing principle, pure research offers solutions to many practical problems. For example, Maslow's theory of motivation serves as a guideline for formulating incentive schemes and approaches to motivating employees in organizations. Generalizations have many practical applications. In fact, nothing is so practical for the goals of diagnosis or treatment as good theoretical research.

2) Pure research helps to find the critical factors in a practical problem. For example, a common sense approach to problems like communal disharmony or ethnic conflict fail to abstract the key factors. On the other hand, by deeper study such social maladies can be better understood and it may be possible to find a solution to such problems.

3) Pure research develops many alternative solutions and thus enables us to choose the best solution. By applying scientific knowledge developed by pure researches. Various appliances like radio, television, refrigerator, computer etc. have been invented. Continuous basic research in these fields has contributed to the manufacture of more effective and useful models at the least cost.

Contribution of Applied Research:-

1) Applied research can contribute new facts. A practical study designed to improve productivity in agricultural farms may stimulate theoretical analysis of extension technology, land tenure system, price purity between agricultural inputs and output, etc. Applied research uncovers new facts, which enrich the concerned body of knowledge.

2) Applied research can put theory to the test. Applied research is also a scientific endeavour. The researcher has to design it scientifically. From his knowledge of theory, he has to develop a conceptual framework for his study and formulate hypothesis. Thus, his study offers an opportunity to test the validity of existing theory.

3) Applied research may aid in conceptual clarification. Many concepts like small farmer, agricultural labourer, social responsibility, social structure, etc. are not precise. Different people define them differently leading to confusion and clarity. The vagueness of a concept surfaces most sharply when we attempt to operationalise it for dealing with it in research. Thus, research aids conceptual clarity.

4) Applied research may integrate previously existing theories. A practical problem has many facts. It cannot be solved by the application of abstract principles from a single science. Township development, for example may draw upon such disciplines as town planning, geology, demography, sociology, economics, etc. Thus, the solution of a practical problem may require some integration of the theories and principles of various disciplines.

4.3 EXPLORATORY OR FORMULATIVE RESEARCH:

Meaning:-

Exploratory research is preliminary study of an unfamiliar problem about which the researcher has little or no knowledge. It is similar to a doctor's initial investigation of a patient suffering from an unfamiliar malady for getting some clues for identifying it. "it is ill-structured and much less focused on pre-determined objectives." It usually takes from of a pilot study.[5]

Though it is a separate type of research, it is appropriate to consider it as the first stage of a three-stage process of exploration, description and experimentation.

Purposes:-

The purpose of an exploratory study may be:

- To generate new ideas or
- To increase the researcher's familiarity with the problem or
- To make a precise formulation of the problem or
- To gather information for clarifying concepts or
- To determine whether it is feasible to attempt the study.

Sometimes, a scientist may find, after spending a tremendous amount of energy and time on a research project, that it is not possible to secure the required data. A preliminary exploration could help avoiding such dismay. For example, a research student of the author wanted to study the pattern of marketing strategies of large manufacturing enterprises. A critical pre-requisite to this study was to know whether marketing executives would divulge adequate information about their marketing strategies. An exploration determined that they would not.

An exploratory study does not aim at testing hypothesis. According to Daniel Katz, it just attempts "to see what is there rather than to predict the relationships that will be founded." But it should be so designed as to provide definite information as possible for a set of research objectives.

Levels of Exploratory Studies:-

Katz conceptualizes two levels of exploratory studies. "All the first level is the discovery of the significant variables in the situation; at the second, the discovery of relationship between variables."[7]

It is necessary to delimit the area to be studied even at the first level. Katz warns that it is a mistake to believe that one study is going to be able to account for all the variance in complex social phenomena. He advises that "it is much more effective to take one central set of variables and investigate them as thoroughly as possible than to try to study the universe in one piece of research."

The need for Exploratory Studies:-

Social sciences are relatively young. Research in them are scarce. Many of them inevitably have to be exploratory ones. Few well-trodden paths exist to follow for the investigators of social life. Most existing theories in social sciences are either too general or too specific to provide clear guidance for empirical research. Hence, exploratory research is necessary to get initial insight in to the problems for the purpose of formulating them for more precise investigation. Hence, it is also known as formulative research.

The steps in Exploration:-

Selitz and others have suggested the following three steps/methods for the exploratory study:

(a) A review of pertinent literature
(b) A experience survey
(c) An analysis of 'insight stimulating' cases.

Literature survey: A study related and pertinent books, articles and reports turns up a number of leads and clues for further investigation that will advance the research. A workable hypothesis may be identified.

Experience Survey: Informal interviews with persons experience in the area of study will help the researcher in securing insight into the subject and its various facts. In selecting the person for this survey, representation to different facts of experience should be given. For example, in an exploratory study of the problem of rural development, it is profitable to interview researchers familiar with rural studies, rural development administrators, social workers, rural financial institutions and village leaders.

The researchers should prepare an interview guide so as to have an idea of issues and aspects of the problem on which questions may be posed of course, this interview guide should be flexible enough to explore various avenues that emerge during the interviews.

This survey may yield a new hypothesis and information on the various dimensions of the study, facilities and cooperation available for the study, and the factors to be controlled.

Analysis of insight – stimulating cases: In an unexplored area of study and intensive study of some selected cases can yield stimulating insight. For example, the extraordinary theoretical insights of Sigmund Freud on human psyche were the result of his intensive study of patients. Profound insights into the relationship between the individual and society have been brought out by anthropological case studies of primitive cultures.

The types of people[10] who people 'insight – stimulating' information could include the following:

1 Selltiz, Claira, Marie Jahoda, Morton Deutsch and Stuart W. Cook, Research methods in social Relations. New York; Holt, Rinehart and Winston, 1959, pp.32-47.

2 Marginal or peripheral individuals who are placed on the margin between contending groups for example, in an organizational hierarchy, foremen are neither managers nor workers but something in between.

3 Individuals in transition, e.g., recently promoted or transferred employees.

4 Deviants and isolated in a group who hold a different view from the majority.

5 'Pure' cases or cases that should be extreme example of the conditions under study, e.g., the most dissatisfied beneficiary of a rural development scheme.

6 Those who fit well and those who do not.

7 Those who represent different categories in the system.

The end of an exploratory study comes when the researcher finds that further research is not presently possible on the problem or succeeds in identifying the major dimensions of the problem. In the latter case, he has to plan the formal research design.

4.4 DESCRIPTIVE RESEARCH:

Meaning:-

Descriptive study is a fact-finding investigation with adequate interpretation. It is the simplest type of research. It is more specific that an exploratory study, as it has focus on particular aspects or dimensions of the problem studied. It is designed to gather descriptive information and provide information for formulating more sophisticated studies. Data re collected by using one or more appropriate methods: observation, interviewing and mail questionnaire.

All problems do not lend themselves to descriptive study. This method is applicable to problems which satisfy certain criteria.

First, the problem must be describable and not arguable. For instance, philosophical and controversial issues are not suitable for descriptive study. Second, the data should be amenable to an accurate, objective, and, if possible, quantitative assemblage for reliability and significance. Third, it should be possible to develop valid standards of comparison. Last, it should lend itself to verifiable procedure of collection and analysis of data.

Objective:-

A descriptive study aims at identifying the various characteristics of a community or institution or problem under study but it does not deal with the testing of proposition or hypothesis. However, it "can reveal potential relationships between variables thus setting the stage for more elaborate investigation later."[11]

A descriptive study also aims at a classification of the range of elements comprising the subject matter of study the classification must satisfy two criteria, viz., (1) exhaustiveness and (2) mutual exclusiveness occurs when each item can be unambiguously placed in only one category in the system. Descriptive information should also be useful for explanation, prediction and awareness.

Descriptive Study Vs Analytical Research:

A descriptive study identifies relevant variables but does not aim at testing hypothesis. On the other hand, and analytical study is primarily concerned with testing hypothesis and specifying and interpreting relationships.

A descriptive study is relatively less limited by the rigorous requirements of measurement and analysis than an analytical study. An analytical study's design approximated to the model of an experimental design.

A descriptive study employs simple statistical techniques like averages and percentages, but an analytical study employs advanced statistical techniques like correlation and multivariate analysis.

Usefulness:-

The descriptive studies are useful in their own way.

1 They have much to contribute to the development of a young science, as descriptive information can focus directly on a theoretical point. It may be useful in verifying focal concepts through empirical observation. "The more adequate the description, the greater is the likelihood that the units derived from the description will be useful in subsequent theory building."[12]

2 Descriptive information can highlight important methodological aspects of data collection and interpretation. The collection of factual data increases our awareness of the relative accuracy of our measuring devices thus; our ability to accumulate further knowledge is significantly broadened.

3 Descriptive information obtained in a research may be useful for prediction about areas of social life outside the boundaries of the research.

4 Descriptive studies are valuable in providing facts needed for planning social action programmes.

Limitations:-

The descriptive method of study has certain limitations:

1 It has not applicable to problems, which cannot satisfy the required criteria mentioned earlier.

2 The researcher may make description an end in itself. Research must lead to discovery of facts.

3 Although social science problems are continuous and have a past and a future, the researcher may lose himself in current conditions only.

4 The researcher may tend to over-use statistics. In making statistical analysis, its limitations should be recognized.

4.5 DIAGNOSTIC RESEARCH:

Meaning:-

This is similar to descriptive study but with a different focus. It is directed towards discovering what is happening. Why is it happening and what can be done about. It aims at identifying the cases of a problem and the possible solutions for it.

Purpose:-

A diagnostic study may also be concerned with discovering and testing whether certain variable are associated, e.g. are persons hailing from rural areas more suitable for manning the rural branches of banks? Do more villagers that city – voters for a particular party?

Requirements:-

Both descriptive and diagnostic studies share common requirements, viz. prior knowledge of the problem. Its through

formulation, clear-cut definition of the given population, adequate methods for collecting accurate information, precise measurement of variables, statistical analysis and test of significance. As the aim is to obtain complete and accurate information about a given situation/phenomenon, the research design must make much more provision for protection against bias that is in an exploratory study. Moreover, the amount of work involved is considerable and so concern with economy of research effort is extremely important.

Diagnostic Study v/s Descriptive Study:-

Though these two types of studies have in common emphasis an the specific characteristics of given phenomenon, they differ from each other in some respects.

First, a diagnostic study is more directly concerned with casual relationships and with implications for action that is a descriptive study.

Second, while a descriptive study is oriented towards finding out what is occurring, a diagnostic study is directed towards discovering not only what is occurring but why it is occurring and what can be done about it.

Third, a diagnostic study is more actively guided by hypothesis than is a descriptive study.

Last, a diagnostic study is not possible in areas where knowledge is not advanced enough to make possible adequate diagnosis. In such cases, the social scientist limits his effort to descriptive studies.

4.6 EVALUATION STUDIES:

Meaning:-

Evaluation study is one type of applied research. It is made for assessing the effectiveness of social or economic programmes implemented (e.g., family planning scheme) **or for assessing impact of developmental projects** (e.g. irrigation project) **on the development of the project area**.

Suchman defines evaluation as “determination of the results attained by some activity (whether a programme, a drag or a therapy or an approach) designed to accomplish some valued goal or objective.”

Purpose:-

Evaluative research is thus, directed to assess or appraise the quality and quantity of an activity and its performance and to specify its attributes and conditions required for it success. It is also

concerned with change over time. As Suchman puts it, “evaluative research asks about the king of change the program views as desirable, the means by which the change is to be brought about and the signs according to which such change can be recognized.”

Types of Evaluation:-

Evaluations are of three types:

1 Concurrent evaluation : This is a continuous process and partakes the nature of an inspection or social audit of an on going programme. It aims at the evaluation of the quality implementation and services as a feed back for improving the performance.

2 Periodic evaluation : This is made after each distinct phase or state of a project has been completed. In the case a medium period time bound programme like 5 year plan, this evaluation may be done in the middle of the period and it may be called mid-term/interim evaluation.

3 Terminal evaluation : This is done after the completion of a programme or project (e.g. an irrigation project). This is designed to assess the extent of the achievement of its goals or objectives. It may also involve a benefit-cost analysis. In the case of a project with long-gestation period (e.g. an irrigation project), the appropriate methodology for terminal evaluation will consist of a survey cum experimental design.

Criteria of Evaluation Research :-

Weiss and Coleman list a number of specific, criteria, which distinguish evaluative research from other types of research.

First, evaluation research is usually conducted for a client who intends to use the finds as a basis for decision-making. This is quite different from basic research, which aims at knowledge for its own sake.

Second, the evaluation researcher deals with his client’s questions relating to the latter’s programme, while the basic researcher formulates his own research questions.

Third, the evaluation researcher measures whether the programme goals are being reached. Other scientific researchers concern themselves with ‘what is’ rather than with comparisons of ‘what is’ with ‘what ought to be’.

Fourth, unlike basic researcher who normally has control over research work, the evaluation researcher works in a setting

where priority goes to the programme as opposed to the evaluation? This means that the evaluation researcher must fit time schedule to the programme/project's built-in time schedule. The programme staffs tend to see data-collection work as hindrance to their work.

Fifth, researcher programme personnel conflicts are inherent in evaluation study. While the researcher is interested in objective evaluation and public dissemination of results, the project personnel expect that the evaluation results should be meant for in-house use only.

Nevertheless, evaluation research does not differ from other types of research in methodology. The problems of reliability, validity and operationalization and research method, techniques and principles are common to evaluation and other types of research.

Design and Measurement:-

An evaluation researcher must plan his design as to probe deeper into the following questions:

1. What is the nature of content of the objectives of the programme to be evaluated?
2. Are the objectives unitary or multiple?
3. How are the objectives to be achieved?
4. Who is the target of the programme?
5. When is the desired change to take place?
6. What is the desired magnitude of effect?
7. Do the benefits really reach the target group?
8. What are the unintentional effects or side effects of the programme?

The evaluation researcher's operationalization is concerned with one or more of the following indicators:

1. Effort or activity (i.e. input) variables.
2. Performance or programme output in terms of the policy objectives.
3. Adequacy of performance (one common index of adequacy is "the rate of effectiveness the number of people exposed to the programme")
4. Efficiency – a measure of benefit – cost

5. Process – measures why the programme is successful or unsuccessful.

A few types of special designs suitable for evaluation research are:

1 Social audits: These are a useful means of getting at process and efficiency. They aim at examining: How much of resource inputs actually reaches the intended recipients in some from (i.e. cash subsidy, food and clothing for flood victims)? Of that portion which does not reach them, where does this loss of input go? Does the intended change take place? Etc.

2 Benefit – cost analysis: This is made in order to measure the programme efficiency and to measure its effectiveness by comparison with alternative programmes. This analysis depends on availability of reliable and valid data. Monetary costs can be easily estimated, but many social costs are purely speculative. For example, how could one financially measure the anguishes of rape, the emotional costs of assault or murder? Some social costs can be rationally dealt with e.g. the social costs of total disability of an industrial employer arising out of injury could be measured in terms of society's loss of the disabled person's work power and the loss of his potential tax amount.

4.7 ACTION RESEARCH:

Meaning:-

Action research is a type of evaluation study. It is a concurrent evaluation study of an action programme launched for solving a problem/for improving an existing situation.

In the quest for development, advancement, excellence and promotion of welfare of people, government, institutions and voluntary agencies undertake action programmes for achieving specific goals or objectives. Land reform programmes, agricultural extension programmes, social welfare programmes, human resource development programmes, managerial improvement programmes, rural development programmes, programmes for improving the quality of life in factories and offices, etc. are some examples of action programmes. This plethora of development programme has given impetus to action research. With the pressing need to assess the relative effectiveness of different approaches to the same goal or the worthwhile ness of one goal as against another, research has been called upon to play a closer and relevant role for action. The criterion of relevance for action is of critical importance in action research.

Typologies of Action Research:-

Prospero R. Covar categorizes action research in to five types:

Type I - Classical design:- Research and action are separate and independent. The connection between research and action is not purposely sought. It may occur by chance. Action programme agency may not know/use the research finding. The researcher may not deliberately gear his work toward contributing to the effectiveness of an action programme.

Type II - Interdependence of action and research:- Action is carried out by an agency not connected with a research institution. Research on action may be entrusted to an independent research body. For example, government may launch a development programme and a university social scientist may be welcomed to study the on going programme. The research may include in his report a section on implications for action, and give a copy of the report to the implementing agency, but he had no further obligation to the action programme.

Type III – Evaluate research built into an action programme:- In this case, research is dependent upon action, and the action people define the scope of the research.

Type IV – Action for research:- Here the activities of the action programme are designed and modified to carry out tests of hypotheses of research for example, a researcher may wish to test the relative effectiveness of three different methods of introducing family planning information personal contact with the wife, and impersonal contact through the mass media alone. For this research purpose, a family planning programme applying each approach to different groups of couples with similar characteristics and under similar circumstances has to be launched. Thus, the research requirements dictate how the action will be carried out.

Type V – Research-cum-action:- Action and research go together as a joint endeavour. Researcher and decision makers jointly design and launch the action programme and research on it. Once the operational design is completed and action launched, they record what happens under specified conditions. They may vary the conditions if they want.

4.8 EXPERIMETAL RESEARCH:

Introduction:-

There are various phenomena such as motivation, productivity, development and operational efficiency, which are

influenced by various variables. It may become necessary to assess the effect of one particular variable or one set of variables on a phenomenon. This need has given rise to experimental research.

Meaning:-

Experimental research is designed to assess the effects of particular variables on a phenomenon by keeping the other variables constant or controlled. It aims at determining whether and in what manner variables are related to each other. The factor, which is influenced by other factors, is called a dependent variable. And the other factors, which influence it are known as independent variables. For example, agricultural productivity, i.e. crop yield per hectare is a dependent variable and the factors such as soil fertility, irrigation, quality of seed, manuring and cultural practices which influence the yield are independent variables.

The nature of relationship between independent variables and dependent variables is perceived and stated in the from of casual hypothesis. A closely controlled procedure is adopted to test them. The testing of the hypothesis is described in section 5.4 hypothesis of chapter 5 below.

Procedure:-

Two identical groups are selected. These should be 'identical' in terms of the characteristics of the phenomenon under study. For example, in a farm productivity experiment, two plots of farmland with same soil composition, soil fertility, same size, same climate and same irrigation facility should be selected for the study.

One of the groups is used as experimental group, and the other as control group. Experimental group is exposed to an experimental variable or stimulus. Control group is not exposed to the experimental variable. The difference between the experimental and control groups outcome is attributed to the effect of the experimental variable.

4.9 ANALYTIAL STUDY OR STATISTICAL METHOD:

Meaning:-

Analytical study is a system of procedures and techniques of analysis applied to quantitative data. It may consist of a system of mathematical models or statistical techniques applicable to numerical data. Hence, it is also known as the statistical method. (for detailed discussion see chapter II: statistical analysis)

Aim:-

This study aims at testing hypothesis and specifying and interpreting relationships. It concentrates on analyzing date in depth

and examining relationships from angles by bringing in as many relevant variables as possible in the analysis plan.

Uses:-

This method is extensively used in business and other fields in which quantitative numerical data are generated. It is used for measuring variables, comparing groups and examining association between factors.

Data may be collected from either primary sources or secondary sources.

There is vase scope for making analytical studies by using data published by various departments of Government and institutions like the RBI, Bureau of Public Enterprise, NABARD, and central statistical organization.

Analytical Study v/s Experimental Research:-

One way to distinguish analytical studies from experimental research is that the former rely heavily on the post-facto-analysis of data generally collected in a natural or real life setting or from records. Unlike descriptive studies, analytical studies are characterized by rigrous requirements of measurement and analysis, and design approximated to the model of an experimental design.

4.10 HISTORICAL RESEARCH:

Meaning:-

Study is a study of past records and other information sources with a view to reconstructing the origin and development of an institution or a movement or a system and discovering the trends in the past.

It is descriptive in nature. It is a difficult task; it must often depend upon inference and logical analysis of recorded date and indirect evidences rather than upon direct observation. Hence, it is aptly described as “the induction of principles through research in to past and social forces which have shaped the present.”

Objective:-

Its objective is to draw explanations and generalizations from the past trends in order to understand the present and to anticipate the future. It enables us to grasp our relationship with the past and to plan more intelligently for the future. The past contains the key to the present and the past and the present influences the future. Historical study helps us in visualizing the society as a dynamic organism and its structures and functions as evolving, steadily growing and undergoing change and transformation.

Sources of Data:-

The sources of data for historical research consists of (1) eye witness accounts narrated by an actual observer or participant in an event, (2) oral testimony by elders, (3) records and other documentary material and (4) relics. The data available from the above sources may be scattered and discontinuous and fragmented. Personal accounts are mostly subjective and so should be studies with great caution and corroborated with documentary evidences. The origin and genuineness of the sources and the validity of facts contained in them should be critical tested and examined. Their authenticity should be tested. Only authentic sources should be depended upon for collection of data. It is essential to check and cross-check the data from as many sources as possible

4.11 SURVEYS:

Meaning:-

Survey is a 'fact finding' study. It is a method of research involving collection of data directly from a population or a sample there of at particular time. It must not be confused with the mere clerical routine of gathering and tabulating figures. It requires expert and imaginative planning, careful analysis and rational interpretation of the findings.

Data may be collected by observation, or interviewing or mailing questionnaires.

The analysis of data may be made by using simple or complex statistical techniques depending upon the objectives of the study.

The characteristics of survey method:-

The survey method has certain characteristics:

1 It is always conducted in a natural setting: it is a field study.

2 It secks responses directly from the respondents.

3 It can cover a very large population, thanks to sampling techniques.

4 A survey may involve an extensive study or an intensive study. An extensive study covers a wilder sample. An intensive one covers a few samples and tends to 'dig deeper'. These two approaches serve different ends; where generalization or estimation is necessary, the extensive approach is useful, but where one wants to make an in-depth study of some aspects of a subject – matter, the intensive approach is preferable.

5 A survey covers definite geographical areas; a city, or a district, or a state.

The quality of survey depends upon the thoroughness of the planning, the soundness of sampling. The adequacy and reliability of data, the quality of analysis and the interpretation of the findings.

4.12 CASE STUDY:

Meaning:-

A case study is an in-depth comprehensive study of a person, a social group, an episode, a process, a situation, a programme, a community an institution or any other social unit.

It is one of the most popular types or research methods. Its purpose may be to understand the life cycle of the unit under study or the interaction between factors that explain the present status or the development over a period of time. Some examples of a case study are: a social – anthropological study of a rural or tribal community; a causative study of success full cooperative society; a study of the financial health of a business undertaking; a study of labour participation in management in a particular enterprise a study of juvenile delinquency; a study of life style of working women; a study of slum dwellers; a study of urban poor; a study of economic offenses;; a study of requgees from another country.

Function:-

The case study method describes a case in terms of its peculiarities. It gives us an insight into the typical or extreme cases whose unique features are not reflected by the usual statistical method.

A case study helps to secure a wealth of information about the unit of study, which may provide clues and ideas for further research. It provides an opportunity for the intensive analysis of many specific details that are overlooked in other methods.

It examines complex factors involved in a given situation so as to identify casual factors operating in it.

A case study aims at studying everything about something rather than something about everything as in the case of statistical method.

While in a statistical approach the ‘individual’ disappears from the analysis, in a case study the individual’ representing the ‘wholeness’ is preserved as it is an approach which views any social unit as a whole. Thus, a case study gives us a total view of a unit or a clear insight into a situation or process in its total setting.

Thus, the perspective of a case study is both qualitative and organic. It gives an overall generic picture of a problem.

The case study, as a research method, often employs more techniques than one. Thus, for tracing a development process, it uses historical method, it employs descriptive method a factual picture is needed, it employs interviewing, mail questionnaire, check lists, rating scales, etc. to gather data, it looks to statistics for testing hypotheses.

The aim of a case study is to ascertain the generic development of a social unit under study, revealing the factors that moulded its life within its cultural setting. Because of its aid in studying behaviour in specific, precise detail, Burgess termed the case study methods as “the social microscope.”

It is most valuable for diagnostic, administrative and therapeutic purpose.

It develops ideas, sometimes leading to conclusion and sometimes to hypotheses to be tested. It may also be useful for developing new concepts or testing existing concepts.

Case study v/s survey:-

Case study may be conducted as an independent study or a supplementary investigation to a survey. The primary distinctions between a case study and a survey lie in the intensity and depth of investigation and its coverage.

1 While a survey is a broad based investigation of a phenomenon, a case study is an intensive investigation

2 A survey covers a large number of units – all units of a universe or a sample of them; buyt a case study is a study of a single unit/group.

3 The findings of a study can be generalized when it is based on a representative sample; but whereas the finds of a case study cannot be generalized.

4 While a survey is useful for testing hypotheses about large social aggregates, a case study is useful for testing hypotheses about the structural and procedural characteristics (e.g. status relation, interpersonal behaviour, managerial style of a specific social unit (e.g. an organisation a small group or a community).

4.13 FIELD STUDIES:

Meaning:-

Field studies are scientific enquiries aimed at discovering the relations and interactions among sociological, psychological and educational variables in social institutions and actual life situations like communities, schools, factories, organizations and institutions. A social or institutional situations is selected and the relations among the attitudes, values, perceptions and behaviours of individuals and groups in the selected situations are studied. Some examples of field studies are: Dollard's study of cast and class in a southern town. Malinowski's investigations of the Trobriand Islander Lynd's study of Middletown Jone's study of the scio-economic basis of class in Akmon, ohio Mann-Kanitkay's study of land and labour in a Deccan Village; Ajyyappan's study of social revolution in a Kerala Village.

Field study v/s surveys:-

Although it is not easy to draw a fine logical between survey and field study, there are practical differences between them.

First, a survey attempts to be representative of the universe under study and thus calls for an adequate and representative sample. This emphasis on sampling may or may not be found in a field study, because it is more concerned with a thorough account of the processes under study than with their typicality in a large universe.

Second, while a field study aims at directly studying the interrelations of the parts of social structure of a singly community r a singly group, a survey aims at covering a larger universe, and it may indirectly deal with social and psychological processes, though inference from the statistical analysis rather than through direct observation. Thus, field study will provide a more detailed natural picture of social interrelations of the group than does a survey.

Types of Field Studies:-

Katz has classified field studies into (1) anthropological studies and (2) quantitative field studies. In an anthropological study, the researcher lives in the selected community, observes its people, talks with them at great length, and thus gains a thorough insight into the social structure of the community and the people's life culture and ideologies. But the anthropological approach does not aim at precise measurement of specific variables and relations.

On the other hand, a social-psychological field study employs quantitative approach and measures variables and their interrelationships. Newcomb's research on Bennington college a self contained college community is an example for this type of

study. The conclusions of a quantitative study can be readily confirmed by other investigators.

The conflict between the two approached can be resolved by utilizing anthropological approach as the initial stage in a field study. In this stage, the situation as a whole can be studied and the fundamental relationship grasped. These insights can yield hypothese which can be tested by a detailed quantitative study. In the Festinger-Schachter-Back study of a processing community this procedure was employed. In the combined approach, the initial anthropological study serves as an exploratory stage and the subsequent quantitative study tests hypotheses derived from the exploratory stage.

4.14 QUESTIONS

1) Write a note on pure and applied research.
2) Discuss the different types of Research.

5

RESEACH DESIGN

Unit Structure :

5.1 INTRODUCTION

A research design is a logical and systematic plan prepared for directing a research study. It specifies the objectives of the study, the methodology and techniques to be adopted for achieving the objectives. It constitutes the blue print for the collection, measurement and analysis of data. It is the plan, structure and strategy of investigation conceived so as to obtain answer to research question. The plan is the overall scheme or program of research. A research design is the program that guides the investigator in the process of collecting, analyzing and interpreting observation. It provides a systematic plan of procedure for the research to follow.

5.2 THE DEFINITION OF A RESEARCH DESIGN

A research design is a plan, structure and strategy of investigation so conceived as to obtain answers to research questions or problems. The plan is the complete scheme or program of the research. It includes an outline of what the investigator will do from writing the hypothesis and their operational implications to the final analysis of data. A traditional research design is blue print or detailed plan for how a research study is to be completed operationalising variables so they can be measured, selecting a sample of interest to study. Collecting data to be used is a basis for testing hypothesis and analyzing the results. A research design is a procedural plan that is adopted by the researcher to answer questions validly objectively accurately and economically. According to Seltiz of at, “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 which economy in procedure”.

1. **According to Kerlinger,** "research design is the plan, structure and strategy and strategy of investigation conceived so as to obtain answers to research questions and to control variance"

   Research design is in fact the conceptual framework within which the research is conducted.

2. **According to Bernard Philips** he research design "as a blue print for the collection, measurement and analysis of data".

3. **According to Claire Seltiz**, "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".

4. **According to S.L. Gupta and Hitesh**, "a research design provides a flow of activities from problem formulation to hypothesis development to data collection to data analysis to final results to implications".

A research design provides a flow of activities from problem formulation to hypothesis development to data collection to data analysis to final result.

A research design provide :

- Design of research-that is explanatory, conclusive, descriptive, casual or experimental
- Type of data required for information gathering
- Measurement and scaling requirements
- Form of data collection such as questionnaire
- Sampling process and sampling size required
- Data analysis to be done

5.3 NEED AND IMPORTANCE OF RESEARCH DESIGN

A research without a pre-drawn plan is like an ocean voyage without Mariner's compass. The preposition of a research plan for a study aids in establishing direction to the study and in knowing exactly what has to be done and how and when it has to be done at every stage. It enables the researcher to consider beforehand the various decisions to be made. What are the objectives of the study? What are the investigative questions? What are the sources of data? What is the universe of the study? What sampling method is appropriate? And so on.

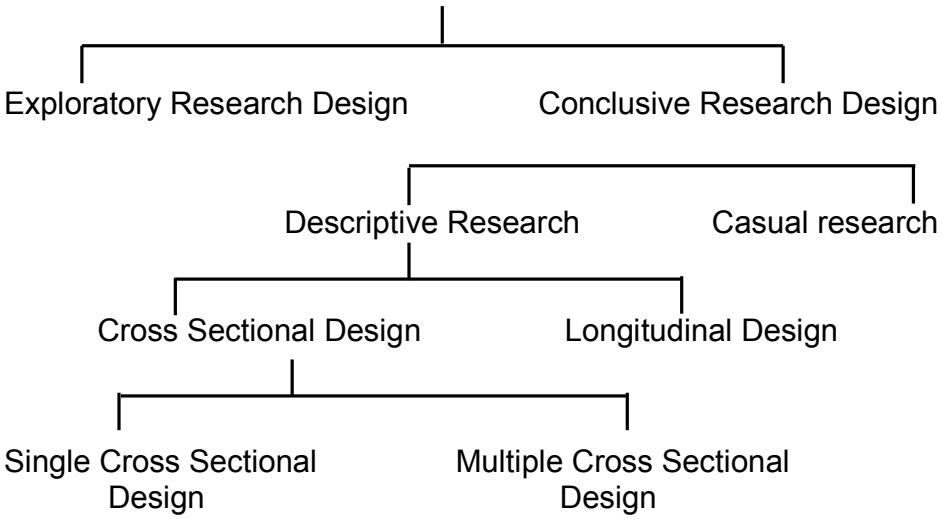
Without a plan, research work becomes unfocussed and aimless empirical wandering the researcher would find if difficult,

laborious and time-consuming to make adequate discriminations in the complex inter plan of facts before him, he may not be able to decide which is relevant and which is not and may get lost in a welter of irrelevances. The use of a research design prevents such a blind search and indiscriminate gathering of data and guides him to proceed in the right direction. A research plan prescribes the boundaries of research activities and enables the researcher to channel his energies in the right work with clear research objectives in view, the researcher can proceed systematically focused their achievement the design also enable the research to anticipate potential problems of data gathering operationalation of concepts, measurement, etc.

5.4 TYPES OF REASERCH DESIGN :

On the basis of objectives of the research, the research can be classified into (a) Exploratory Research Design and (b) conclusive Research Design. The conclusive Research Design can be sub divided into (i) Descriptive Research and (ii) casual or experimental research design. Descriptive Research further divided into cross sectional design and longitudinal design. The cross sectional design classified into single cross sectional design and multiple cross sectional design. It shows with the following diagram.

A Classification of Research Designs



A] Exploratory Research:

The research design for exploratory research is best characterised by its lack of structure and flexibility. This research design is diagnostic in nature. It is generally used for the development of hypothesis regarding potential problems and opportunities. This type of research provides insight and understanding of the problems. Exploratory research method includes secondary data sources, expert's opinion, surveys, in

depth discussions, case studies and observation. In most of the time exploratory research is followed by conclusive research for more precise analysis and conclusion.

Nature of Exploratory Research Design:

i) Exploratory Research using secondary sources of information many companies who regularly conduct market research studies have maintained a record of research finding over the years., the access to which is both quick and economical for a market researcher.

ii) Exploratory Research using expert opinions and ideas :

Experts can give valuable insights into a marketing problem because of their expensive with the problem hand, ability to act as an observer and an ability to express ideas unlike any other individual. Despite the desire to find individuals with ideas, it is important not to concentrate the investigation only among the better educated or more articulate person.

iii) Depth Interviews :

There are one-to-one interviews because most people do not have clear ideas why they make particular purchase decisions. Individuals normally do not report decisions. They normally do not report socially unacceptable motives. So market researcher in-depth interviews attempt to influence respondents to talk freely about their subject of interest.

iv) Group Interviews :

When the management wants to get a first person feel of consumer reactions an its marketing mix variables, a marketer researcher can convert a focus group with him acting as a moderator.

v) Projective Techniques :

in projective techniques interviewing the respondents we asked to project themselves into a particular situation.

B] Conclusive Research

This type of research is generally more formal and structured as compared to exploratory research. Conclusive research is used to provide information for the evaluation of alternative courses of action. This type of research can be classified into descriptive research and casual or experimental research. Conclusive research method include descriptive research with cross sectional or time

series or longitudinal or case studies method and casual / experimental research with the design of experiments. Descriptive research is used to describe marketing to predict future marketing phenomena. In cross sectional design, which is typically used in descriptive research project, a sample of population elements is taken at one point of time conclusive research studies can be classified either as descriptive or experimental.

i) Descriptive Research :

The research objectives in this types of research is generally describing the characteristics of consumer segment viz, demographic and benefits sought. Descriptive studies can also portray buyer perceptions of brands, audience profiles for media types viz. TV, radio, newspaper, availability of distributors, product consumption patterns, price sensitivity of consumers, market share, etc. These are just a few representative studies out of numerous studies that come under descriptive research in marketing. The purpose and nature of descriptive research is quite different from that of exploratory research. Many descriptive studies are made with only hazy objectives and with inadequate planning. Much of the data collected in such studies turns out to be useless. Descriptive studies of this type are actually more of exploratory type. Other types of Research Design listed below is the whole range of research design that your can use for dissertation.

1. Historical Research Design
2. Case and field Research Design
3. Descriptive or Survey Research Design
4. Corelational or prospective Research Design
5. Development or Time Series Research Design
6. Quasi Experimental Research Design.

ii) Experimental or Causal Research :

Although, it is the nature of marketing decision-making that all the conditions allowing the most accurate causal statements are not usually present out in these circumstances, causal inference will still be made by marketing manager.

5.5 QUESTION

1) Define Research Design and explain its importance.
2) Discuss the types of Research Designs.

6

FORMULATING OF RESEARCH PROBLEM

Unit structure :

6.1 INTRODUCTION:

The central aim of this chapter is to detail the process of problem formulation. However, the specific process that you are likely to adopt depends upon:

- Your expertise in research methodology;
- Your knowledge of the subject area;
- Your understanding of the issues to be examined;
- The extent to which the focus of your study id predetermined.

If you are not very familiar with the research process and/or do not have a very specific idea about what is to be research, you need to follow every step detailed in this chapter. However, more experienced researchers can take a number of short cuts. The process outlined here assumes that your have neither the required knowledge of the process of formulating a research problem nor a specific idea about what is to be researched.

6.2 THE RESEARCH PROBLEM

If you have a specific idea for the basic of your inquiry, you do not need to go through this chapter. However, you should make

sure that your idea is researchable as not all problems lend themselves to research methodologies. Broadly speaking, **any question that you want answered and any assumption or assertion that you want to challenge or investigate can become a research problem or a research topic for your study**. however, it is important to remember that not all questions can be transformed into research problems and some may prove to be extremely difficult to study. according to powers, Meenaghan and Twoomey (1985:38), 'Potential research questions may occur to us on a regular basis, but the process of formulating them in a meaningful way is not at all an easy task; as a new comer it might seem easy to formulate a problem but it requires a considerable knowledge of both the subject area and research methodology. Once you examine a question more closely you will soon realize the complexity of formulating an idea into a problem which is researchable. 'First identifying and then specifying a research problem might seem like research takes that ought to be easy and quickly accomplished.

It is essential for the problem you formulate to be able to withstand scrutiny in terms of the procedures required to be undertaken. Hence, you should spend considerable time in thinking it through.

6.3 THE IMPORTANCE OF FORMULATING A RESEARCH PROBLEM:

The formulation for research problem is the first and most important step of the research process. It is like the identification of destination before undertaking a journey. As in the absence of a destination, it is impossible to identify the shortest or indeed any route, in the absence of a clear research problem, a clear and economical plan is impossible. A research problem is like the foundation of a building. The type and design of the building is dependent upon the foundation. If the foundation is well designed ad strong you can expect the building to be also. The research problem serves as the foundation of a research study: It is well formulated, you can expect a good study to follow.

According to Kerlinger, **if one wants to solve a problem one must generally know what the problem is. It can be said that a large part of the problem lies in knowing what one is trying to do.**

You must have a clear idea with regard to what it is that you want to find out about and not what you think you must find.

A research problem may take a number of forms, from the very simple to the very complex. The way you formulate a problem determines almost every step that follows: the type of study design that can be used; the type of sampling strategy that can be employed; the research instrument that can be used or developed; and the type of analysis that can be undertaken. The formulation of a problem is like the 'input' into a study, and the 'output'- the quality of the contents of the research report and the validity of the association or causation established- is entirely dependent upon it. Hence, the famous saying about computers- 'garbags in garbags out'- is equally applicable to a research problem.

In the beginning you may be become more confused but this is normal and a sign of progression. Remember: confusion is often but a first step towards clarity. Take time over formulating your problem, for the clearers you are about your research problem, question, the easier it will be for you later on. Remember, this is the most crucial step.

6.4 SOURCES OF RESEARCH PROBLEM:

This section is of particular relevance if you have not yet selected a research topic and do not know where to start. If you have already selected your topic or question, go to the next section.

Most research in **the humanities revolves around four Ps:**

- People
- Problems
- Programs
- Phenomena

The emphasis an a particular 'p' may very from study to study but generally, in practice, most research studies are based upon at least a combination of two Ps. You may select a group of individuals (a group or a community as such- 'people'), either to examine the existence of certain issues or problems relating to their lives, to ascertain attitude of a group of people towards an issue ('problem'), to establish existence of a regularity ('phenomenon') or to evaluate the effectiveness of an intervening ('program'). Your focus may be the study of an issues an association or a phenomenon per Ps; for example, the relationship between unemployment and street crime, smoking and cancer or fertility and mortality, which is done on the basis of an information collected from individuals, groups communities or organizations. The emphasis in these studies is on exploring, discovering or establishing associations or causation. Similarly, you can study different aspects of a program; its effectiveness, its structure, the need for it, consumers' satisfaction with it, and so on. In order to

ascertain these you collect information from people. The 'people' provide you with the 'study population', whereas the other three Ps furnish the 'subject areas'. Your study population individuals, groups and communities is the peoples from whom the information is collected. Your subject area is a 'problem', 'program' or 'phenomenon' about which the information is collected a closer look at any academic discipline or occupation field will also that most research revolves around the four Ps.

Every research study has two aspects:
1) The study population;
2) The subject area.

Shows aspects of a research problem :

Aspects of a research problem:

<table>
<tr><th>Aspects of Study</th><th>About</th><th>Study of</th><th></th></tr>
<tr><td>Study Population</td><td>People</td><td>Individuals, organizations, groups, communities</td><td>They provided you with the required information from or about them</td></tr>
<tr><td rowspan="3">Subject Area</td><td>People</td><td>Issues, situations, associations, needs population compositions, profits, etc</td><td rowspan="3">Information that Your need to collect to find answer to your research questions</td></tr>
<tr><td>Program</td><td>Contents, structure, outcomes, attributes, satisfaction, consumers, service providers, etc.</td></tr>
<tr><td>Phenomenon</td><td>Cause-and-effect relationships, the study of a phenomenon itself, etc</td></tr>
</table>

You can study a problem, a program of a phenomenon in any academic field or from any professional perspective. For example, you can measure the effectiveness of a program in the field of health, education, social work, industrial management, public health, nursing, health promotion or a welfare program, or you can look at a problem from a health, business or welfare perspective. Similarly you can gauge consumers' opinions about any aspect of a program in the above fields.

Examine your won field in the context discipline or professional field in the context of the four Ps in order to identify anything that looks interesting. Consider some of the aspects identified under ‘study of in Table 4.1 against problem, program of phenomenon for a possible research topic, for examples, if you are student in the health field there are an enormous number of issues, situations and associations within each sub field of health that you could examine. Issues relating to the spread of a disease, drug rehabilitation, an immunisation program, the effectiveness of a treatment, the extent of consumers’ satisfaction or issues concerning a particular health program can all provide you with a range of research problems. Similarly, in education there are several issues: students satisfaction with a teacher, attributes of a good teacher, the impact of the home environment on the educational achievement of students, and supervisory needs of postgraduate students in higher education. Any other academic or occupational field can similarly be dissected into sub fields and examined for a potential research problem. Most fields lend themselves to the above categorisation even though specific problems and programs vary markedly from field to field.

6.5 CRITERIA/CONSIDERATIONS IN SELECTING RESEARCH PROBLEM

When selecting a research problem/topic there are a number of considerations to keep in mind. These help to ensure that your study will be manageable and that you will be manageable and that you will remain motivated. These considerations are interest, magnitude, measurement of concepts, level of expertise, relevance, availability of data and ethical issues.

a) **Interest: Interest should be most important consideration in selecting a research problem**. A research endeavour is usually time consuming, and involves hard work and possibly unforeseen problems. If you select a topic which does not greatly interest you, it could become extremely difficult to sustain the required motivation, and hence its completion as well as the amount of time taken could be affected.

b) **Magnitude: You should have sufficient knowledge about the research process to be able to visualise the work involved in completing the proposed study**. Narrow the topic down to something manageable, specific and clear. It is extremely important to select a topic that you can manage within the time and resources at your disposal. Even if you are undertaking a descriptive study, you need to carefully consider its magnitude.

c) **Measurement of Concept:** If you are using a concept in you study, make sure you are clear about its indicators and their measurement for example, **if you plan to measure the effectiveness of a health promotion program, you must be clear as to what determines effectiveness and how it will be measured.** Do not use concepts in your research problem that you are not sure how to measure. This does not mean you cannot develop a measurement procedure as the study progresses. While most of the developmental work will be done during your study, it is imperative that you are reasonably clear about the measurement of these concepts at this stage.

d) **Level of Expertise: Make sure you have an adequate level of expertise for the task you are proposing**. Allow for the fact that you will learn during the study and may receive help from your research supervisors and others, but remember you need to do most of the work your self.

e) **Relevance: Select a topic that is of relevance to you as a professional.** Ensure that your study adds to the existing body of knowledge, bridges current gaps or is useful in policy formulation. This will help you to sustain interest in the study.

f) **Availability of Data:** If your topic entails collection of information from secondary sources (office records, client records, census or other already- published reports, etc) before finalising your topic, make sure that these data are available and in the format you want.

g) **Ethical Issues: Another important consideration in formulating a research problem is the ethical issue involved**. In the course of conducting a research study, the study population may be adversely affected by some of the question (directly or indirectly); deprived of an intervention, expected to share sensitive and private information; or expected to be simply experimental 'guinea pigs'. How ethical issues can affect the study population and how ethical problems can be overcome should be thoroughly examined at the problem formulation stage.

6.6 STEP IN THE FORMULATION OF A RESEARCH PROBLEM

The formulation of a research problem is the most crucial part of the research journey on which the quality of the entire project depends. Yet the available books offer very little be way of specific guidance. This task is largely left either to the teachers of research methodology or to students like you to learn themselves.

One of the strength of this book is that it offers a beginner a very specific set of step-by-step guidelines in one place.

The process of formulating a research problem consists of a number of steps. Working through these steps presupposes a reasonable level of knowledge in the broad subject area within which the study is to be undertaken. A brief review of the relevant literature helps enormously in broadening this knowledge base. Without such knowledge it is difficult to clearly and adequately 'dissect' a subject area.

If your do not knows what specific research topic, idea or issue you want to research (which is not uncommon among students) first go through the following two steps:

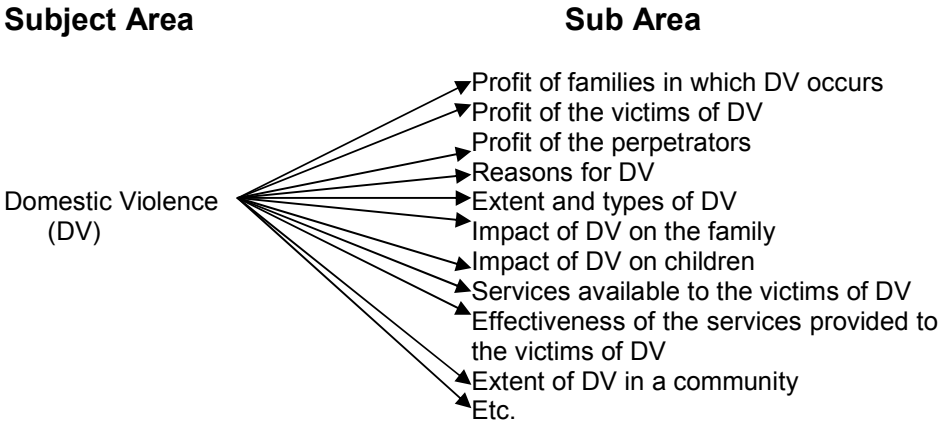
Step 1: Identify a Broad Subject :

Identify a broad field or subject area of interest to you. Ask yourself, 'what is it that really interests me as a professional'? In the authors' opinion, it is good idea to think about the field in which you would like to work after graduation. This will help you to find an interesting topic, and one which may be of use to you in the future for example, if you are a social work student, inclined to work in the area of youth welfare, refugees or domestic violence after graduation, you might take to research in one of these area or if you are studying marketing you might be interested in researching consumer behaviour or, as a student of public health, intending to work with patients who have HIV/AIDS, you might like to conduct research on a subject area relating to HIV/AIDS. As far as the research journey goes, these are the broad research areas it is imperative that you identify one of interest to you before undertaking your research journey.

Step 2: Discussing sub Area of subject :

Dissect the broad area into sub areas. At the onset, you will realise that all the broad areas mentioned above youth welfare, refugees, domestic violence, consumer behaviour and HIV/AIDS have many aspect. Take domestic violence for example. There are many aspect and issue in the area of domestic violence shows of its any aspects.

Dissecting the subject area of domestive violence and sub areas :



Similarly, you can select any subject area from other field such as community health or consumer research and to through this dissection process. In preparing this list of sub areas you should also consult others who have some knowledge of the area and the literature in you subject area. Once you have developed an exhaustive list of the sub areas from various sources, you processed to the next stage where you select what will become the basis of your inquiry.

Step 3: Selecting most interested Area of study :

Select what as of most interest to you. It is neither advisable nor feasible to study all sub areas. Out of this list, select issues or sub areas about which you are passionate. This is because your interest should be the most important determinant for selection, even though there are other considerations which have been discussed in the previous section, 'considerations in selecting a research problem'. One way to decide what interests you most is to start with the process of elimination. Go through your list and delete all those sub areas in which you are not very interested you will find that towards the end of this process, it will become very difficult for you to delete anything further. You need to continue until you are left with something that is manageable considering the time available to you, your level of expertise and other resources needed to undertake the study. Once you are confident that what you have selected you are passionate about and can manage, you are ready to go to the next step.

Step 4: Development of Research Problem :

Raise research questions at this step you ask yourself, 'what is it that I want to find out about in this sub area'? Within your chosen sub area, first list whatever questions you want to find answers to. If you find yourself in a situation where you can think of

many question, too many to be manageable, again go through a process of elimination, as you did in step 3.

Step 5: Formulate Objectives :

Formulate objectives **formulate your main objectives and your sub objectives**. Your objectives grow out of your research questions. The main difference between objectives and research question is the way in which they are written. Research questions are obviously that questions. Objectives transform these questions into behavioural aim by using action oriented words such as 'to find out', 'to determine', 'to ascertain' and 'to examine'. Some researchers prefer to reverse the process; that is, they start from objectives and formulate research questions from them. Some researchers are satisfied only with research questions, and do not formulate objectives at all. If you prefer to have only research questions or only objectives, this is fine but keep in mind the requirement of your institution for research proposals.

Step 6: Examine Objectives :

Assess your objectives. Now examine your objectives to ascertain the feasibility of achieving them through your research endeavour. Consider them in the light of the time, resources (financial and human) and technical expertise at your disposal.

Step 7: Double check.

Go back and give final consideration to whether or not your are sufficiently interested in the study, and have adequate resources to undertaken it. Ask yourself, 'Am I really enthusiastic about this study', and 'Do I really have enough resources to undertake it'? Answer these question thoughtfully and realistically. If your answer to one of them is 'no' re-assess your objectives.

So far we have focused on the basis of your study, the research problem. But every study in social science has a second element, the study population, from whom the required information to find answer to your research questions is obtained. As you narrow the research problem, similarly you need to decide very specifically who constitutes your study population, in order to select the appropriate respondents.

6.7 THE FORMULATION OF OBJECTIVES

Objectives are the goals you set out to attain in your study. Since, these objectives inform a reader of what you want to achieve through the study, it is extremely important to word them clearly and specifically.

Objectives should be listed under two headings:

- Main Objectives
- Sub-objectives

a) Main Objectives :

The main objectives are an overall statement of the thrust of your study. It is also a statement of the main associations and relationships that you seek to discover or establish. The sub-objectives are the specific aspects of the topic that you want to investigate within the main framework of your study.

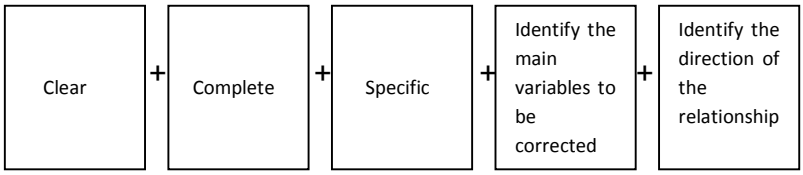
b) Sub-Objectives :

Sub-objectives should be numerically listed. They should be worded clearly and unambiguously. Make sure that each sub-objective contains only one aspect of the study. Use action oriented words or verbs when writing your objectives. The objectives should start with words such as 'to determine', 'to find out', 'to ascertain', 'to measure' and 'to explore'.

The way the main and sub-objectives are worded determine how your research is classified (e.g. descriptive, co-relational or experimental). In other words, the wording of your objectives determines the type of research design you need to adopt to achieve them. Hence, be careful above the way your word your objectives.

Irrespective of the type of research, the objectives should be expressed in such a way that the wording clearly, completely and specifically communicates to your readers your intention. There is no place for ambiguity, non-specificity or incompleteness, either in the wording your objectives or in the ideas they communicate. Display the characteristics of the wording of objectives in relation to the type of research study.

Characteristics of Objectives:



If your **study is primarily descriptive**, your main objective should clearly describe the major focus of your study even mentioning the organisation and its location unless these are to be kept confidential (e.g. to describe the types of treatment program provided by…. [name of the organization]….or to find out the

opinion of the community about the health service provided by….[name of the health centre/department] in….[name of the place]….). Identification of the organisation and its location is important as the services may be peculiar to the place and the organization and may not represent the services provided by other to similar populations.

If your **study is co-relational in nature**, in addition to the above three properties, the wording of the ain objective should include the main variables being co-related (e.g. to ascertain the impact of migration on family roles or to compare the effectiveness of different teaching methods on the comprehension of students).

If the overall thrust of **your study is to test a hypothesis**, the wording of main objectives, in addition to the above, should indicate the direction of the relationship being tested (e.g. to ascertain if an increase in youth unemployment will increase the incident of street crime, or to demonstrate that the provision of maternal and child health services to Aboriginal people in rural Australia will reduce infant mortality).

6.8 ESTABLISHING OPERATIONAL DEFINITIONS

As mentioned earlier, in **every study there are two components: the subject area and the study population.** The main aim of formulating a research problem is to clearly and precisely define the research problem. In defining the problem you may use certain words or items that are difficult to measure and/or the understanding of which may vary from respondent to respondent. In a research study it is important to develop, define or establish a set of rules, indicators or yardsticks in order to clearly establish the meaning of such word/items. On the other hand, it is sometimes also important to define clearly the study population from which you need to obtain the required information. The following example studies help to explain this.

- To find out the number of children living below the poverty line in Australia;
- To ascertain the impact of immigration on family roles among immigrants;
- To measure the effectiveness of a retaining program designed t help young people.

Although, these objectives clearly state the main thrust of the studies, they are not specific in terms of the main variables to be studied and the study populations. You cannot count the number of children living below the poverty line until you decide what constitutes the poverty line and how to determine it; you cannot find

out the impact of immigration on family roles unless you identify which roles constitute family roles; and you cannot measure effectiveness until you define what effectiveness is. On the other hand, it is equally important to decide exactly what you mean by 'children', 'immigrants' or 'young'. Up to what age will you consider a person to be a child (i.e. 5, 10, 15, or 18)? Who would you consider young? A person 15 years of age, 20, 25, or 30? Who would you consider to be an immigrant? A person who immigrated 40, 20 or 5 years ago? In addition, are you going to consider immigrants from every country or only a few?

In many cases you need to develop operational definitions for the variable you are studying and for the population that becomes the source of the information for your study. Following table shown the concepts and the population group to be operation alished for the above examples.

In a research study you need t define these clearly in order to avoid ambiguity and confusion. This is achieved through the process of developing operational/working definitions. You need to develop operational definitions for the major concepts you are using in your study and develop a framework for the study population enabling you to select appropriate respondents.

Operationalisation of concepts and the study populations

Study	Concept to be studied		Population to be studied	
	Concepts	Issues	Study Population	Issues
1	Poverty Line	What constitutes 'Poverty Lines'?	Children	Who would you consider a child?
2	Family roles	What constitutes 'Family roles'?	Immigrants	Who would you consider an immigrant?
3	Effectiveness	What constitutes 'Effectiveness'?	The young	Who would you consider a young person?
You must	Operationalise the concepts: define in practical, observable and measurable terms 'poverty line', 'family roles' and 'effectiveness'.		Operationalise the study population: define in identifiable terms 'children', 'immigrants' and 'young'.	

Operational definitions may differ from dictionary definitions as well as from day-to-day meanings. These meanings may not be helpful in either identifying you study population or the concepts you are studying. Though in daily life you often use words such as 'children', 'youth' and 'immigrant' loosely, your need to be more

specific when using them in a research study. you should work through your own definition.

Operational definitions give operational meanings to the study populations and the concepts used. It is only through making your procedures explicit that you can validly describe, explain, verify and test. It is important to remember that there are no rules for deciding if an operational definition is valid. Your arguments must convince other about the appropriateness of your definitions.

6.9 SUMMARY

The formulation of a research problem is the most important step in the research process. It is the foundation in terms of design, on which you build the wholes study. Any defects in it will adversely affect validity and reliability of your study.

There are no specific guidelines but the model suggested in this chapter could serve as a useful framework for the beginner. The seven step model is operational in nature and follows a logical sequence that takes the beginner through the complexities of formulating a research problem in a simple and easy-to-understand manner.

It is important to articulate the objectives of your study clearly. Objective should be specific and free from ambiguity, and each one should relate to only one aspect of the study. They should be under two headings: main objective and sub-objectives. Use action-oriented words when writing your objectives.

6.10 QUESTION

1) What do you mean by research problem? Discuss its importance.
2) Discuss the sources and steps in formulating research problem.

7

HYPOTHESIS

Unit Structure :

7.1 INTRODUCTION

The important consideration in the formulation of a research problem is the construction of hypothesis. **Hypotheses being clarity, specificity and focuse to a research problem, but are not essential for a study. You can conduct a valid investigation without constructing a single formal hypothesis.** On the other hand, within the context of a research study you can construct as many hypotheses as you consider to appropriate. Some believe that one must formulate a hypothesis to undertake an investigation it is important to formulate hypotheses.

The importance of hypotheses lies in their ability to bring direction, specificity and focus to research study. **They tell a researcher what specific information to collect, and thereby provide grater focus.** Let us imagine you are at the race and you place a bet. You bet on a hunch that a particular horse will win. You will only know if you hunch was right after the race. Take another example suppose you have a hunch that there are more smokers than non-smokers in your class. To test you hunch you ask either all or just some of the class if they are smokers you. **Can them conclude whether you hunch was smoker?** Suppose you work in the area of public health. Your clinical impression is that a higher rate of a particular condition prevails among people coming from a

specific population subgroup. You want to find our the probable cause of this condition. These could be many causes. To explore every conceivable possibility would require an enormous amount of time and resources. Hence, to narrow the choice, based on your knowledge of the field, you could identify what you assume to be the most probable cause. You could then design a study to collect the information needed to verify your hunch.

Hypotheses are based upon similar logic as a researcher you do not know about a phenomenon a situation the prevalence of a condition in a population on about the outcome of a program, but you do have to from the basis of certain assumptions on gasses. You test these by collecting information that will enable you to conclude if you hunch was right. The verification process can have on the three out come you hunch proved to be right, partially right or wrong. Hence a hypothesis is a hunch assumption suspicion ascertains or an idea about a phenomenon, relationship as situation, the reality or truth on which you do not. Know a researcher calls these assumptions, assertions, statements or hunches hypotheses and they become the basis of an inquiry. In most studies the hypothesis will be based upon either previous studies or on your own or someone else's observation.

7.2 MEANING OF HYPOTHESES

There are many definitions of :

1) A hypothesis. **"A hypotheses is conjectural statement of the relationship between two or more variables."**

2) **Webster's New International Dictionary of** English language defines **"a hypothesis as a proposition, condition, or principle which is assumed, perhaps without belief, in order to draw out its logical consequences and by this method to test its accord with facts which are known or may be determined.**"

3) **According to Grinnell and Slothers**, a hypothesis is written in such as way that it can be proven or disproven by valid and reliable data. it is in order to obtain these data that we perform our study.

4) Hypotheses is a tentative proportion formulated for empirical testing it is a deductive statement combining concepts. It is a tentative answer to a research question. He is tentative because its veracity can be evaluated only after it has been tested empirically.

5) **Lundberg defines** hypothesis as a tentative generalization the validity of which remains to be tested.

From the above definitions it is apparent that a hypothesis has certain characteristics.

- It is a tentative proportion
- Its validity is unknown
- In most cases, it specifies a relationship between two or more variables.

7.3 THE CHARACTERISTICS OF HYPOTHESIS

These are a number of considerations to keep in mind when constructing a hypothesis as they are important for valid verification.

a) Simple specific and conceptually clear :

There is no place for ambiguity in the construction of a hypothesis, as ambigrity will make the verification of your hypothesis almost impossible. If should be unidimensinal. That is it should test only one relationship on hunch at a time to be able to develop a good hypothesis you must be familiar with the subject are. The more insight you have into a problem the easier it is to construct a hypothesis. For example “The average age of the male students in this class is higher than that of the female students”.

The above hypothesis is clear, specific and easy to test. It tells you what you are attempting compare which population groups are being compared, and what you want to establish. For example “suicide rate very inversely with social cohesion”.

This hypothesis is clear and specific but a lot more difficult to test. These are three aspects of this hypothesis. Suicide rates vary inversely, which stipulates the direction of the relationship and social cohesion. To find out the suicide rate and to establish whether the relationship is inverse or otherwise are comparatively easy, but to ascertain social cohesion is a lot more determines social cohesion? How can it be measure? This problem makes if more difficult to test this hypothesis.

b) A hypothesis should be capable of verification :

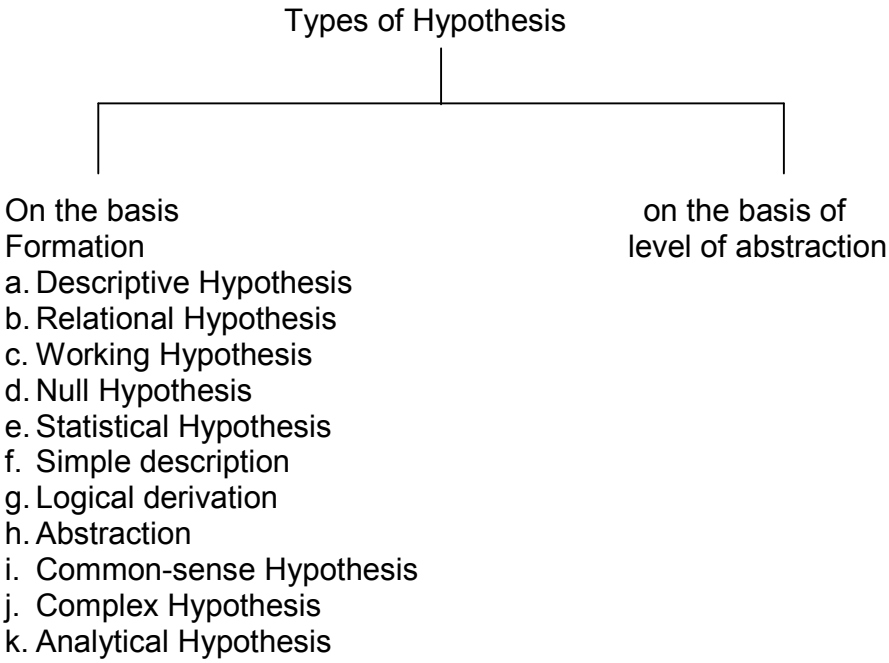
Methods and techniques must be available for data collection and analysis. **There is no point in formulating a hypothesis if it cannot be subjected to verification because there are no techniques to verify it.** However this does not necessarily means that you should not formulate a hypothesis for which there are no methods of verification.

A hypothesis should be related to the existing body of knowledge.

c) **A hypothesis should be operational** is sable this means that it can be expressed in terms that can be measured it cannot be measured, it cannot be tested and no conclusion can be drawn.

7.4 TYPES OF HYPOTHESIS

As explained any assumption that you seek to validate through on inquiry is called a hypothesis. Hence, theoretically these should be only one type of hypothesis that is the researcher hypothesis. The basis of researchers investigation. Hypotheses are classified in several ways.



a) Descriptive Hypotheses :

These are propositions that describe the characteristics (such as size from or distribution) **of a variable. The variable may be an objective, person, organization, situation or event some examples are :**

The rate of unemployment among arts graduates is higher than of commerce graduates"

Public enterprises are more amenable for centralized planning. The educational system is not oriented to human resource needs of a country.

b) Relational Hypotheses :

These are propositions, which describe the relationship between two variables. The relationship suggested may be positive or negative condition on a causal relationship. Some examples were 'families with higher income spend more for recreation'.

c) Casual Hypotheses:

Casual hypotheses state that the existence of or a change in one variable causes or leads to an effect on another variable. The first variable is called the independent variable, and the latter the dependent variable when dealing with causes relationships between variable the researcher must consider the direction in which such relationship flow i.e. which is cause and which is effect.

d) Working Hypotheses:

While planning the study of problem hypotheses are formed. Initially they may not be very specific. In such cases, they are referred to as 'Working Hypotheses', which are subject to modification as the investigation proceeds.

e) Null Hypotheses:

These are hypothetical statement denying what are explicitly indicated in working hypotheses. They do not, nor were ever intended to exist in reality. They state that no difference exists between the parameter and the statistic being compared to it. For example, even though there is relationship between a family's income and expenditure on recreation, a null hypothesis must stay: "There is no relationship between family", income level and expenditure on recreation".

g) Common Sense Hypotheses:

These represent the common sense ideas. They state the existence of empirical uniformities perceived through day to day observations. Many empirical uniformities may be observed in business establishments, the social background of workers, and the behaviour pattern of specific group like students. 'shop-assistants in small shops lack motivation'. Common sense statement are often a confused mixture of clichés and moral judgments. Scientists have a large-scale job in transforming and testing them. This requires three tasks. 'first, the removal of value judgment'. Second, the clarification of terms; and third, the application of validity tests".

h) Complex Hypotheses:

These aim at testing the existence of logically derived relationships between empirical uniformities. For example, in the early stage Human Ecology described empirical uniformities in the distribution of land value, industrial concentration, types of business and other phenomena.

i) Analytical Hypotheses:

These are concerned with the relationship of analytic variables. These hypotheses occur at the highest level of abstraction. These specify relationship between changes in one property and changes in another. For example, the study of human fertility might show empirical regularities by wealth, education, region and religion. If these were raised to the level of ideal type formulation, one result might be the hypotheses. 'There are two high-fertility population segments in India, viz. low income when Muslims and low-income rural low caste Hindus.

7.5 SOURCES OF HYPOTHESES:

Hypotheses can be derived from various sources. Some of the sources is given below.

a) Observation

Hypotheses can be derived from observation from the observation of price behavior in a market. For example the relationship between the price and demand for an article is hypothesized.

b) Analogies

Analogies are another source of useful hypotheses. Julian Huxley has pointed out that casual observations in nature or in the framework of another science may be a fertile source of hypotheses. For example, the hypotheses that similar human types or activities may be found in similar geophysical regions come from plant ecology.

c) Theory

This is one of the main sources of hypotheses. It gives direction to research by stating what is known logical deduction from theory lead to new hypotheses. For example, profit / wealth maximization is considered as the goal of private enterprises. From this assumption various hypotheses are derived'.

d) State of Knowledge

An important source of hypotheses is the state of knowledge in any particular science where formal theories exist hypotheses can be deduced. If the hypotheses are rejected theories are scarce hypotheses are generated from conception frameworks.

e) Culture

Another source of hypotheses is the culture on which the researcher was nurtured. Western culture has induced the emergence of sociology as an academic discipline over the past decade, a large part of the hypotheses on American society

examined by researchers were connected with violence. This interest is related to the considerable increase in the level of violence in America.

f) Continuity of Research

The continuity of research in a field itself constitutes an important source of hypotheses. The rejection of some hypotheses leads to the formulation of new ones capable of explaining dependent variables in subsequent research on the same subject.

7.6 CHARACTERISTICS OF A GOOD HYPOTHESES

a) Simplicity

Hypotheses should be a simple one requiring fewer conditions on assumptions. But, simple does not mean obvious, simplicity demands insight. The more insight the researcher has into a problem the simpler will be his hypotheses about it.

b) Objectivity

Scientific hypotheses should be free from value judgment. In principle the researcher's system of values has no place in scientific method. However, as social phenomena are affected by the milier in which they take place the researcher must be aware of his values and state them explicitly.

c) Consistency

Hypotheses must be logically consistent. Two or more propositions logically derived from the some theory must not be mutually contradictory.

d) Theoretical relevance

A hypotheses should be related to a body of theory. A science can be cumulative only by building on an existing body of facts and theory. It cannot develop if each study is an isolated investigation when research is systematically based upon a body of existing theory.

e) Availability of Techniques

Hypotheses should be related to available techniques, otherwise they will not be researchable.

f) Testability

A hypothesis should be testable and should not be a moral judgment. It should be possible to collect empirical evidences to test the hypothesis.

g) Specificity

A hypothesis should be specific and explain the expected relation between variables and the conditions under which these relations will hold. E.g. when there is dissatisfaction and no care is taken, deprivation will engender violence.

h) Conceptual clarity

A hypothesis should be conceptually clear. It should consist of clearly defined and understandable concepts. Clarity is obtained by means of defining operationally the concepts in the hypothesis.

7.7 SUMMARY

Hypothesis, though important are not essential for a study. A perfectly Hypothesis are important for bringing clarity, specificity and focus to a research study. A hypothesis is a speculative statement that is subjected to verification through a research study. In formulating a hypothesis it is important to ensure that it is simple, specific and conceptually clean, is able to be verified, is rooted in an existing body of knowledge.

7.8 QUESTIONS

1. Define Hypothesis. Explain its nature and significance.
2. Discuss the types of Hypothesis
3. What are the sources of Hypothesis?
4. What are the characteristics of good Hypothesis?

8

SAMPLING

Unit structure :

8.0 INTRODUCTION:

Empirical field studies require collection of first-hand information or data pertaining to the units of study from the field. The units of study may include geographical areas like districts, taluka, cities or villages which are covered by the study, or institutions or households about which information is required, or persons from whom information is required, or person from whom information is required, or person from whom information is available. The aggregate of all the units pertaining to a study is called the population or the universe population is the target group to be studied.

It is the aggregate of elements about which we wish to make inferences a member of the population is an element. It is the subject on which measurement is taken. It is the unit of study. A part of the population is known as a simple. The process of drawing a sample from a larger population is called sampling. The list of sampling units from which a sample is taken is called the sampling frame, e.g. a map a telephone directory, a list of industrial undertakings a list of car licenses etc.

Illustration 1:- A researcher desires to study the attitude of students of Master of Education of a college of education towards semester system. A student of that course is a unit of study. The total of all Master Education Student of that course is a unit of study. The list of M.Ed. student from which a sample will be drawn is the sampling frame.

Illustration 2:- A researcher wants to survey the brand preferences of households regarding toilet soaps in Jayanagar area of the city of Bangalore. A household is the sampling unit. The total of all households in Jayanagar area is the population. Suppose in a detailed map of Jayanagar, but list of households is not available, each block may be considered a sampling unit. A list of such blocks will be used as the frame.

8.1 AIMS OF SAMPLING:

Well-selected sampling may reflect fairly accurately of the population. For example, with a survey of a sample of voters, one can predict the voting intentions of millions of voters. A specified value of the population, such as average of variance is named parameter; the corresponding value in the sample is termed a statistic. The chief of sampling is to make an inference about an unknown parameter from a measurable sample statistic.

A second aim of sampling is to test a statistical hypothesis relating to population. A sample is drawn and the data collected from the sample informants are analysed and on the basis of the result the hypothesis may be accepted or rejected.

Census v/s Sampling:-

The process of designing a field study, among other things, involves a decision to use sampling or not. The researcher must decide whether he should cover all the units or a sample of units. When all the units are studied, such a complete coverage is called a census survey. When only a sample of the universe is studies, the study is called a sample survey.

In making this decision of census or sampling, the following factors are considered:

1. The size of the population: If the population to be studied is relatively small, say 50 institutions or 200 employees or 150 households, the investigator may decide to study the entire population. The task is easily manageable and the sampling may not be required. But if the population to be studied is quite large, sampling is warranted. However, the size is a relative matter. Whether a population is large or small depends upon the undertaken and the time and other resources available for it.

2. Amount of funds budgeted for the study:- The decision regarding census or sampling depends upon the budget of the study. Sampling is opted when the amount of money budgeted is smaller than the anticipated cost of census survey.

3. Facilities:- The extent of facilities available-staff access to computer facility and accessibility to population elements – is another factor to be considered in deciding to sample or not, when the availability of these facilities is extensive, census survey may be manageable. Otherwise, sampling is preferable.

4. Time:- The time limit within which the study should be completed is another important factor, to be considered in deciding the question of census or sample survey. This, in fact, is a primary reason for using sampling by academic and marketing researchers.

8.2 CHARACTERISTICS OF GOOD SAMPLE:

Whether the results obtained from a sample survey would be accurate or not depends upon the quality of the sample. The characteristics of a good sample are described below:

1. Representative ness: - A sample must representatives of the population. Probability sampling technique yield representative sample. In measurement terms, the sample must be valid. The validity of a sample depends upon its accuracy and precision.

2. Accuracy: - Accuracy is defined as the degree to which bias is absent from the sample accurate (unbiased) sample is one which exactly represents the population. It is free from any influence that causes any difference between sample value and population value (say, average).

3. Precision:- The sample must yield precise estimate. Precision is measured by the standard error or standard deviation of the sample estimate. The smaller the standard error or estimate, the higher is the precision of the sample. (see section 6.4 below)

4. Size:- A good sample must be adequate in size in order to be reliable. (For a detailed discussion of sample size, see section 6.4 below). The sample should be of such size that the inferences drawn from the sample are accurate to the given level of confidence.

8.3 BASIS OF SAMPLING:

Sampling is based on two premises. They are:

1. There is such similarity among the elements in a population that a few of these elements will adequately represent the

characteristics of the total population. For example, the attitude of postgraduate students towards the examination system can be gauged by studying the attitudes of a few representative postgraduate students in a university.

2. While the sample value (statistic) or some sample units may be more than the population value (parameter), the sample value of other sample units may be less than the population value. When the sample is drawn properly these differences tend to counteract each other with the result a sample value is generally close to the population value.

Thanks to these tendencies, sampling yields almost the same result as that of a census survey.

8.4 ADVANTAGES OF SAMPLING:

Why is sampling used? What are its advantages? The advantages of sampling are many.

First, **sampling reduces the time and cost and** research studies. Thanks to the use of sampling, it has become possible to undertake even national or global studies at reasonable cost and time. Such economy in time and cost improves the viability of several field studies like credit surveys, poverty surveys and marketing surveys.

Second, **sampling saves labour. Smaller** staffs are required both for fieldwork and for processing and analyzing the data.

Third, **the quality of a study is often better with** sampling than with a complete coverage. The possibility of better interviewing, more thorough investigation of missing, wrong or suspicious information, better supervision, and better processing is greater in sampling than in complete coverage. No wonder that the accuracy of decennial population censuses in USA, India and other countries is checked by making sample surveys.

Fourth, sampling provides much quicker results than does a census. The speed of execution minimizes the time between the recognition of a need for information and the availability of that information. The speed of execution is vital in feasibility studies, evaluation studies and business research. Timely execution of a study is essential for making use of its findings.

Fifth, sampling is the only procedure possible, if the population is infinite e.g. throws of dice consumer behaviour surveys, etc.

Last, statistical sampling yields a crucial advantage over any other way of choosing a part of the population for a study. That is when the estimated of the population characteristics are made from the sample results, the precision of these estimates can also be gauged from the sample results themselves (for explanation, see section 6.4 below).

8.5 LIMITATIONS OF SAMPLING:

Sampling is however not free from limitations :

1. **Sampling demands a through knowledge** of sampling methods and procedures and an exercise of greater care: otherwise the results obtained may be incorrect or misleading.

2. **When the characteristic to be measured occurs** only rarely in the population, a very large sample is required to secure units that will give reliable information about it. A large sample has all the drawbacks of a census survey.

3. **A complicated sampling plan may require** more labour than a complete coverage.

4. **It may not be possible to ensure the representatives** of the sample even by the most perfect sampling procedures. Therefore sampling results in a certain degree of sampling errors i.e. there will be some difference between the sample value and the population value (see section 6.5 below).

8.6 SAMPLING TECHNIQUES OF METHODS:

Classification:-

Sampling techniques or methods may be classified into two generic types (a) **probability or random sampling and (b) non-probability or non-random sampling**.

1 Simple random sampling
2 Stratified random sampling
3 Systematic random sampling
4 Cluster sampling
5 Area sampling
6 Multi – stage and sub – sampling
7 Random sampling with probability proportional to size.
8 Double sampling and multiphase sampling
9 Replicated or interpenetrating sampling

Non – probability sapling may be classified into:
1 Convenience or accidental sampling
2 Purposive (or judgement) sampling
3 Quota sampling
4 Snow – ball sampling

Sampling Methods

Probability Methods	Non-Probability Sampling
a. Simple Design	
b. Simple random sampling	a. Convenience or accidental sampling
c. Stratified random sampling	b. Purposive or judgement sampling
d. Systematic random sampling	
e. Complex Design	
f. Cluster and area sampling	c. Quota sampling
g. Multi-Stage and sub-sampling	d. Snow-ball sampling
h. Probability proportional to size sampling	
i. Double sampling and multi-phase sampling	
j. Replicated Sampling	

Each of the above sampling methods is discussed below :

Probability v/s Non – probability Sampling:-

Probability sampling is based on the theory of probability. It is also known as random sampling. It provides a known non-zero chance of selection for each population element.

a) Its characteristics are:

1. In probability sampling every population has a chance of being selected.

2. Such chance is a known probability. For instance, if a sampling frame is a list of 100 students of a specific course of study in a simple random sample, each student has $1/100^{th}$ chance of being selected.

3. Probability sampling yields a representative sample, and hence, the findings of the sample survey are generalisable to the population.

4. The closeness of a sample to the population can be determined by estimating sampling bias of error (which we will discuss in more detail later. See section 6.5 below). Through randomization, the danger probability sampling bias can be minimized. Hence, probability sampling is preferable to non-probability sampling probability sampling should be used when generalization is the objective of study, and a greater degree of accuracy of estimation of population parameters is required cost and time required for probability sampling may be large. Hence, the benefit derived from it should justify the cost.

Non-probability sampling or non-random sampling is not based on the theory of probability. This sampling does not provide a chance of selection to each population element. The only merits of this type sampling are simplicity convenience and low cost.

b) Its merits are:-

1. It does not ensure a selection chance to each population unit.
2. The selection probability is unknown.
3. A non-probability sample may not be a representative one.
4. Non-probability sampling plan does not perform inferential function, i.e. the population parameters cannot be estimated from the sample values.
5. It suffers from sampling bias, which will distort results.

Therefore, non-random is not a desirable method. Yet there are some practical reasons for using it. those reasons are:

1. When there is no other feasible alternative due to non-availability of a list of population, non-availability of some population elements for collection of data, etc.
2. When the study does not aim at generalizing the findings to the population, but simply at feeling the range of conditions or nature for the phenomenon.
3. When the cost required for probability sampling may be too large, and the benefit expected from it is not commensurate with such costs, and
4. When probability sampling requires more time, but the time constraints and the time limit for competing the study do not permit it.

8.7 PROBABILITY SAMPLING METHODS:

Random Sampling Procedures:-

The importance of randomness an sampling needs no emphasis. It is a means for securing a representive sample. How can a random sample be drawn? The layman tends to thing that random sampling means picking out units "at random," i.e. in a haphazard or hit and miss way. Experience shows that the human being is an extremely poor instrument for the conduct of a random selection. To ensure true randomness the method of selection must be independent of human judgement.

There are three basic procedures.

1) The lottery method:- This is the simplest and most familiar procedure of random sampling if a sample of 10 students is to be drawn out of a list of 50 students in a section, take 50 equal size chips or slips of paper; number them from 1 to 50 each hearing only one number. Roll each slip, put the rolled slips in a global container and thoroughly shuffle or mix them take 10 chips from the container one after another. Each time before drawing a chip, mix the chips in the container thoroughly; the units bearing the numbers of chips drawn constitute the random sample.

In the above sampling procedure, there are two alternatives. After a number is selected by draw it may be replaced and consequently it has a chance of being selected again such a method is known as sampling with replacement. This is usually referred to as unrestricted random sampling. Alternatively, the selected number is set aside, and so in the subsequent draws it does not get a chance of being selected again. This type of sampling is known as sampling without replacement. This is a form of restricted sampling.

Sampling with replacement, guarantees each element an equal and independent chance of being selected in each draw. However, an element previously drawn and replaced in the vessel has a chance of being drawn again. But the woman procedure is not to count it again as an item of the sample for, it is absurd to ask a respondent to fill in a questionnaire twice.

Lottery method is useful for drawing a small sample from a small population. But it would be time consuming and tedious if the population is very large.

2) The use of table of random numbers:- This is a less cumbersome, but equally valid procedure of sample selection tables of random numbers have been developed by Kendall and Smith (1939). Fisher and Yates (1963) and Tippet (1927). One of them is usually found in a standard book on statistics or methodology of research. To select a random sample out of a given frame, one should simply start t read numbers from a table of random numbers at any randomly selected point and pick out numbers within the range of the frame. This procedure is illustrated below:

Let us suppose that random sample of 50 is to be selected from a college population of 500 commerce students. We can use any table of random numbers.

EXTRACT FROM A TABLE OF RANDOM NUMBERS

10	09	73	25	33	76	52	01
37	54	20	48	05	64	89	47
08	42	26	89	53	19	64	50
09	01	90	25	29	09	37	67
12	80	79	99	70	80	15	73
66	06	57	47	17	34	07	27
31	06	01	08	05	45	57	18
85	26	97	76	02	02	05	16
63	57	33	21	35	05	32	54
73	79	64	57	53	03	52	96

Let us suppose, we start, at the top of the left hand second column. As the population consists of a three digit figure, read three – digit columns i.e. read 097, 542, 422, 019, and 50 on. All the numbers within the range of 1 to 500 may be picked out. Then the sample will consist of.

097, 422, 019, 065, 269, and so on. In the above reading 542, 807, 573, etc are rejected because they are over 500.

When the researcher the bottom of a column, he can simple one digit to the right and start at the top of the column again and read numbers in three – digits: 973, 420, 226, 190, 079 and so on.

The main advantages of the use of a table of random numbers are:

Easy to use and ready accessibility :

The table of random numbers in ideal for obtaining a random sample from relatively small populations when populations are quite large say lakhs or crores, drawing numbers from the table becomes tedious.

3) Use of Computer:- If the population is very large and if computer facilities are available, a computer may be used for drawing a random sample. The computer can be programmed to print out a series of random numbers as the researcher desires.

Simple Random Sampling:-

This sampling technique gives each element an equal and independent chance of being selected an equal chance means equal probability of selection e.g. in a population of 300, each element theoretically has 1/300 chance of being selected. In a population of 1000 chance of being selected equal probability

selection method is described as Epsem sampling. An independent chance means that the draw of one element will not affect the chances of other elements being selected.

Where some elements are purposely excluded from the sample, the resulting sample is not a random one. Hence all elements should be included in the sample frame to draw a random sample.

Procedure:- The procedure of drawing a simple random sample consists of:

- Enumeration of all elements in the population.
- Preparation of a list of all elements, a giving them numbers in a serial order 1, 2, 3… so on, and
- Drawing sample numbers by using (a) lottery method, (b) a table of random numbers or (c) a computer.

Suitability:- The simple random sampling is suitable only for a small homogenous population. It may yield a representative sample under the following conditions:

1. Where the population is a homogeneous group with reference to the specified characteristics, e.g. students studying in fifth standard in a boys school from a homogenous group as regards level of education and age group.
2. Where the population is relatively small, and
3. Where a complete list of all elements is available or can be prepared.

The simple random sampling is not suitable for drawing a simple from a large heterogeneous population, as it may not yield a representative sample of such population.

Advantages:- Some advantages of simple random sampling are:.

1 All elements in the population have an equal chance of being selected.

2 Of all the probability sampling techniques simple random sampling is the easiest to apply.

3 It is the most simple type of probability sampling to understand.

4 It does not require a prior knowledge of the true composition of the population.

5 The amount of sampling error associated with any sample drawn can easily be computed.

Disadvantages:- The simple random sampling techniques suffers from certain drawbacks.

1 It is often impractical, because of non-availability of population list or of difficulty in enumerating the population. For example, it is difficult to get a current accurate list of households in a city or a list of landless rural agricultural labourers who migrate from area to area in search of employment or a list of households of a nomadic tribe.

2 The use of simple random sampling may be wasteful because we fail to use all of the known information about the population

3 This technique does not ensure proportionate representation to various groups constituting the population.

4 The sampling error in this sampling is greater than that in other probability samples of the same size, because it is less precise than other methods.

5 The size of the simple required to ensure its representative ness in usually larger under this type of sampling than under other random sampling techniques.

6 A simple random design may be expensive in time and money.

These problems have led to the development of alternative superior random sampling designs like stratified random sampling, systematic sampling, etc.

Stratified Random Sampling:-

This is an improved type of random of probability sampling. In this method, the population is sub-divided into homogeneous groups or strata, and from each stratum, random sample is drawn. For example, university students may be divided on the basis of discipline and each discipline group may again be divided into juniors and seniors and employees of a business undertaking may be divided into managers and non-managers and each of those two groups may be sub-divided into salary grade wise strata.

Need for stratification:- Stratification is necessary for (1) increasing a sample's statistical efficient (2) providing adequate data for analyzing the various sub-populations, and (3) applying different methods to different strata.

Stratification ensures representation to all relevant sub-groups of the population, more efficient statistically than simple random sampling.

Stratification is essential when the researcher wants to study the characteristics of population sub-groups e.g. male and female employees of an organization.

Stratification is also useful when different methods of data collection etc. are used for different parts of the population e.g. interviewing for workers and self administered questionnaire for executives.

Suitability:- The stratified random sampling is appropriate for a large heterogeneous population.

Stratification Process:- This involves three major decisions:
1) The stratification base or bases to be used should be decided. The ideal base would be the principal variable under study. For example, if the size of firms is a primary variable, the firms may be stratified on the basis of the block capital employed.

2) The number of strata: what should be the number of strata? There is no precise answer to this question. Larger the number of strata, greater may be the degree of representativeness on the number of sub-population group to be studied and the cost of stratification. Cochran suggests that there is little to be gained in estimating overall population values when the number of strata exceeds six.

3) Strata sample sizes: there are two alternatives: first, the strata sample sizes may be proportionate to strata's shares in the total population; second, they may be disproportionate to strata's shares accordingly stratified random sampling may be classified into (b) disproportionate stratified sampling

Proportionate Stratified Sampling:-

This sampling involves drawing a sample from each stratum in proportion to the latter's share in the total population. For example, if the final year MBA students of the management faculty of a university consist of the following specialization groups:

Specialization Stream	No of Students	Proportion of each stream.
Production	40	0.4
Finance	20	0.2
Marketing	30	0.3
Rural Development	10	0.1
	100	1.0

The researcher wants to draw an overall sample of 30, then the strata sample sizes would be:

Strata	Sample Size
Production	30 x 0.4 = 12
Finance	30 x 0.2 = 6
Marketing	30 x 0.3 = 9
Rural Development	30 x 0.1 = 3
	30

Thus, proportionate sampling gives proper representation to each stratum and its statistical efficiency is generally higher. This method is, therefore, very popular.

Advantages:- The principal advantages of proportionate stratified sampling are:

1 It enhances the representativeness of the sample by giving proper representation to all subgroups in the population.

2 It gives higher statistical efficiency than that given by simple random sampling for a given sample size.

3 it is easy to carry out this sample method.

4 This method gives a self – weighing sample the population mean can be estimated simple by calculating the sample mean.

Disadvantages:- The drawbacks of the proportionate stratified random sampling are:

1 A prior knowledge of the composition of the population and the distribution of the population characteristics are required to adopt this method.

2 This method is very expensive in time and money of course its greater efficiency may offset the additional cost.

3 The identification of the strata might lead to classification errors. Some elements may be included into the wrong strata. This may vitiabe the interpretion of survey results.

Disproportionate Stratified Random Sampling:-

This method does not give proportionate representation to strata. I necessary involves giving overrepresentation to some strata and under representation to others. There may be several disproportionate schemes. All strata may be given equal weight

even though their shares in the total population vary. Alternatively some substrata may be given greater weight and others lesser weight when is such disproportionate weighing preferable?

The desirability of disproportionate sampling 95 usually determined by three factors, viz (a) the sizes of strata (b) internal variances among strata, and (c) sampling costs.

The guideline suggested by cochran 95:

In given stratum, take a large sample if

a The Stratum is large.

b the stratum is more variable internally, and

c Sampling is cheaper in the stratum.

If the Clements of stratum are more mixed or variable, then it would be sensible to take a larger sample from it in other to make it representative of the stratum. Similarly, if the cost per sampling unit is expected to be greater in some strata than in others, one could increase the cost effective by taking a less proportionate sample in the costlier strata.

Usage:- This method of disproportionate sampling is not widely used. However, it is appropriate to use it under the following circumstances.

1 When the population contains some small but important sub-groups.

2 When certain sub-groups are quite heterogeneous, while others are homogeneous and

3 When it is expected that there will be appreciable differences in the response rates of the sub-groups in the population. But the above differences should be several – fold to make disproportionate sampling worth while.

Disproportionate sampling cannot be used for population with unknown proportions of characteristics, because correct sizes of strata samples cannot be determined.

Advantages:- The major advantages of disproportionate sampling are:

1 It is less time consuming compared with proportionate sampling, because the researcher is not necessarily concerned about the proportionate representativeness of his resulting sample as in the latter method.

2 It facilitates giving appropriate weighing to particular groups, which are small but more important.

Disadvantages:- The disadvantages of disproportionate sampling are:

1 This method does not give each stratum proportionate representation. Hence, the resulting sample may be less representative.

2 This method requires a prior knowledge of the composition of the population which is not always possible.

3 This method is also subject to classification errors. It is possible that the researcher may misclassify certain elements.

4 Though disproportionate sampling is a means for developing an optimal stratification scheme, its practical feasibility is doubtful because one generally does not know the relative variability in the strata nor the relative costs.

Systematic Sampling or Fixed Interval Method:-

Meaning & Process:- This method of sampling is an alternative to random sampling. It consists of taking every K them in the populations after a random start with an item from 1 to K for example, suppose it is desired to sect a sample of 20 students, from a list of 300 students, divide the population total of 300 by 20 the quotient is 15 (if there is any fraction in the questient ignore the fraction and take the interger or whole number). Select a number at random between 1 and 15 using lottery method or a table of random numbers. Suppose the selected number is g then the students numbered 9, 24, (9+15), (24 + 15) (39 + 15) 69, 84 are selected as the sample.

As the interval between sample units is fixed, this method is also known as fixed interval method.

Applications:- Systematic selection can be applied to various populations such as students in a class houses in a street, telephone directly, customers of a bank, assembly line output in a factory members of an association, and so on.

Strictly speaking this method of sampling is not a probability sampling. It is sometimes called a pseudo – random sampling.

Real Systematic Sampling:- It is more appropriate to use the label systematic sampling to the procedure of drawing a sample from a frame re-arranged in a systematic order of the basis of the populations important characteristic e.g. arranging the farm households in a village in an ascending or descending order of the size of their farms. Such systematic re-arrangement of the frame is desirable for populations with greater variability in such a case; even stratification cannot give proper representation to all size

groups. For example, for a farm management study, the farm size is a pramary variable suppose the size of farms of farmers in the area covered by the study varies widely ranging from 0.2 hectare to 25 hectares. Even if they are stratified into 5 strata viz (1) upto 5 hectares (2) 5 to 10 hectares (3) 10 to 15 hectares (4) 15 to 20 hecates and (5) 20 to 25 hectares there are greater variations in each stratum. Thus, even stratified random sampling may not yield a good representative sample. But if the list of farmers is rearranged in ascending or descending order of their farm sizes, and a sample is drawn at regular interval with a random start, all size groups get proper representation. Thus the degree of representativeness of this sample will be higher than that of a simple or stratified random sample of same size.

Hence, it will be more appropriate to call this kind of interval sampling as systematic random sampling.

Advantages:- The major advantages of systematic sampling are:

1 It is much simpler than random sampling. It is easy to use.

2 It is easy to instruct the field investigators to use this method.

3 this method may require less time. A researcher operating on a limited time schedule will prefer this method.

4 This method is cheaper than simple random sampling.

5 It is easier to check whether every 'K' th has been included in the sample.

6 Sample is spread evergly over the population.

7 It is statistically more efficient than a simple random sample when population elements are ordered chronologically, be size, class, etc. then systematic sampling gives a better representative sample.

Disadvantages:- The primary disadvantages of systematic sampling are:

1 This method ignores all elements between two 'K'th elements selected further except the first element other selected elements are not chosen at random. Hence, this sampling cannot be considered to be a probability sampling in the strict sense of the term.

2 As each element does not have an equal chance of being selected the resulting sample is not a random one. For studies aiming at estimations or generalization, this disadvantage would be a serious one.

3 This method may sometimes give a biased sample. If by chance, several 'K'th elements chosen represent a particular group, that group would be over represented in the sample.

Cluster Sampling:-

Where the population elements are scattered over wider area and a list of population elements is not readily available, the use of simple or stratified random sampling method would be too expensive and time consuming. In such cases cluster sampling is usually adopted.

Meaning:- Cluster sampling means random selection of sampling units consisting of population elements. Each such sampling unit is a cluster of population elements. Then from each selected sampling unit a sample of population elements is drawn by either simple random selection or stratified random selection.

Suppose a researcher wants to select a random sample of 1,000 households out of 40,000 estimated households in a city for a survey. A direct sample of individual households would be difficult to select, because a list of households does not exist and would be too costly to prepare. Instead, he can select a random sample of a few blocks/wards. The number of blocks to be selected depends upon the average number of estimated households per block suppose the average number of households per block is 200, then 5 blocks comprise the sample. Since, the number of households per block varies the actual sample size depends on the block which happen to be selected. Alternatively he can draw a sample of more blocks and from each sample blocks a certain number of households may be selected by systematic sampling.

Some illustrations of clusters are:

Population	Elements	Cluster or sampling units
City	Households	Blocks
City	Individuals	Households
Affiliating University	Students	Affiliated colleges
Rural areas	Households	Villages
Industrial areas	Industrial unit	Industrial estates

Features:- What makes a desirable cluster depends on the survey's situation and resources the individual elements are determined by the survey objectives. For example, for an opinion poll the individual person is a population element but for a socio-economic survey of households or a consumer behaviour survey a households may be population element or unit of study. The cluster

may be an institution or a geographical area or any other appropriate group depending on the nature of survey.

The number of elements in a cluster is called the cluster size. The cluster is most populations are of unequal size e.g dwellings in blocks persons in household, employees in section, farm households in village etc. Clusters of equal size are often the result of planned conditions such as manufacturing e.g. matches in match boxes, soap cakes in cases. The rarely exist in nature or society.

Cluster sampling v/s Stratified sampling:- How does cluster sampling compare with stratified sampling. There are certain differences between them.

Cluster sampling process:- The process of cluster sampling involves the following steps.

	Cluster Sampling	Stratified Sampling
1	The Sampling unit is a cluster or a group consisting of population elements	The population element itself is the sampling unit
2	The population is divided in to many clusters or subgroups, each with a few elements.	The population is divided into a few sub-groups or strata each with many elements.
3	Clustering is done on the basis of geographical area or administrative divisions (district/taluka) farm size etc.	Stratification is done on the basis of variables under study e.g. educational status, product line.
4	We try to secure heterogeneity with sub groups and homogenly between sub groups.	We aim at securing homogeneity within sub-groups and heterogeneity between sub-groups.
5	We make a random selection of sub-groups or cluster	We make a random selection of elements from each sub-group
6	The resulting sample may give a lower degree of representativeness for a given sample size	It yields a higher degree of representative sample for the same sample size.
7	The sampling error may be great	The sampling error will be less
8	The cost per element is lower	The cost per element is higher.

1 Identify Clusters:- What can be appropriate cluster for a population? This depends on the nature of the study and the distribution of the population realting to it. The appropriate cluster may be area units (e.g. districts, talukas villages, block or a city) or organizations/organizational units (e.g. schools, colleges, factories, sections in the school or departments in a factory.

2 examine the nature of clusters:- How homegeneous are the clusters? Clusters should not be homogeneous in internal characteristics. A sample drawn from such clusters cannot fully represent the overall population, hence clusters should be constructed in a way as to increase intra – cluster variance for example contiguous village/city blocks that contain different income/social groups may be combined into one cluster should the clusters be of equal or unequal size? The theory of clustering is that the means of sample clusters are unbiased estimates of the population mean." This is generally true when clusters are equal. But natural clusters often vary. The effects of unequal size may be reduced by 1) combining small clusters and splitting large clusters or 2) stratifying clusters by size and selecting clusters from each stratum.

3 Determine the number of stages:- Shall we use single stage or multistage cluster? This depends primarily on the geographical area of the study the scale of the study the size of the population and the consideration of costs. Depending on these factors, the following alternatives are possible.

(a) Single –stage sampling:- select clusters on a random basis and study all elements in each of the sample clusters.

(b) Two- stage sampling:- select cluster and then select elements from each selected cluster

(c) Multi-stage sampling:- extend the above method to more stages. This is discussed in detail under a separate subsequent sub-heading multi-stage sampling in this chapter itself.

Economy v/s Accuracy:- Cluster samples usually give a less precise estimates than simple random samples of the same size because of social area tendencies toward homogeneity. Why then should cluster sampling be used? It is used simply because it cuts research costs and time. For example, it is simpler more convenient and cheaper to randomly select 20 street with 30 average households each rather than to select 600 households ahead over an entire city. Interviewing units in small geographic areas is more convenient and less costly. One need not also waste lot of time in moving from one unit to another, because of their close special

proximity. Thus, cluster sampling is economically more efficient in terms of time, cost convenience.

However, the statistical efficiency to cluster samples is relatively low, because they may not fully be representative of the population.

Hence, we have to strike a balance between economic and statistical factors and consider the net relative efficiency in adopting the cluster sampling.

Applications:- The applications of the cluster sampling in social science research are extensive, particularly in farm management surveys, socio economic surveys, rural credit surveys, demographic studies ecological studies, public opinion polls, large scale surveys of political and social behaviour attitude, surveys, and so on.

Advantages:- The primary advantages of the cluster sampling method are.

1 This method is much easier and more convenient to apply when large populations are studied or large geographical areas are covered. Even a ready list of population elements is not necessary a researcher can simply draw a random sample of geographical sections and adopt single of multistage sampling depending of the vastness of the area covered by the study.

2 The cost of this method is much less when compared with other sampling methods.

3 This method promotes the convenience of field work as it could be done in compact places

4 Sampling under this method does not require more time.

5 Units of study a can be readily substituted for other within the same random section

6 This method is flexible; where it involves multistage sampling it is possible to employ different types of sampling in successive stages.

Disadvantages:- This method has certain stages. They are:

1 The cluster sizes may vary and this variation could increase the bias of the resulting sample. For example, if the researcher were to interview all adults in households in each selected street the number of adults would vary from house to house. There would be certain bias resulting from the large coverage of big families.

2 The sampling in this method of sampling is greater. Thus this method is statistically less efficient than other probability sampling methods.

3 Adjacent units of study (e.g. households) tend to have more similar characteristics than do units distinctly apart. This effects the representativeness of the sample and this effect is reflected in a greater sampling error.

Area Sampling:-

This is an important form of cluster sampling. In large field surveys, clusters consisting of specific geographical areas like districts, talukas, villages or blocks in city are randomly drawn. As the geographical areas are selected as sampling units in such cases their sampling is called area sampling. It is not a separate method of sampling, but forms part of cluster sampling.

In a country like India, where a state (previously known as a province) is divided into districts into talukas and talukas into towns and villages areas sampling is done on the basis of these administrative. It is not a separate method of sampling, but forms part units in multi stages (see multistage sampling below)

Illustration:- Where are area covered by a study is a city, to draw a random sample of households the following procedure may be adopted.

1. Take a map of the concerned city and lay over it a transparent sheet with a grid system of lines (i.e. horizontal and vertical lines drawn at equal intervals)
2. The grid system divides the city into squares of equal size say 100 areas.
3. Leave the squares occupied by non-residential business and public buildings, parks etc, - say 30 squares.
4. Number the squares occupied in a serial order 1, 2, 3, 4, 5 70 in expensive manner.
5. Estimate the average number of households in each saare on the basis of house consists in a few squares. Say the average number of households is 80.
6. If the required sample of households is, may 640 determine the number of squares to be selected by dividing this total by 80 i.e. .. 8 squares.
7. Select eight squares out of 80 on a simple random basis using a table of random numbers : or by adopting systematic random sampling method i.e. every 10^{th} (80/8 = 10) square with a random start.

8. Study all households in each of the sample eight squares the total sample would be 8 x 80 = 640 or a little less or more.

Where different socio- economic class of households are found to be concentrated in specific areas of the identifiable basis, then,

- ❖ Draw a random sample of proportionate number of areas from each strata.
- ❖ Prepare a list of households in each of the selected areas.
- ❖ Select randomly a proportionate number of households in each of these lists.

Alternatively divide each of the selected area into smaller areas of almost equal size called segments and select randomly a proportionate number of segments in each sample area and survey all households in each of the selected segments.

Are a sampling invariably involved multi-stage sampling and sub-sampling (see below).

Multi-Stage Sampling:-

In this method sampling is carried out in two or more stages. The population is regarded as being composed of a number of first stage sampling units. Each of them is made up to a number of second stage units and so forth that is at each stage, a sampling units is a cluster of the sampling units of the subsequent stage. First a simple of the first stage sampling units is drawn, then from each of the selected first stage sampling unit, a sample of the second stage sampling units is drawn the procedure continues down to the final sampling units or population elements. Appropriate random sampling method is adopted at each stage.

Usage:- Multi-stage sampling is appropriate where the population is scattered over a wider geographical area and no frame or list is available for sampling. It is also useful when a survey has to be made within a limited time and cost budget.

Advantages:- The crucial advantages of multi-stage sampling are:

1. It results in concentration of fieldwork in compact small areas and consequently in a saving of time, labour and money.
2. It is more convenient, efficient and flexible than single-stage sampling.
3. It obviates the necessity of having a sampling frame covering the entire population.

Disadvantages:- The major disadvantage of the multi-stage sampling is that the procedure estimating sampling error and cost advantage is complicated. It is difficult for a non-statistician to follow this estimation procedure.

Sub-Sampling:-

Sub-sampling is a part of a mult-stage sampling process. In mult-stage sampling the sampling in second and subsequent stage frames is called sub-sampling. Suppose that from a population of 40,000 households in 800 streets of the city, we want to select a simple of about 400 households (elements) or a sample of 8 streets cluster. The sample of 400 elements would be scattered over the city, but the cluster sample would be confined to 8 streets clustering reduces survey costs, but increases the sampling error. Sub-sampling balances these two conflicting effects of clustering. In the above case first a sample of say 80 streets may be drawn and from each of the selected a 10% sub sample of households may be drawn. In each of the above stages an appropriate probability sampling simple random/stratified random sampling systematic random sampling may be adopted.

Control of Sampling Size:-

One of the problem of cluster sampling is the problem of greater inequality in cluster sizes. The total sample size is subject to large variation if it is based on a random selection of clusters that differ greatly in size. If we sub sample the selected clusters at a fixed rate the total sample size of elements depends on which clusters are chosen at the first stage. With a large cluster of 10,000 a second-stage sampling fraction of 1/1000 gives a sample of 100 persons while with a small cluster of 2000 persons it yields only 20. the researcher needs to be able to fix the sample size within reasonable limits, therefore, the uncontrolled random sampling of clusters with unequal sizes e.g. cities blocks in big cities, districts, villages and establishments is not suitable.

Exact control of sample size is unnecessary and impossible in most situations. However, the teast an approximate control is essential. The main reasons for controlling sample size are:

1 The sample should be of adequate size in order to get results of desired degree of precision

2 The cost of data collection requires an upper limit on the overall sample size; and contractual obligation, if any, may also impose a lower limit.

3 Large differences and fluctuations in the size of clusters cause administrative inefficiencies in the field work.

4 Statistical efficiency tends of suffer from large inequalities of sample clusters. If the random sample of clusters includes one or two very large clusters containing mostly one social, ethnic group, the survey results would become biased.

For several such reasons a reasonable control over the sample size is needed. There are some ways to control and decrease variations in ultimate sample size viz.

1 Stratification of cluster by size and selecting a random sample in each size-group.

2 Splitting and combining natural clusters to form artificial clusters of more or less equal size; or

3 Selecting clusters with probability proportional to size (PPS) either from the overall frame or clusters or from each size group of clusters.

Sampling with probability proportionate size (PPS):

The procedure of selecting clusters with probability proportional to size (PPS) is widely used. If one primary cluster has twice as large a population as another, it is given twice the chance of being selected. If the same number of persons is then selected from each of the selected clusters, the overall probability of any person will be the same. The PPS is a better method for securing a representative sample of population elements in multi-stage cluster sampling.

The selection procedure is all follows:

1 Draw a list of clusters with their size measures.

2 Cumulate the size measures in sequences.

3 Divide the list into a certain appropriate number of eaual zones/strata with reference to cumulated measure e.g. if the cumulative total is say 600, the list may be divided into three equal zones 1-200, 201-400, 401-600;

4 Select the required equal number of sample in each zone, applying preferably systematic selection with a random start; and

5 Draw a same fixed number of population elements from each selected cluster at random.

Illustration:- Suppose the of a survey is a state consisting of 20 districts out of them 4 districts are to be selected with PPS the measure of size being population.

(a) List the district in some order and record the population of each together with cumulative population figures (see table 6.1)

(b) Divide the cumulative total by 2:310/2 = 155

(c) Divide the list into two zones 1-155:156 = 310

(d) Make a systematic random selection of two districts in each zone

(e) Divide the first zone total by 2 155/2 =77. Draw a random number between I and 77 say 66. The districts 8 is the first sample.

The scheme for selecting districts with PPS.

District	Population (lakhs)	Cumulative Population (lakhs)
1	05	05
2	06	11
3	07	18
4	08	26
5	10	36
6	11	47
7	12	59
8	13	72
9	13	85
10	14	99
11	15	114
12	16	130
13	17	147
14	18	165
15	20	185
16	21	207
17	23	230
18	24	254
19	26	280
20	30	310

(f) Add the interval 77 to the random number of 66 to give 143 to locate 13 as the second

(g) Add the interval 77 to 143 to give 220, to locate district 17 as the third sample; and

(h) Add the interval 77 to 220 to give 297 to locate 20 as the fourth sample.

Advantages:- The major advantages of PPS are:

1. Clusters of various sizes get proportionate representation.
2. PPS lead to greater precision than would a simple random sample of clusters and a constant sampling fraction at the second stage.
3. Equal-sized samples from each selected primary cluster are convenient for field work. If one interviewer is assigned to each cluster, the interviewers have equal workloads.

Limitations:- PPS cannot be used if the sizes of the primary sampling clusters are not known.

Application:- Since in practice, primary sampling units (clusters) generally vary considerably in size, sampling with PPS is used in all multi-stage sampling.

(Double car Two-phase) sampling and multi-phase sampling

Double (or two-phase) sampling refers to the subsection of the final sample from a pre-selected larger sample that provide information for improving the final selection. When this procedure is extended to more than two phases of selection it is then called multi-phase sampling this is also known as sequential sampling as sub-sampling is done from a main sample in phases. Additional information from sub samples of the full sample may be collected at the same time or later.

Multi-phase v/s multi-stage sampling:- Multi-phase sampling is different from multi-stage sampling. In multi- phase sampling the different phases of observation relate to sample units of the same type while in multi-stage sampling the sampling units are of different types at different stages.

Usage:- Double or multi-phase sampling is a compromise solution for a dilemma posed by undesirable extremes. The statistics based on the sample of n can be improved by using ancillary information from a wide base; but this is too costly to obtain from the entire population of N elements. Instead information is obtained from a larger preliminary sample nL which includes the final sample n. multi-phase sampling is appropriate.

When it is more convenient and economical to collect certain items of general information on the whole of the units of a simple, and other items of special information from a sub-sample of cases possessing a given set of characteristics.

For example in a consumer behaviour study relating to television a common set of data may be collected from a large sample of households and a set of additional data from those who posses colour TVs.

In multi-phase sampling the general sample should be larger enough to yield adequate sub-sample or for detailed investigation.

Multi-phase sampling can result in considerable economies and reduce the burden on the respondents. Moreover, the information collected from the full sample can be used for stratification purposes in the selection of the sub sample or for estimating the effect of non-response in the sub-sample.

Suppose we want a sample of individuals stratified by educational level, but the necessary information is not available for the population under study. A large first-phase sample may be selected and information on the educational level of sampled individuals may be collected from them. The respondents may then be stratified on the basis of educational levels. A sub-sample can then be drawn, using either proportionate or disproportionate stratified sampling.

The use of two phase sampling for the sole purpose of increasing the precision of sub-sample results is effective. Only if the cost of data collection is considerably lower for members of the first phase sample than for members of the sub-sample-by a factor of at least, say, ten.

Replicated or interpenetrating sampling:-

A real difficulty with complex sample designs like multi-stage stratified sampling is the laboriousness of the sampling error calculations. The case of these calculations is a factor to be taken into account in designing of a sample plan one approach to simplify the procedure of computing sampling errors is replicated or interpenetrating sampling which Deming discusses in full with a number of illustrations.

Replicated or interpenetrating sampling involves selection of a certain number of sub-samples rather than one full sample from a population. All the sub-samples should be drawn using the same sampling technique and each is a self contained and adequate sample of the population.

Replicated or interpenetrating sampling can be used with any basic sampling technique simple or stratified single or multi-stage or multi-phase sampling.

For example, in order to study the views of postgraduates students of a university on semester system a random sample of 300 students (out of a total population of 3,000 students distributed over different disciplines like economics, sociology statistics, mathematics, management etc) is to be drawn adopting discipline-based stratified sampling.

Instead of selecting one full sample of 300 students, two sub-samples of 150 each, or five sub-samples of each may be selected. The latter procedure is replicated sampling.

Whatever, may be the number and size of sub-samples, each sub-sample has to be an independent sample with the same sampling method and must be a sample covering the complete population each sub-sample may be allocated to one individual investigator or a team of investigators.

Sample errors estimates can be calculated for each of the sub-samples and the variation between these estimates provide a means of assessing the precision of the overall estimate.

A decision to be made is the number of sub-samples to be drawn. The number may vary between 4 to 10 Mahalanobis often used four replications. If it is desired to obtain simple estimates of sampling errors, more replications are desirable. For this purpose Deming has made wide use of ten replications.

Advantages:- The major advantages of replicated or interpenetrating sampling are:

1 It provides a simple means of calculating the sampling error.

2 It is practical. If the size of the total sample is too large to get the results ready in time, one or more of the replications can be used to get the advance results.

3 The replicated sample can throw light on variable non-sampling errors (see section 6.5 of this chapter). If each of the sub-sample is interviewed by a different or set of interviewers. An estimation of inter-viewer variation can be obtained.

Disadvantages:- A disadvantages of replicated sampling is that it limits the amount of stratification that can be employed. This limitation is a real drawback to the use of replicated sampling in a multi-stage sampling plan.

8.8 NON-PROBABILITY SAMPLING METHODS:

Introduction:- As explained earlier, non-probability sampling does not adopt the theory of probability and it does not give a representative sample of the population. The primary methods of non-probability sampling are:

- ❖ Convenience sampling
- ❖ Purposive (or Judgement) sampling
- ❖ Quota sampling
- ❖ Accidental sampling
- ❖ Snow-ball sampling

A) Convenience or Accidental Sampling:-

This is non probability sampling. It means selecting sample units in a just hit and miss fashion e.g. interviewing people whom we happen to meet. This sampling also means selecting whatever sampling units are conveniently available e.g. a teacher may select student in his class.

This method is also as accidental sampling because the respondents whom the researcher meets accidentally are included in the sample.

Usefulness:- Though convenience sampling has no status it may be used for simple purpose such as testing ideas or gaining ideas or rough impression about a subject of interest. It lays a groundwork for a subsequent probability sampling sometimes it may have to be necessarily used. For example, when a population cannot be defined or a list of population is not available there is not other alternative than to use convenient sampling.

Advantages:-

1. Convenience sampling is the cheapest and simplest
2. It does not require a list of population
3. It does not require any statistical expertise.

Disadvantages:-

1. Convenience sampling is highly biased, because of the researcher's subjectivity, and so it does not yield a representative sample.
2. It is the least reliable sampling method. There is no way of estimating the representatives of the sample.
3. The findings cannot be generalized.

B) Purposive or Judgement Sampling

This method means deliberate selection of sample units that confirm to same pre-determined criteria. This is also known as

Judgement Sampling. This involves selection of cases which we judge as the most appropriate ones for the given study. It is based on the judgement of the researcher or some expert. It does not eam at securing a cross section of population.

The chance that a particular case be selected for the sample depends on the subjective judgement of the researcher for example a researcher may deliberately choose industrial undertakings in which quality circles are believed to be functioning successfully and undertakings in which quality circles are believed to be total failure.

Application:- The method is appropriate when is important is the typicality and specific relevance of the sampling units to the study and not their overall representativeness to the population.

Advantages:- The advantages of purposive or judgement sampling etc.

1. It is less costly and more convenient.
2. It guarantees inclusion of relevant elements in the sample, probability sampling plans cannot give such guarantee.

Disadvantages:- The demerits of judgement sampling are:

1 This does not ensure the representativeness of the sample

2 This is less efficient for generalizing when compared with random sampling

3 This method requires more prior extensive information about the population one studies without such information, it is not possible to adjudge the suitability of the sample items to be selected.

4 This method does not lend itself for using inferential statistics, because, this sampling does not satisfy the underlying assumption of randomness.

C Quota Sampling:-

This is a form of convenient sampling involving selection of quota groups of accessible sampling units by traits such as sex, age social class etc. when the population is known to consist of various categories by sex, age, religion, social classes, etc. in specific proportions, each investigator may be given an assignment of quota groups specified by the pre-determined traits in specific proportions. He can then select accessible persons belonging to those quota groups in the area assigned to him.

Quota sampling is therefore a method of stratified sampling in which selection within strata is non-random. It is this non-random element that constitutes its greatest weakness.

Quotas are stratified by such variables as sex, age, social class and religion. It is easy to classify the accessible respondents under sex, age and religion, but it is very difficult to classify them into social categories. Since social class usually involves a combination of factors such as occupation income and caste and the interviewer's subjective judgement and bias play some role in the social class classification of respondents.

A model of assignment given to an interviewer is shown below:

Assignment of Quota

Sex	Age	5	Social Class
Male 11	20-40	5	Higher 3
Female 9	41-50	8	Middle 10
	51-60	4	Lower 7
	61-above	3	
Total 20	Total	20	Total 20

Application:- Quota sampling is used in studies like marketing surveys, opinion polls and leadership surveys which do not aim at precision, but to get quickly some crude results.

Merits:- The major advantages of quota sampling are:

1 It is considerably less costly than probability sampling.

2 It is takes less time.

3 There is not need for a list of population. Thus quota sampling is a suitable method of sampling a population for which no suitable frame is available.

4 Field work can easily be organized, strict supervision need not be required.

Shortcomings:- The method of quota sampling suffers from certain major shortcomings.

1 It may not yield a precise representative sample and it is impossible to estimate sampling error. The findings, therefore, are not generalizable to any significant extent.

2 interviewers may tend to choose the most accessible persons; they may ignore slums or area difficult to reach. Thus they may fail to secure a representative sample within their quota groups.

3 Strict control of field work is difficult.

4 It is difficult for sampling on more than three variables dimensions. This is because the number of categories to be selected is a multiplication of the number of values in each variable for instances if we want to sample proportionate number of persons by sex, social status and age and these variables consist of two, three and three categories respectively, we have to and three categories respectively, we have to select 2x3x3 = 18 categories of respondents.

5 The quota of sampling is subject to a higher degree of classification error, because the investigators are likely to base their classification or respondent's social status and economic status mostly on their impressions about them.

D) Snow-ball Sampling:-

This is the colourful name for a technique of building up a list or a sample of a special population by using an initial set of its members as informants. For example, if a researcher wants to study the problem faced by Indians through some source like Indian Embassy. Then he can ask each one of them to supply names of other Indians known to them and continue this procedure until he gets an exhaustive list from which he can draw a sample or make a census survey.

This sampling technique may also be used in socio-metric studies. For example, the members of a social group may be asked to name the persons with whom they have social contracts, each one of the persons so named may also be asked to do so and so on. The researcher may thus get a constellation of associates and analyse it.

Advantages:- The advantages of snow-ball sampling etc

1. It is very useful in studying social groups, informal group in a formal organization, and diffusion of information among professionals of various kinds.
2. It is useful for smaller populations for which no frames are readily available.

Disadvantages:-

1. The major disadvantages of snow-ball sampling is that it does not allow the use of probability statistical methods. Elements included are dependent on the subjective choice of the original selected respondents.
2. It is difficult to apply this method when the population is large.
3. It does not ensure the inclusion of all elements in the list.

8.9 SAMPLE DESIGN AND CHOICE OF SAMPLING TECHNIQUE:

Sample Design:-

Sample design is a plan for drawing a sample from a population. This is an important part of a person design or plan. The preparation of a sample design involves making decisions on the following questions:

1. What is the relevant population?
2. What method of sampling frame shall we use?
3. What sampling frame shall we use?
4. What are the parameters of interest?
5. What should be the sample size?
6. How much will be the sample cost?

Relevant population:-

The population relevant to a survey depends upon the research problem, the objectives of study the geographical area selected for the survey, and the operational definition of the unit of study.

Some examples are:

	Research Problem	Relevant Population
a	A study of a operational efficiency of regulated market (this will involve a survey of regulated markets and the farmers for whose benefit they have been set up and the graders who function in them)	Regulated markets in the selected area. Farmers in the area of each sampled regulated market. Traders who make purchases in each sampled regulated market.
b	A socio-economic survey of agricultural labourer (agricultural labourer is one who derive not less than 50% of his total income from agricultural wages)	All regulated labourers who derive not less than 50% of their total income from agricultural wages.
c	A study of job satisfaction of managers in a public enterprise.	Managers in various levels of the selected organization.
d	A study of postgraduate student's opinion on library facilities	Higher educational institution in the selected area. Students studying in master degree programs.

E	A study of corporate planning in large-scale enterprises (this will involve a survey of enterprises which are large scale ones as per the operational definition adopted and also a survey of executives participating in planning process)	Large-scale enterprises satisfying definition criteria executives in selected enterprises, who participate in the corporate planning exercise.
f	A study of consumer behaviour or towards a particular brand of a toilet soap	Households in an area selected for the survey
g	A survey of voter's opinion on election reform	All eligible voter's in the selected area.

Sampling:-

This is the list of population elements from which the sample is drawn. Ideally it should be a complete and correct list of population elements only. In practice, the sampling frame available may not meet the requirements of the survey. It may suffer from some shortcomings, giving rise to frame problems. In Kish's classification these are four basic kinds of frame problems.

They are:

The first is the problem of non-coverage and incomplete frame. For example, the voters list in a graduate's constituency may not contain the names of all eligible graduates due to non-registration by some graduates; the payroll list of a firm may not contain the names of newly recruited employees.

Such incomplete frames cannot yield representative samples, one way to deal with the missing elements in incomplete frame is to prepare a supplementary list of missing items and use that list as a separate stratum. But if the missing elements belong to different strata, they have to be listed in the respective strata. However, when such listing is costly the coverage of the survey may be limited to the available frame, provided the survey objective permits it.

The second problem is appearing of clusters of elements in lists. This occurs when elements are listed not individually but in clusters. For example, a list of house numbers available from a municipal corporation office is only a list of houses and in each house there may be several individuals/households.

The possible ways of dealing with this problem are:

1 To make all the elements in the selected clusters provided the clusters are small.

2 To select one element from each of the selected clusters, at random and to weigh it up with number of elements in the cluster.

3 To take a sample of clusters, list all their elements and then take a sample of elements from this list.

The third problem is that of blocks or foreign elements. Some of the available lists may contain no elements of the target population or contain elements not relevant to the target population. For example, a list of members of a cooperative society may be out-of-date and some of the persons listed might have died or withdrawn membership or emigrated.

The fourth problem is duplicate listing i.e. elements appearing more than once on the sampling frame. This problem arises when the sampling frame is made up of a combination of lists which have overlapping memberships. If the additional entries of elements can be removed before selection, then the problem of duplication can be avoided altogether of such removal is expensive. One of the listings may be chosen represent the element and the others treated as blanks.

In evaluating a sampling frame, the researcher should be on the look-out for the existence of any of the above problems. If they are present he should take appropriate remedial actions.

If no suitable frame exists, one may have to be constructed.

Methods of sampling:- There are various methods of sampling (see section 6.2 below, for a detailed discussion). What method should we use? This decision depends on the aim of the study, the expected degree of accuracy of the survey result and the sampling costs. For example, if the aim of the sample survey is to estimate certain population values in terms of ratios, percentages, averages, etc. probability sampling is appropriate. Where some broad idea of population values will serve the purpose, as in the case of market surveys a non-probability sampling method may be selected. Where the representativeness of the sample is important an appropriate type of random sampling is appropriate? This depends upon the nature of universe and is size. For sample, if the universe is heterogeneous and can be classified into a few homogenous sub-groups then stratified random sampling method may be used (for a detailed discussion, see “criteria for selecting techniques below in this section).

Parameters of interest:- The specific population parameters to be estimated should be determined these are apparent from the investigative questions and hypothesis e.g.

- The average amount of savings per month.
- The percentages of consumers who prefer a particular brand of a product
- The average rate of return on capital employed
- The proportion of family expenditures on recreation
- The extent of dining out by families
- The percentage of women who read women's section in a magazine.

Such questions of determine the sample design, and sample size.

Parameters may be variable or attributes. Variables like rupees, age, length, scores, family size, number of visits per month, etc are measured by using measures of central tendency and deviation techniques, attributes like interest, opinion, attitude etc, are measured in terms of percentage of ratio.

Sample Size:- The size of sample to be drawn depends upon various factors like the population size, the size of population dispersion, the acceptable confidence level for the parameter estimate etc. These are discussed in detail later in this chapter (see section 6.4 in this chapter, below)

Sample Cost:- Cost considerations influence decisions about the method of sampling and the sample size probability sampling involves listing costs, call back costs and other costs simple random sampling is more costly than cluster sampling. The cost per unit may be less when haphazard methods of sampling are used or when data are collected by mailing questionnaires instead of by personal interviewing.

Criteria for selecting sampling technique:-

In the previous section(6.2) we have examined the various sampling methods their features, applications and merits and limitation. Now let us examine the criteria for selecting and appropriate sampling plan for a give study. The quality of the research output. And the validity of its findings among other things, depend upon the appropriateness of the sampling design selected for the study. The choice of sampling plan calls for a careful consideration of various factors such as the nature of the problem the intention of the researcher, the geographical area covered by the survey, the size of the population to be studied, the extend of the knowledge available about the population, the among of funds and other facilities available for the study, the time factor and the desired precision of reliability of the results vis-à-vis the relative features and suitability of the various sampling techniques.

The decision process is complicated one. The researcher has to first identify the limiting factor or factors. Time factor, funds

or non-availability or preliminary information about it may be limiting factors. He has to consider the other factors with reference to the limiting factors, further several factors conflict. For example, there are conflicts between precision and cost the scope of the study and the available funds and time the area covered and the available funds and time non-availability of population list and the researcher's intention to generalize the findings based on the sample survey and so on. Therefore, the researcher must judiciously balance the conflicting factors. The purpose of the study may call for the application of practical difficulties; it may not be possible to adopt it. For example, if the researcher aims at applying inferential statistical analysis's, then probability sampling is essential. But if the nature of the population to be studied is not known and the sampling frame is not available, it is difficult to apply probability sampling. Such practical difficulties necessitate a compromise on this part.

Now let us discuss in detail the various criteria governing the choice of the sampling technique:

1) Purpose of the survey:- What does the researcher aim at? If he intends to generalize the findings based on the sample survey to the population, then an appropriate probability sampling method must be selected. The choice of a particular type of probability sampling depends on the geographical area of the survey and the size and nature of the population under study.

On the other hand, if he is interested in just understanding the nature of the phenomenon under study, and does not aim at generalizing his finding, some non-probability sampling method will suffice.

2) Measurability:- The application of statistical inference theory requires computation of the sampling error from the sample itself probability sample only allow such computation. Hence, where the research objective requires statistical inference, the sample should be drawn by applying simple random sampling method or stratified random sampling method, depending on whether depending on whether the population is homogenous or heterogeneous. All probability samples are non-measurable e.g. selecting a single cluster are not identified.

3) Degree of Precision:- Should the results of the survey be very precise, or even rough results could serve the purpose? The desired level of precision is one of the criteria of sampling method selection. Where a high degree of precision of results would serve the purpose (e.g. marketing surveys) any convenient non-random sampling like quota sampling would be enough.

4) Information about population:- How much information is available about the population to be studied? Where no lists of population and no information about its nature are available it is difficult to apply a probability sampling method.

Then exploratory study with non-probability sampling may be made to gain a better idea of the population. After gaining sufficient knowledge about the populations through the exploratory study, appropriate probability sampling design may be adopted.

5) The nature of the population:- In terms of the variables to be studied is the population homogeneous for heterogeneous? In the case of a homogeneous population, even a simple random sampling will give a representative sample. If the population is heterogeneous stratified random sampling is appropriate systematic sampling would however be preferred in those cases where the list of units of population is available or easily obtainable and where there is no periodic variation to present in the population.

6) Geographical area of the study and the size of the population:- If the area covered by a survey is very large (e.g. a country or a state) and the size of the population in quite large, multi-stage cluster sampling would be appropriate. But if the area and the size of the population are small single stage probability sampling method would be used.

7) Financial resources:- is the available finance a limiting factor or not? If the available finance is limited it may become necessary to choose a less costly sampling plan like multi-stage cluster sampling or even quota sampling as compromise. However, if the objectives of the study and the desired level of precision cannot be attained within the stipulated budget, there is no alternative than to give up the proposed survey. Where finance is not constraint a researcher can choose the most appropriate method of sampling that fits the research objective and the nature of population.

8) Time Limitation:- The time limit within which the research project should be completed restricts the choice of a sampling method. Then as a compromise, it may become necessary to choose less time consuming methods like simple random sampling instead of stratified sampling/sampling with probability proportional to size: multi-stage cluster sampling instead of single-stage sampling of elements of course, the precision has to be scarified to some extent.

9) Economy:- Should be another criterion in choosing the sampling method. It means achieving the desired level of precision

at minimum cost. A sample is economical if the precision per unit cost is high or the cost per unit of variance is low. The precisions and costs of various measurable probability sampling method can compared and the method which achieves the optimal balance between reliability of results and costs may be selected. This calls for much thought and ingenuity.

The above criteria frequently conflict and the researcher must balance and bend them to obtain a good sampling plan. The chosen plan thus represents and adaptation of the sampling theory to the available facilities and resources. That is, it represents a compromise between idealism and feasibility. One should use simple workable methods instead of unduly elaborate and complicated techniques.

Model Sampling Designs:-

Model:- The multi-stage sampling design adopted for the All India Rural Credit Survey conducted by the Reserve Bank of India during 1951-52 (the first large-scale country-wide survey) is presented below.

The main aim of this survey was to identify the broad patterns of the working of agricultural credit including cooperative credit in the different regions of the country.

It was decided that the working of rural credit should be in relation to two aspects viz. the demand for credit from rural families and supply of credit by credit agencies. Both institutional and private; these two aspects are hereafter referred to as the ‘demand’ and ‘supply’ aspects respectively of the survey. It was decided to treat district as the unit in the investigations connected with both the aspects and to select as may as 75 districts from all over the country representative of all the geographical and other types of regions in the country. It was considered desirable to select the districts on a random basis.

In connection with ‘demand’ aspect of the survey it was decided that a sample of 600 villages at the rate of 8 villages per district should be selected from the 75 districts, and families in these villages should be investigated as one of the main objectives of the survey was to study the working of cooperative credit in rural areas. It was considered desirable that half the number of villages selected should be those in which primary cooperative credit societies existed and the other half should be those where such societies did not exist.

Selection of Sample Units:

Selection of districts:- The survey was to cover the whole of the rural area of the country excluding Jammu and Kashmir, the

Andaman and Nicobar islands, Sikkim, Kutch and the Naga tribal area. The 302 districts included in the area covered by the survey served as the frame for the selection of the sample of 75 districts. In making the selection it was considered desirable that the sample should be representative of the geographical and agricultural regions in the country.

Two factors taken into consideration for this purpose are the percentage area under cash crops and the percentage area under irrigation subject to considerations regarding these two factors and geographical representativeness. The selection of the 75 districts was made at random from among the 302 districts.

The following table gives the average and the standard deviation in respect of rural population density of population, percentage area under cash crops and percentage area under irrigation, for the 75 selected districts and for all the districts.

	Average per districts		Standard Deviation	
	75 Selected districts	All districts	75 Selected districts	All districts
1.Rural Population (000's)	10.82	9.75	6.94	6.81
2.Density of population (rural and urban persons) per square mile	392	414	268	449
3.Percentage area under cash crops	22	22	13	14
4.Percentage area under irrigation	21	20	22	20

It is seen that the averages and the standard deviations for the sample districts and for all the districts are in close agreement.

Selection of the villages:- For the purpose of selecting a sample of eight villages in each selected district, lists of the villages together with their population according to the 1951 census were obtained from the census authorities in the different states. As it was required to select half the number of villages from among those where primary cooperative credit societies existed lists of

such societies were obtained from the Registrars of Cooperative Societies in the different states using both these lists. The villages in each district were divided into cooperative credit societies existed and those where no such societies existed. From each of these groups four villages were selected at random with probability of selection proportional to the population of the village. The list of the villages so selected were sent to the investigators and it was found during the investigation that in some villages where primary cooperative credit societies were reported to be existing no such society could be located; similarly in some villages which were reported to be without cooperative credit societies, such societies were actually found to be existing.

8.10 QUESTION

1) What is mean by sampling? Discuss the characteristics of good sample.
2) Discussq the methods of sampling.
3) What are the advantage and limitations of sampling?

9

QUESTIONNAIRE DESIGN

Unit Structure:

9.1 INTRODUCTION:

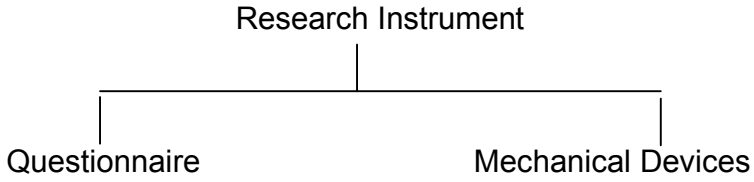
One of the most complex aspects of carrying out research is the development and construction of questionnaire for survey research. Many people think that process of asking questions is easy, but in reality it is a skill that has to e learnt very carefully, otherwise the information that is collected may be worthless. Those who have little skill at designing questionnaires also find that when they try it, the design of the questions is limited and they attribute the unhelpful data to the research rather than the bad phraseology of the questions. A questionnaire is a list of questions sent to a number of persons for them to answer. A questionnaire, whether it is called a schedule interview or measuring instruments form is a formalized set of questions for obtaining information from respondents.

Questionnaire design is one of the important areas of re search. It is most commonly used. The accuracy and relevancy of data collected depends upon the questionnaire. There are certain functions, which a questionnaire performs and these are:

- Given to the respondent clear idea and understanding of the questions. Questions should not be vague.
- Motivate the respondents to give answers
- Stimulate the responses
- How respondent should answer, clear cut instructions
- Information must be treated confidential

Questionnaire design has to produce a document which is:

- ❖ Easy to administer, read our or fill in by both an interviewer and an informant.
- ❖ Constructed in a way that answer the research hypothesis or research problem, but also has the capability to identify new issues.
- ❖ Easy to analyze and can provide all the characteristics of the informant being interviewed.



There are two types of research instruments.

Question should be properly worded, simple, clear and not vague. It can be closed ended or open ended.

Sequence of questions is important. Lead questions should create interest. Difficult questions in the end. Personal questions in the end. They should be in a logical order

- Much of the data in clinical research is gathered using questionnaires or interviews.
- The reliability and validity of the results depends on the quality of these instruments
- Good questionnaires are difficult to construct; bad questionnaires are difficult to analyse.

9.2 TECHNIQUES FOR DESIGNING QUESTIONNAIRES:

The key point to remember about questionnaire design is to make the interview possible for all those using the document. It has to have the following characteristics:

- ❖ **A Logical Sequence:** This is important as the questions much follow on logically. If they do, the interviewer will establish and maintain a rapport and collect the data required without interruptions caused by inappropriate construction or repetitive questions. Intrusive questions are more likely to be answered if they are inserted in to the sequence once the rapport has been established ad built.

- **Good Wording:** The successful questions or the questions that ensure that a survey is successful are those that are shortly, specific, clear and unambiguous. Try to help the informant by specifying clearly what you want to evaluate and where possible show examples an illustration with detailed descriptions.

- **Write a clear layout:** A questionnaire is working document. A question, the possible list of a answer preceded an the questionnaire the instructions to the interviewers, and the analysis instructions all have to be clear so the interviewer does not get confused or reads out the wrong words. Distinguish between all of these very carefully. Interviewer's instruction should be in capital and underlined. Hand our cards and visual prompts should be large enough to read by the informants with poor sight. If the next question to be asked depends the answer to the current question, routing and 'slip' instructions should be printed alongside the relevant answer clearly to help of logic sequence.

- **A reasonable length:** A street or doorstep interview should not last more than ten minutes. An in-home interview should be no more than one hour. A shop or trade interview or business-to-business interview should not last more than 45 minutes. A questionnaire which is of a reasonable length is one which is sufficiently long to collect the required information. It is one which is interesting t the informant and it should be able to help the information to the informant to learn their attitude to the subject or issue being researched.

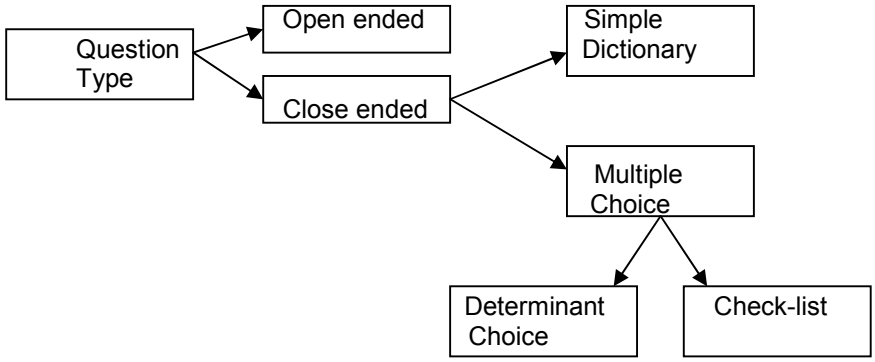
Good questionnaire depend on good design, but this can very when behaviour and attitudes have to be measured and monitored. The essential part of monitoring behaviour is to obtain an accurate recall of what a person did. The effective way of doing this is to ask a series of questions about recent extents that the informant might relate to 'when did you last look at, buy or talk to…?'

Attitudes, opinions and image are generally measured by developing scale. Verbal scales are mere easily understood than numerical scales or making a rating which takes a score out of ten. There are also different options for scales:

- Unipolar scales, a five-point scale from 'good' to 'not very good'
- Bipolar scale. A five-point scale from 'very good' to 'very bad'
- Rating scale base on getting some type of agreement to statements. 'agree strongly, agree, neither agree nor disagree, disagree and disagree strongly provides this analysis.
- Smiley scales are used for children.

9.3 TYPES OF QUESTIONS:

Questions can be of 2 types, i.e. closed ended and open ended. Lets discuss each one of them.



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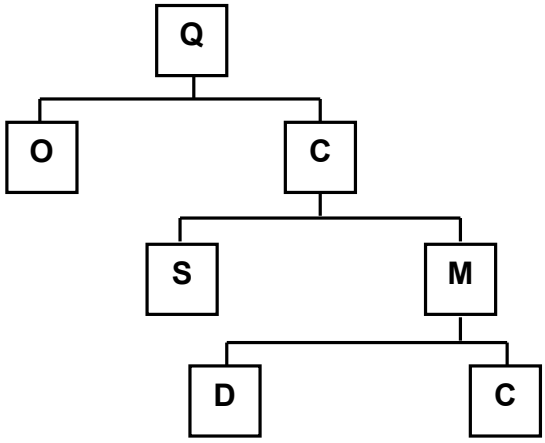


a) Close Ended:

Question in which respondent selects one or more options from pre-determined set of responses.

YES NO

(a) Two choices
(b) Multiple choices a/b/c/d etc
(c) Scale (likert)- here the amount of agreement or disagreement is shown
(d) Semantic differential – a scale is given between 2 words and respondent shown his opinion, e.g.,

Large……..small
Experienced……..Inexperienced
Modern……...Old fashioned

(e) Important scale
(f) Rating scale
(g) Intention to buy scale.

(b) Requirements for close ended questions:

Response categories provided for each close-ended question should be mutually exclusive and exhaustive.

1. Mutually Exclusive: Response categories must be such that the same respondent cannot be classified into more than one category; e.g. the categories Rs.1,000-5,000 and Rs.5,000-10,000 are not mutually exclusive.

2. Mutually Exhaustive: Response categories should include all possible response options. Sometimes this is achieved by including a response option like “other (please specify)…”

(c) Open Ended:

Questions in which the respondent answers in his own words.

- Completely unstructured, e.g. what is your opinion of Indian Airlines?
- Word association
- What is the word that comes to your mind your hear the following?

  Airline_____

  Indian_____

  Travel_____
- Sentence Completion
- When I chose an airline, the most important consideration in my decision is:_____
- Story completion.

  An incomplete story is presented and response has to complete it
- Picture completion
- Thematic appreciation text (TAT)

Some picture is shown and responsed is asked to write a story:

QUESTIONNAIRE CONSTRUCITON

Conceptual framework questionnaire:

- Structured/unstructured
- Language
- Type of questions
- Administration

a) Questionnaire content to be kept in mind:

- Wording of questions
- General to specific (inverted funnel approach)
- Sequence of questions
- Easy question formats
- Personal questions at the end
- Double barrel question should be avoided
- Questions should be helpful in tabulations and analysis
- Questionnaire items

b) Questionnaire layout:

- Keep questionnaire short it possible, but too short they you sacrifice needed information
- Do not over crowd questionnaire
- Provide decent margin space
- Use multiple grid layout for questions with similar responses
- Use booklet from if possible
- Carefully craft the questionnaire title:
  1. Captures respondent's interest
  2. Shows importance of the study
  3. Shows interesting nature of the study.

c) Some key points to be remembered:

Overcome the inability to answer can the respondent remember?

Example:

(Incorrect) How many gallons of hard drinks did you consume during the last 10 weeks?

(Correct) How often do you consume hard drinks in a typical week?

1. Less than once week
2. 1-3 times per week
3. 4-6 times per week
4. 7 or more time per week

Choose the question wording- use ordinary words.

Example:

(Incorrect) Do you think the distribution of hard drinks is adequate?

(Correct) Do you think the hard drink are readily available when you want to buy them/
Choose the question wording- use unambiguous words.

Example:
(Incorrect) In typical month, how often do you show in malls?

1. Never
2. occasionally
3. sometimes
4. often
5. regularly

(Correct) In a typical month, how often do you shop in malls?

1. less than once
2. 1 or 2 times
3. 3 or 4 times
4. more than 4 times

Choose question wording- avoid leading or biasing question

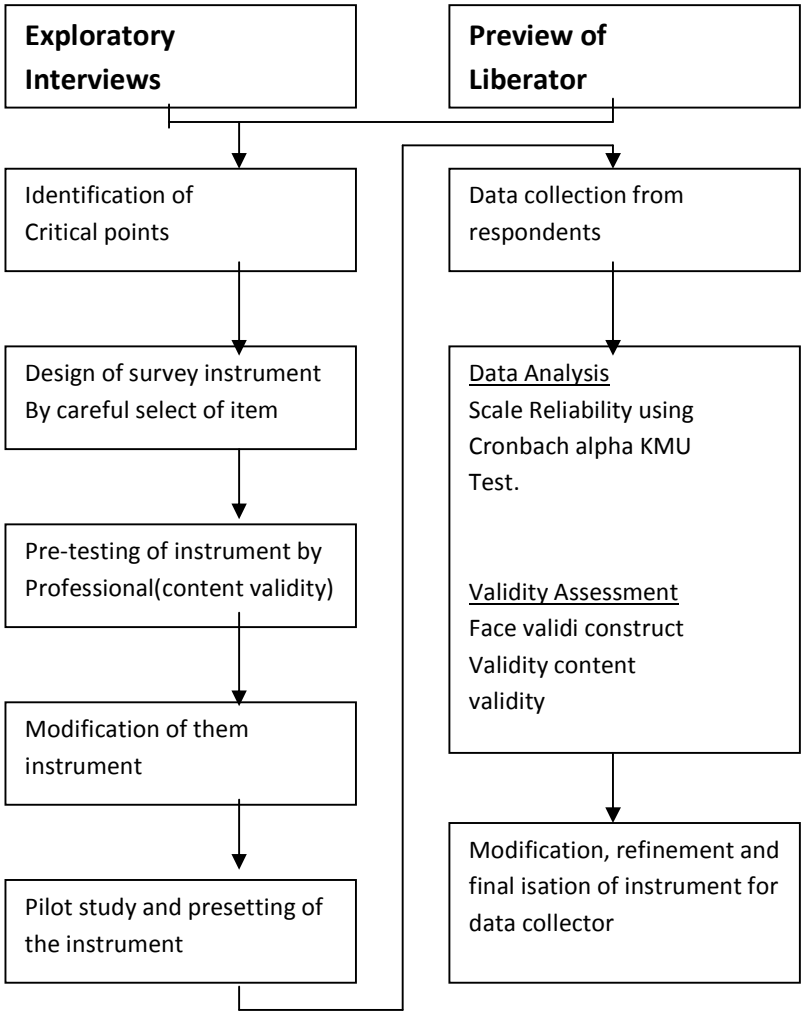
Example:
(Incorrect) Do you think that patriotic Indians should buy imported automobiles when that would put Indian labour our of work?

1. Yes
2. No
3. Don’t think

(Correct) Do you think that Indians should buy imported automobiles?

1. Yes
2. No
3. Don’t know.

d) Questionnaire Development:



e) Limitations of questionnaire:

- Superficial- difficult to capture the richness of meaning
- Cannot deal with context
- Information is not casual
- Information is self report- does not necessarily reflect true behaviour.

Conclusion:

Questionnaire should be brief to the point and as small as possible. It should meet the desired objectives. A good questionnaire is one which examines the habits, awareness, attitudes and needs of an informant and how all of these relate. In this way consumer behaviour can be analysed, understood and exen simulated to predict now it could change. Questionnaire design is an art and not a science, and therefore, it depends on an individual's creative power to get it right.

Some sample questionnaires are given ahead.

Sample survey / questionnaire:

Part I- Organization Related

Question 1.Type of IT industry your organization is active (can be more than one)

Hardware ☐ Services ☐
Software ☐ Telecom ☐
Other ☐

Question 2. Total number of employees in you organization

>100 ☐ 100-500 ☐ 500+ ☐

Question 3 Total number of employees in purchase department and how many have access to internet?

Purchase Strength: <10 ☐ 10-25 ☐ 25-50 ☐
50-100 ☐ >100 ☐
Internet Access: Nil ☐ 1-5 ☐ 5-10 ☐
10-25 ☐ 25-50 ☐ >50 ☐
All ☐

Question 4. What are your major product/projects?

Answer:- _____
_____

Question 5. Your annual sales revenue (in rupees crore)

<1 ☐ 1-5 ☐ 5-25 ☐ 25-100 ☐ >100 ☐

Question 6. Total annual purchase value of products/services handle by your purchase department (in rupees crores)

<1 ☐ 1-5 ☐ 5-25 ☐ 25-100 ☐ >100 ☐

Question 7. What type of product/services your purchase department deals with (can be more than one)

Raw material ☐ Consumers ☐
Capital equipment ☐ Services ☐
Others (please specify) _____

Question 8. Which procurement / e-procurement solution you use?

SAP ☐ Oracle ☐ Microsoft ☐ Other ☐
Please give some unique feature of the solution/software.

Part II Buying Related

Question 1 Which stages of buying process in case of straight re-buy, modified re-buy and new task buy are applicable in your organization?

		Straight Re-buy	Modified Re-buy	New Task Buy
1	Anticipate or recognise need/problem/opportunity along with a general solution	☐	☐	☐
2	Identify the characteristics and quantity of product / service	☐	☐	☐
3	Describe those characteristics and quantity in detail	☐	☐	☐
4	Search for and qualify potential sources/vendors	☐	☐	☐
5	Request for proposal/quotation	☐	☐	☐
6	Acquire proposals, analyse and evaluate them	☐	☐	☐
7	Negotiate and select vendors	☐	☐	☐
8	Finalize the specific order	☐	☐	☐
9	Order status feedback and evaluate performance	☐	☐	☐

Question 2 Who all involved in Buying process. Please mention the designation and department of person, if possible.

	Designation & Department	Straight Re-Buy	Modified Re-buy	New Task Buy
1	User _____	☐	☐	☐
2	Analyst_____	☐	☐	☐
3	Influencer_____	☐	☐	☐
4	Purchaser_____	☐	☐	☐
5	Engineer_____	☐	☐	☐
6	Decision Maker_____	☐	☐	☐

Question 3 Kindly rate the following factors:
(rating scale: not important-1, less important-2, important-3, very important-4, extremely important-5)

		N1	L1	1	V1	E1
1	Experience of vendor/supplier	1	2	3	4	5
2	Relationship and past experience	1	2	3	4	5
3	Geographical location of the vendor/supplier	1	2	3	4	5
4	One to one (face to face) contact during buying process	1	2	3	4	5
5	Internet communication	1	2	3	4	5
6	Leg issues in purchasing through internet	1	2	3	4	5
7	Cost of product/service	1	2	3	4	5

Part III Internet Related

Question 1 How internet can be used in overall purchasing/buying activity?

In case of information gathering:		N	O	C	AA	A
1	Collecting product/service information and specification	1	2	3	4	5
2	Collecting information of current vendor	1	2	3	4	5
3	Searching and collecting information of new vendor	1	2	3	4	5
4	Collecting competitive and other information for purchase	1	2	3	4	5
5	Cost/price comparison	1	2	3	4	5
	In case of internet organisation exchange:					
1	e-mail	1	2	3	4	5
2	Web conferencing with vendors	1	2	3	4	5
3	Electronic data interchange (EDI)	1	2	3	4	5
4	Discussion groups	1	2	3	4	5
5	Just in time inventory planning	1	2	3	4	5
	In case of Negotiation, Bidding and Payment					
1	Online Negotiation	1	2	3	4	5
2	Online Bidding	1	2	3	4	5
3	Online Payment	1	2	3	4	5
	In case of Online Ordering:					
1	Online ordering	1	2	3	4	5
2	Online status checking	1	2	3	4	5
3	Online product/service support	1	2	3	4	5
Any other use of internet you can suggest						

Question 2 Perceived benefits of internet according total (rating scale: not important-1, less important-2, important-3, very important-4, extremely important-5)

	Ease of use:	N1	L1	1	V1	E1
1	Availability of updated information					
2	Easy movement across and around websites					
3	Prompt online ordering					
4	Prompt query handling					
	Ease of price and product/service comparison:					
1	Get lowest price for product/service purchase					
2	Easy comparison of product/service from several vendors					
3	Easy comparison of price from several vendors					
4	Able to obtain competitive and educational information regarding product/service					

	Ease of information access and exchange:					
1	Increase in speed of information					
2	Increase in speed of information dissemination within organization (between and within department/colleagues)					
	Reduction in paper, time and money:					
1	Reduced order processing time					
2	Reduced paper flow					
3	Reduced ordering costs					
Any other benefit of internet you perceive? Please specify.						

Question 3 What would you demand in order to get better access of information through internet?
Answer:_____
_____
_____

Question 4 Anything you would like to share regarding your purchase/buying process and role/influence of internet, that could be of help in understanding the influence/role of internet on 32B purchasing/buying process in you organisation.
Answer: _____
_____
_____

Part IV Personal Demographics

Question 1 Name (optional) _____

Question 2 Designation _____

Question 3 Your work experience in years

Purchase experience <1 ☐ 1-5 ☐ 5-10 ☐
10-20 ☐ >20 ☐

Other Experience <1 ☐ 1-5 ☐ 5-10 ☐
10-20 ☐ >20 ☐

Question 4 Your Age in years

<20 ☐ 20-25 ☐ 25-30 ☐ 30-40 ☐ >40 ☐

Question 5 Your Education

High School ☐ Graduate ☐
Graduate with Professional Degree ☐
Post Graduate ☐
Post Graduate with professional degree ☐
Any other (please specify) _____

Question 6 Your Gender

Male ☐ Female ☐

Question 7 Your contact number and E-mail_____

Thank you very much for your cooperation

Pilot Survey
Questionnaire for survey on consumer perfect of Bikes.

Q.1 Which Bike do you own?

Q.2 Why do you select this bike? (multiple)

(i) Performance (iv) Economy
(ii) Style and convenience (v) Safety
(iii) Ruggedness

Q.3 Would you feel a sense of pride in possessing an eco-friendly Bike?

(i) Yes (ii) No

Q.4 Does your Bike possess the above attribute?

(i) Yes (ii) No

Q.5 Who decided the purchase of your Bike?

(i) Yourself (ii) wife/girl friend
(iii) Father/mother (iv) Children
(v) Any other.

Q.6 What was the major consideration of decider?
(please rank 1/2/3 etc)

Speed	Performance	Voice	Economy	Safety	Style

Q.7 What were you motorcycle options immediately before you purchase?

Q.8 Have you seen Yamaha FZ16 add?
(i) Yes, where_____ (ii) No

Q.9 Rate FZ 16 & Gladiator 125 on the following attributes on a scale of 1-4

1- below average 2-average 3-good 4- excellent

	FZ16	Gladiator 125
Power	☐	☐
Performance	☐	☐
Pick-up	☐	☐
Maximum speed	☐	☐
Initial pick-up	☐	☐
Ability to over-take.	☐	☐

Q. 10 Which ad. Among the following strikes you the most?
(i) Yamaha FZ16 (ii) Hero Honda CBZ
(iii) TVS Apache 180 (iv) Bajaj Pulsar 135 LS

Q.11 How do you rate the below ads on scale of 1-4?
1-poor 2-fair 3-good 4-best

	FZ	CBZ	Apache	Pulsar
Newspaper Ad	☐	☐	☐	☐
Magazine Ad	☐	☐	☐	☐
TV Ad	☐	☐	☐	☐

Q.12 How do you the service provided by the manufacture/dealer after you purchase the motorcycle?

Unsatisfactory	Average	Satisfactory

Q.13 How do you rate the overall performance that you Bike is giving you?

Poor	Unsatisfactory	Average	Satisfactory	Excellent

Q.14 Given the attribute. You would like your bike to posses, but it does not have?

Name_____
Age_____
Education_____
Occupation_____
Bike no_____
Income_____
(monthly family income)

(i) Rs.10000-15,000)
(ii) Rs.15000-25000)
(iii) Rs.25000-40000)
(iv) Rs.40000-above)

Pilot Survey
Questionnaire for Comparative Rating Chart

Attributes	FZ	CBZ	Apache	Pulsar
1. Performance				
i. Initial Pick-Up	----------			
ii. Passing Acceleration (Overtaking)	----------			
iii. Maximum Speed	----------			
2. Style and Convenience				
i. Basic Aesthetics (looks)	----------			
ii. Manoeuvrability	----------			
iii. Utility Attachment	----------			
3. Ruggedness				
i. Durability/longer Life	----------			
ii. Luggability (more carriage)	----------			
iii. Serviceability (frequency)	----------			
4. Economy				
i. Initial Price	----------			
ii. Fuel Economy	----------			
iii. Maintenance Cost	----------			
5. Safety				
i. Breaking	----------			
ii. Large Wheel Base	----------			
iii. Locking	----------			
6. Maintenance & Spares Availability	----------			
7. Comfort Level				
i. Seating	----------			
ii. Gear Changing	----------			
iii. Breaking	----------			

8. Product Image
   i. Good Company Name ----------
   ii. Good Bike Image ----------

Market Survey

Questionnaire for Survey of Consumer Perception of Bikes

Q.1. Which Bike do you own?

Q.2. What were you motorcycle options immediately before you purchase?

Q.3. What was the major consideration of decider?
(please rank 1/2/3/4/5/6)

☐	☐	☐	☐	☐	☐
Speed	Performance	Voice	Economy	Safety	Style

Q.4. Who influenced you purchase?
(i) Yourself (ii) Wife/Girl Friend
(iii) Father/Mother (iv) Children
(v) Any Other

Q.5. Would you feel a sense of pride in possessing an eco-friendly bike?
(i) Yes (ii) No

Q.6. Is your bike eco-friendly?
(i) Yes (ii) No

Q.7. Give the attributes you would like your bike to possess, but it does not?

Q.8. Rate FZ 16 & Gladiator 125 on the following attributes on scale of 1-4
(i) Below average (ii) Average
(iii) Good (iv) Excellent

	FZ 16	Gladiator 125
Power	☐	☐
Performance	☐	☐
Pick-up	☐	☐
Maximum speed	☐	☐
Initial pick-up	☐	☐
Ability to overtake	☐	☐

Q.9. Have you seen Yamaha FZ 16 Ad?
(i) Yes (ii) No

Q.10. How do you rate the below Ads on a scale of 1-4?
(i) Poor (ii) Fair
(iii) Good (iv) Best

	FZ	CBZ	Apache	Pulsar
Newspaper Ad	☐	☐	☐	☐
TV Ad	☐	☐	☐	☐

Q.11. How do you the service provided by the manufacturer/dealer after you purchase the motorcycle?

Unsatisfactory	Average	Satisfactory

Q.12. How do you rate the overall performance that your bike is giving you?

Poor	Unsatisfactory	Average	Satisfactory	Excellent

Name _____
Age _____
Education _____
Occupation _____
Bike No. _____
Income _____
(monthly family income) (i) Rs.10000-15000)
(ii)Rs.15000- 25000)
(iii)Rs.25000-40000)
(iv)Rs40000-above)

Main Survey
Questionnaire for Comparative Rating Chart.
Rating the bike according to the attributes listed

Attributes	FZ	CBZ	Apache	Pulsar
1. Performance				
i. Initial pick-up	----------			
ii. Passing acceleration (overtaking)	----------			
iii. Maximum speed	----------			
2. Style and convenience				
i. Basic aesthetics (looks)	----------			
ii. Manoeuvrability	----------			
iii. Utility attachment	----------			
3. Ruggedness				
i. Durability/longer life	----------			
ii. Luggability (more carriage)	----------			
iii. Serviceability (frequency)	----------			

4. Economy
   i. Initial price ----------
   ii. Fuel economy ----------
   iii. Maintenance cost ----------

5. Safety
   i. Breaking ----------
   ii. Large wheel base ----------
   iii. Locking ----------

6. Maintenance and spares availability ----------

7. Comfort level
   i. Seating ----------
   ii. Gear changing ----------
   iii. Breaking ----------

8. Product image
   i. Good company name ----------
   ii. Good bike image ----------

9.4 QUESTIONS

1) Explain different types of questions.
2) Design a questionnaire of market survey.
3) Design a questionnaire for mobile consumers.

10

METHODS AND TECHNIQUES OF DATA COLLECTION

Unit Structure:

10.1 INTRODUCTION:

Once the researcher has decided the 'Research Design', the next job is of data collection for data to useful, our observations need to be organized so that we can pick out patterns and come to logical conclusion.

Statistical investigation requires systematic collection of data so that all relevant groups are represented in the data.

To determine the potential market for new product, for example, Sandhya, a researcher might study 500 consumers in a certain geographical area. It must be ascertained that the group contains peoples representing variables such as income level, race, education and neighbourhood. The quality of data will greatly affect the conclusions and hence, utmost importance must be given to this process and every possible precaution should be taken to ensure accuracy while gathering and collecting data.

Depending upon the sources utilized whether the data has come from actual observations or from records that are kept for normal purposes, the statistical data can be classified into two categories. These categories are:

Primary Data:

Primary data is one which is collected by the investigator himself for the purpose of a specific inquiry or study. Such data is original in character and is generated by surveys conducted by individual or research institutions.

Secondary Data:

When an investigator uses the data which has already been collected by others, such data is called secondary data. This data is primary data for the agency that collected it and becomes secondary data for someone else who uses this data for his own purposes. The secondary data can be obtained from journals, reports, government publications, publication of professional and research organization and so on. For example, if a researcher desires to analyse the weather conditions of different regions, he can get the required information or data from the records of the meteorology department.

10.2 DISTINTION BETWEEN PRIMARY DATA AND SECONDARY DATA:

	Description	Primary Data	Secondary Data
1	Source	Original source	Secondary source
2	Methods of data collection	Observation method, questionnaire method, Trade Journal, etc	Published data of Govt. agencies
3	Statistical process	Not done	Done
4	Originality of Data	Original first time collected by user	No data are collected by some other agency
5	Use of data	For specific purpose data are complied	Data are taken from other source and used for decision
6	Terms and definition of units	Incorporated	Not include
7	Copy of the schedule	Included	Excluded
8	Method of data collection	Given	Not given

9	Description of sample selection	Given	Not given
10	Timer	More	Less
11	Cost	Expensive	Cheaper
12	Efforts	More	Less
13	Accuracy	More accurate	Less accurate
14	Training personnel required	Expert/trained required	Less trained personnel

10.3 DATA COLLECTION PROCEDURE FOR PRIMARY DATA:

The various steps involved are:

- Planning the study
- Modes of data collection
- Sample selection
- Editing the primary data

a. Planning the Study:

Since the quality of results gained from statistical data depends upon the quality of information collected, if is important that a sound investigative process be established to ensure that the data is highly representative and unbiased. This requires a high degree of skill and also certain precautionary measure may have to be taken.

b. Modes of primary data collection:

There are basically three widely used methods for collections of primary data:

- Observation
- Experimentation
- Questionnaire

c. Primary data –observation process:

Information is collected by observing the process at work the following are few examples.

(i) Services station – pose as a customer, go to a services station and observe.

(ii) To evaluate the effectiveness of display of sleep-well cushions in a departmental store, observer notes

(a) How many pass by

(b) How many stopped to look at the display

(c) How many decide to buy.

(iii) Super market – what is the best location in the shelf? Hidden cameras are used.

(iv) Concealed tape recorder with the investigator to determine typical sales arguments and find out sales enthusiasm shown by various salesmen.

By this method, response bias is eliminated.

The methods can be used to study sales techniques, customer movements, customer response, etc. But the customer/consumer state of mind, their buying motives, their images are not revealed. Their income and education is not obvious. It also takes time for the investigator to wait for particular sections to take place.

d. Primary Data – Experimentation Method:

Many of the important decisions facing the marketing executive cannot be settled by secondary research observation or by surveying the opinions of customers or experts. Experimental method may be used in the following situations.

i) What is the best method for training salesmen?

ii) What is the best remuneration plan for salesman?

iii) What is the best shelf arrangement for displaying a product?

iv) What is the effectiveness of a point of purchase display?

v) What package design should be used?

vi) Which copy is the most effective? What media are the most effective?

vii) Which version of a product would consumers like best?

In a marketing experiment the experimental units may be consumers, stores, sales territories, etc.

Factors or marketing variables under the control of the researcher which can be studies are price, packaging, display, sales incentive plan, flavour, colour, shape, etc

Competitor's actions, whether changes, in co-operative dealers, etc are environmental factors.

To study the effect of the marketing variables in the presence of environmental factors, a sufficiently large sample should be used or sometimes a control group is let up. A control group is group equivalent to the experimental group and differing only in not receiving any treatment.

The result/response of a marketing experiment will be form of sales, attitudes or behaviour.

e. Primary Data- Questionnaire Technique:

The survey method is a technique of gathering data by a slang questions to people who are thought to have the desired information.

Advantages: One cannot known by observation why a buyer purchases or what his opinion about a product is compared with either direct observation or experimentation, surveys yield a broader range of information and are effective to produce information on socio-economic characteristics, attitudes, opinions, motives, etc and together information for planning product features, advertising copy, advertising media, sales promotions, channels of distributions and other marketing variables. Questioning is usually faster and cheaper than observation.

f. Limitations of Primary Data Collection:

(a) Unwillingness of respondents to provide information: This requires salesmanship on the part of the interviewer. The interviewer may assure that the information will be kept secret or some present may be given.

(b) Inability of the respondents to provide information: This may be due to

i) Lack of Knowledge

ii) Lapse of memory

iii) Inability to identify their motives and prove reason why for their actions.

(c) Human Biases of the respondent: i.e. ego etc.

(d) Semantic difficulties: It is difficulty, if not impossible, to state a given question in such a way that is will mean exactly the same thing to every respondent. Similarly two different wordings of the same question will frequently produce quite different results. These limitations can be controlled to some extent by

(i) Careful phrasing of question.

(ii) Careful control of data gathering by employing specially trained investigators who will observe carefully and report on the subtle reaction of persons interviewed.

(iii) Cautions interpretation by a clear recognition of the limitations of the data and an understanding of what exactly the data represent. This is especially true of responses to questions like.

(iv) Looking at facts in relative rather than absolute terms. A dentifrice survey showed that 60% of families in the middle income group used tooth past. Taken by itself in the absolute sense, the results of the survey are in come doubt because the question asked encountered an obvious bias. But if this 60% is looked at on a relative basis viz. the corresponding figure of 90% for upper income group families, a more meaningful and significant interpretation can b e made, even though the individual figure for each group may be slightly inflated

g. Different types of Study through Primary Data:

(A) Structured Study:

If a radio manufacture wanted to find out how many own a radio, what tyupe it is, when they bought it, the respondents would be asked a set of questions in agiven sequence.

Does your family won a radio? Yes/No (if yes ask)
What brand it is? Name_____
How many valves? No_____
When did you purchase this radio date_____
This is an example of structured and non disguised study.

(B) Non-Structured Study:

More than anything else marketing men want to know why people buy or don't buy their products.

Reasons for why can be classified as

(1) These reasons which one part of the individual own purposes or attitudes.

(2) Those reasons which are result of outside influences such as advertising.

(3) Those reasons which are based on characteristics of product itself. But question aimed at these 3 categories separately. This approach is still not satisfactory. Many will not report motives which might be considered base or socially unacceptable. To overcome these difficulties, techniques have been developed by psycho analysts.

Disguised/Non-disguised study:

(A) Projective Technique (Disguised Study):

Respondent is given an (ambiguous) situation and asked to describe it. The description given contains a projection of the respondent's personality and attitudes of the situation described.

Various projective techniques are used, but the most are word association, sentence completion and story telling.

In word association a series of words is read one at a time to the respondent. After each word, the respondent says the first thing that comes into his mind. Sentence completion requires sentences i n story telling the respondent to complete partial sentences. In story telling the respondent is shown a picture or given a description and asked to tell a story about it.

(B) Dept Interview (Non-disguised)

Instead of approaching the respondent with a fived list of questions, the interviewer attempts to get the respondent to talk truly about the subjected of interest. By doing so the interviewer hopes to get the respondent at ease and then encourage him to express any idea which he has on the subject. If some idea of interest is passed over too quickly, the interviewer may seek more information by "probing" for example, he many comment "that is interesting why do you feel that way"? This encourages further discussion of the point. Various probes can be used as needed to get the respondent to expand on any particular ideas. Although no formal questionnaire is used in interviewing of this type, the interviewer has an outline in mind. If the respondent does not get into areas of special interest, the interviewer will insert questions opening up these topics. The objective of these interviews is to get below the respondent's surface reasons for particular marketing decisions, and to find the underlying or basic motives.

Interviewer should have background of social psychology and field experience of 500 or more interviews sometimes a group of 6 to 8 are called for discussion with interviewer as a moderator.

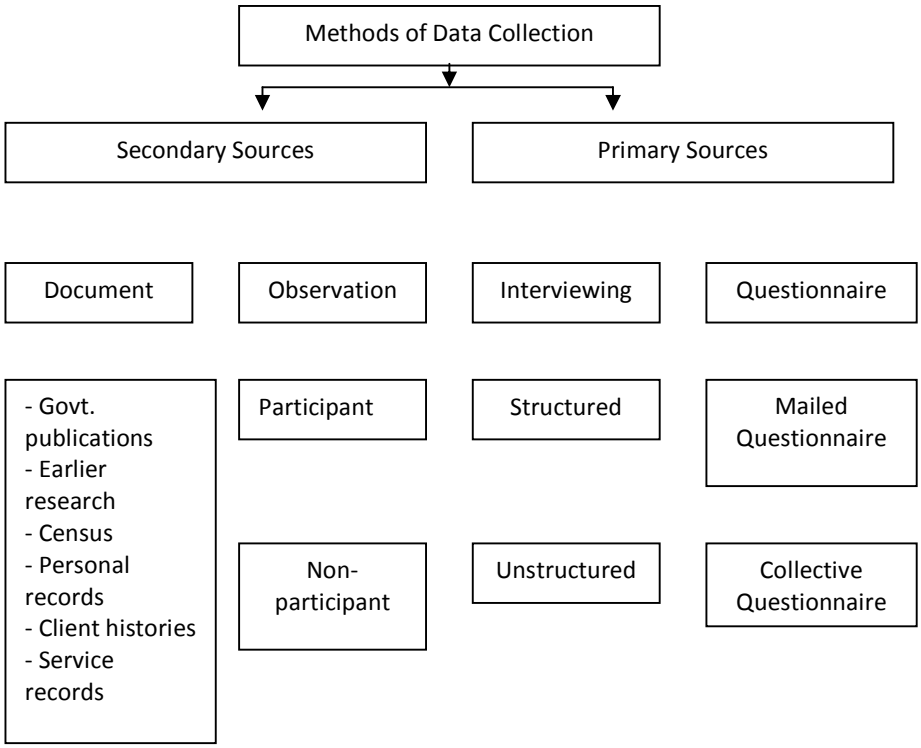
4. METHODS OF DATA COLLECTION:

There are two major approaches to gathering information about a situation, problem or phenomenon. Sometimes, information required is already available and need only be extracted. However, there are times when the information must be collected. Based upon these broad approaches to information gathering, data are categorized as:

- Secondary data;
- Primary data.

Information gathered using the first approach is said to be collected from secondary sources, whereas the sources used in the second approach are called primary sources. Examples of secondary sources include the use of census data to obtain information on the age-sex structure of a population; the use of hospital records to find out the morbidity and mortality patterns of a community; the use of an organization's records to ascertain its activities; and the collection of data from sources such as articles, journals, magazines, books and periodicals to obtain historical and other types of information. On the other hand, finding out first-hand the attitude of a community towards health services, ascertaining the health needs of community, evaluating a social program, determining the job satisfaction of the employees of an organization, and ascertaining the quality of services provided bya worker are examples of information collected from primary sources. in summary, primary sources provide first hand information and secondary sources provide secondary hand data. Following shows the various methods of data collection.

Methods of Data Collection:



None of the methods of data collection provides 100% accurate and reliable information. the quality of the data gathered is dependent upon a number of other factors, which we will identify as we discuss each method. Your skill as a researcher lies in your ability to take care of the factors that could affect the quality of your data. One of the main differences between experienced and amateur researchers lies in their understanding of, and ability to

control, these factors. It is therefore important for a beginner to be aware of them.

A collecting data using primary sources:

Several method can be used to collect primary data. The choice of a method depends upon the purpose of the study, the resources available and the skill of the researcher. There are times when the method most appropriate to achieve the objectives of a study cannot be used because of constraints such as a lack of resources and/or required skills. in such situations you should be aware of the problems these limitations impose on the quality of the data.

In selecting a method of data collection, the socio-economic demographic characteristics of the study population play an important role: you should know as much as possible about characteristics such as educational level age structure, socio-economic status and ethnic background. If possible, it is helpful to know the study population's interest in, and attitude towards, participation in the study. Some populations, for a number of reasons, may not feel either at ease with a particular method of data collection (such as being interviewed) or comfortable to express opinions in a questionnaire. Further more, people with little education may respond differently to certain methods of data collection compared to people with more education.

Another important determinant of the quality of your data is the way the purpose and relevance of the study is explained to potential respondents. Whatever method of data collection is used, make sure that respondents clearly understand the purpose and relevance of the study. This is particularly important when you use a questionnaire to collect data because in an interview situation you can answer a respondent's questions but in a questionnaire you will not have this opportunity.

In the following section each method of data collection is discussed from the point of view of its applicability and suitability to a situation, and the problems and limitations associated with it.

Observation:

Observation is one way to collect primary data. Observation is a purposeful, systematic and selective way of watching and listening to an interaction or phenomenon as it takes place. There are many situations in which observation is the most appropriate method of data collection; for example, when you want to learn about the interaction in a group, study the dietary patterns of a population, ascertain the functions performed by a worker , or study the behaviour or personality traits of an individual. it is also appropriate in situations where full and/or accurate information

cannot be elicited by questioning, because respondents either are not co-operative or are unaware of the answer because it is difficult for them to detach themselves from the interaction. in summary, when you are more interested in the behaviour than in the perceptions of individuals, or when subjects are so involved in the interaction that they are unable to provide objective information about it, observation is the best approach to collect the required information.

Types of observation - there are two types of observation:

- Participant observation;
- Non-participant observation.

Participant observation is when you, as a researcher, participate in the activities of the group observed in the same manner as its members, with or without their knowing that they are being observed. For example, you might want to examine the reactions of the general population toward people in wheelchairs. you can study their reactions by sitting in a wheelchair yourself of you might want to study the life of prisoners and pretend to be a prisoner in order to do this.

Non-participant observation, on the other hand, is when you, as researcher, do not get involved in the activities of the group but remains a passive observer, watching and listening to its activities and drawing conclusions from this. for example, you might want to study the functions carried out by nurses in a hospital. as an observe, you could watch, follow, and record the activities as they are performed. after making a number of observation, conclusions could be drawn about the function nurses carry out in the hospital. any occupational group in any setting can be observed in the same manner.

Problems with using observation as a method of data collection:

The use of observation as a method of data collection may suffer from a number of problems, which is not to suggest that all or any of these necessarily prevails in every situation. But as a beginner you should be aware of these problems.

- When individuals or groups become aware that they are being observed, they may change their behaviour. Depending upon the situation, this change could be positive or negative – it may increase or decrease, for example, their productivity and may occur for a number of reasons. When a change in the behaviour of person or groups is attributed to their being observed it is known as the Hawthome Effect. The use of observation in such a situation may introduce distortion: What is observed may not represent their normal behaviour.

- There is always the possibility of observer bias. If an observer is biased, she/he can easily introduce bias and there is no easy way to verify the observations and the interference drawn from them
- The interpretation draws from observations may vary from observer to observer.
- There is the possibility of incomplete observation and/or recording, which varies with the method of recording. an observer may watch keenly but at the expense of detailed recording. The opposite problem may occur when the observer takes detailed notes but in doing so misses some of the interaction.

Situations in which observations can be made observations can be made under two conditions:

- Natural;
- Controlled.

Observing a group in its natural operation rather than interviewing in its activities is classified as observation under natural condition. Introducing a stimulus to the group for in to react to and observing the reaction is called controlled observation.

The Recording of Observation:

There are many ways of recording observation. The selection of a method of recording depends upon the purpose of the observation. Keep in mind the each method has its advantages and disadvantages.

- Narrative – in this form of recording the researcher records a description of the interaction in his/her own words. Usually, he/she makes brief notes while observing the interaction and soon after the observation makes detailed notes in narrative form. In addition, some researchers may interpret the interaction and draw conclusions from it. The biggest advantage of narrative recording it that it provides a deeper insight into the interaction. However, a disadvantage is that an observer may be biased in his/her observation and, therefore, the interpretations and conclusions drawn from the observation may also be biased. Also, if a researcher's attention is on observing, he/she might forget to record an important piece of interaction and, obviously, in the process of recording, part of the interaction may be missed. Hence, there is always the possibility of incomplete recording and/or observation> In addition, with different observers the comparability of narrative recording can be a problem

- Scales – at times some observers may prefer to develop a scale in order to rate various aspects of the interaction or phenomenon. The recording is done on a scale developed by the observer/researcher. A scale may be one, two or three directional, depending upon the purpose of the observation. For example, in the scale in figure 9.2 designed to record the nature of the interaction within a group three are three directions: positive, negative, and neutral.

One of the problems with using a scale to record observations is that is does not provide in-depth information about the interaction. In addition, it may suffer from any of the following problems:

A three-directional rating scale

A study of the nature of interaction in a group:

Aspect of Interaction Positive Neutral Negative

Participation	5	4	3	2	1	0	1	2	3	4	5
Rapport	5	4	3	2	1	0	1	2	3	4	5
Confidence	5	4	3	2	1	0	1	2	3	4	5
Aggressive	5	4	3	2	1	0	1	2	3	4	5
Withdrawnness	5	4	3	2	1	0	1	2	3	4	5
Friendliness	5	4	3	2	1	0	1	2	3	4	5
Aloofness	5	4	3	2	1	0	1	2	3	4	5

- Unless the observer is extremely confident of his/her ability to assess an interaction he/she may tend to avoid the extreme positions on the scale, using mostly the central part. The error this tendency creates is called the error of central tendency.

- Some observers may prefer certain sections of the scale in the same way that some teachers are stric markers and others are not. When observers have a tendency to use a particular part of the scale in recording an interaction, this phenomenon is known as the elevation effect.

- Another type of error that may be introduced is when the way an observer rate an individual an one aspect of the interaction influences the way he/she rates that individual on another aspect of the interaction. Again something similar to this can happen in teaching when a teacher's assessment of the performance of a student in one subject may influence his/her rating. This type of effect is known as the Halo Effect.

- Categorical recording- sometimes an observer may decide to record her/his observation using categories. The type and number of categories depend upon the type of interaction and the observer's choice about how to classify the observation. For example, passive/active (two categories); introvert/extrovert (two categories); strongly agree/ agree/ uncertain /disagree/ strongly disagree (five categories). The use of categories to record an observation may suffer from the same problems as those associated with scales

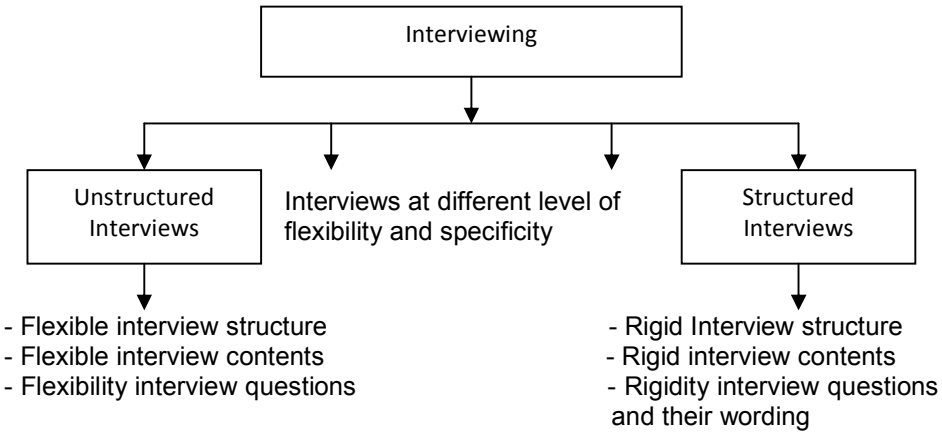
- Recording on mechanical devices- observation can also be recorded on a video tape and then analysed. The advantages of taping the interaction is that the observer can see it a number of times before drawing any conclusions, and can invite other professionals to view the tape in order to arrive at more objective conclusion. However, one of the disadvantages is that some people may feel uncomfortable or may behave differently before a camera. Therefore the interaction may not be true reflection of the situation.

The choice of a particular method for recording your observation is dependent upon the purpose of the observation, the complexity of the interaction and the type of population being observed. It is important to consider these factors before deciding upon the method for recording your observation.

B The Interview:

Interviewing is a commonly used method of collecting information from people. In many walks of life we collect information through different forms of interaction with others. Any person-to-person interaction between two or more individuals with a specific purpose in mind is called an interview. On the other hand, interviewing can be very flexible, when the interviewer has the freedom to formulate question as they come to mind around the issue being investigated; and on the other hand, it can be inflexible, when the investigator has to keep strictly to the questions decided before hand. Interviews are classified according to the degree of flexibility as in follow.

Type of Interview:



I. Unstructured Interviews:

The strength of unstructured interviews is the almost complete freedom they provide in terms of content and structure. You are free to order these in whatever sequence you wish. You also have complete freedom in terms of the wording you use and the way you explain questions to your respondents. You may formulate questions and raise issue on the spure of the moment, depending upon what occur to you in the context of the discussion.

There are several types of unstructured interviewing, for example: in-depth interviewing, focus group interviewing narratives and oral histories.

II. In-depth Interviews:

The theoretical roots of in-depth interviewing are in what is known as the interpretive tradition. According to Taylor and Bogdon, in-depth interviewing is, 'repeated face-to-face encounter between the researcher and informants directed towards understanding informants' perspectives on their lives, experiences, or situations as expressed in their own worlds'.

III. Focus Group Interviews:

The only difference between a focus group interview and an in-depth interview is that the former is undertaken with a group and the latter with an individual. In a focus group interview ; your explore the perceptions, experiences and understandings of an group of people who have some experience in common with regard to a situation or event. For example, you may explore with relevant groups such issues as domestic violence, physical disability or refugees.

IV. Narratives:

The narrative technique of gathering information has even less structure that the focus group. Narratives have almost no predetermined contents expect that the researcher seeks to near the personal experience of a person with and incident of happening in her/his life. Essentially, the person tells his/her story about an incident or situation and you, as the researcher, listen passively. And, occasionally, you encourage the individual by using techniques of active listening; that is you say words such as 'uh huh', 'mmmm', yean', 'right' and nod as appropriate. Basically, you let the person talk freely and without interrupting.

V. Oral Histories:

Oral histories, like narratives, involve the use of both passive and active listening. Oral histories, however, are more commonly used for learning about a historical even or episode that took place in the past of for gaining information about a cultural, custom or story that has been passed from generation to generation. Narratives are more about a person's personal experiences whereas, historical, social or cultural events are the subjects of oral histories.

C Structured Interviews:

In a structured interview the researcher asks a predetermined set of question, using the same wording and order of questions as specified in the interview schedule. An interview schedule is a written list of question, open-ended or closed-ended, prepared for use by an interviewer in a person-to-person interaction (this may be face-to-face, by telephone or by other electronic media). Note that an interview schedule is research tool/instrument for collecting data, whereas interviewing is a method of data collection.

10.5 QUESTIONS

1) What are the techniques of Data Collection?
2) Discuss techniques of primary data collection.

11

PROCESSING OF DATA

Unit Structure:

11.1 INTRODUCTION:

Data interpretation is a crucial step in research. Data should not be studies in isolation of all factors which might influence the origin of the data. Any decision taken needs a holistic overview of paraphernalia factors associated with the subject in concern.

The data which is collected for the purpose of the study itself cannot several any things. This being a raw data it is required to process and analysed in order to have desired result. The data which is collected can not be directly use for making analysis. Before analysis data is requires to be processed.

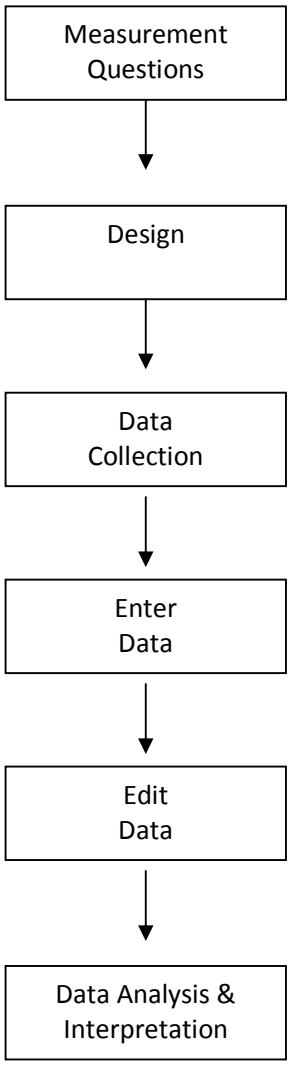
11.2 DATA PROCESSING:

Data processing is a crucial stage in research. After collecting the data from the field, the researcher has to process and analyse them in order to arrive at certain conclusion which may confirm or invalidate the hypothesis which he had formulated towards the beginning of his research worth. The mass of data collected during the field work is to be processed with a view to reducing them to manageable proportions.

The processing of data includes editing, coding, classification and tabulation. The data which is collected is analyze

with an object checking of data, and reducing this data into manageable proportions. Data collected should be organized in such way so that table charts can be prepared for presentation. The processing of data includes various operations which will be explained here.

Data Analysis & Interpretation



A. Editing

The process of examining the collected data is called editing. This include inspection and schedule. There is possibility of error and omission in the on the part of investigator so the editing help us to minimise such correctness. Editing is done at the time of collecting data.

After the collection of statistical data, the most important step in a statistical enquiry is the scrutinizing of the collected data. This

is in real sense known as editing of data. It is essential as in most of the cases the collected data contains various types of mistakes and errors. It is quite likely the some questions has been misunderstood by the informants, and if so, the particular and data has to be recollected. Sometimes answer to a particular possible to draw any inference from them. Some of the questions and schedules are so haphazardly filled that it is necessary to reject them.

Stages involved in Editing:

The stages involved in editing are:

a) Field Editing:

In this stage, the investigator makes, the review of the reporting from for completing what the latter has written in abbreviation and /or in illegible from at the time of recording the responses of the respondents. Field editing is done as soon as possible after the interview.

b) Central Editing:

it is done when all forms of schedules have been completed or returned to the office. This type of editing implies that all forms should get through editing by a single editor in a small study and by a team of editors in case of a large enquiry. While performing their work the editors should always keep the following things in mind.

I. They should be familiar with the instructions supplied to them for the purpose.

II. Editor's initials and the date of editing should be placed on each completed form or schedule.

III. They may make entries on the form in some distinctive colour and in a standardized form.

IV. While crossing out an original entry for one reason or another, they should first draw single line on it so that the same may remain legible.

V. They should initial all answers they change or supply

B. <u>Coding</u>

It is the process of assignment numerals or other symbols to answers so that responses can be put into a limited number of categories or classes. These chasses should posses the following characteristics.

a. The classes should be appropriate to the research problem under consideration

b. The classes should be exhaustive i.e. these must be a class for every data item.

c. The classes should be mutually exclusive i.e. a specific answer can be placed in one and only one cell in a given category set.

d. The classes should be unidimensional i.e. every class must defined in teams of only one concept.

Coding is necessary for efficient analysis. It reduces several replies to a small number of classes which contain the critical information required for analysis. Coding should be taken at the designing stage of the questionnaire because it helps to precede the questionnaire choices.

C. Classification

Meaning and Definition:

It is the process of arranging data in groups or classes or the basis of common characteristics. Due to this process data having a common characteristics are placed in one class and in this way the entire data get divided into number of groups or classes.

According to Secrist, classification is the process of arranging data into sequences and groups according to their common characteristics of separating them into different but related parts. In other words, classification is the process of arranging the collected data into homogenous classes of groups so as to exhibit its common characteristics.

Classification has been defined by prof. Cannor in the following way, classification is the process of arranging things in groups of class according to their resemblance or affinities and give expression to the unity of attributes that may subsist amongst a diversity of individuals.

Characteristics of Classification:

According to above definition of classification by Cannor, the following characteristics may be deduced.

a. Classification is the division of whole data into different groups. Thus by means of classification we convert the jumbled mass of data into a few homogenous groups. The complex mass of data is thus put into more manageable form.

b. The basis of grouping is uniformity of attributes. The items falling within a group one similar in some respect, at the same time they are dissimilar from the units of the other group of least in the respect. If this similarity and dissimilarity is not present these is no basis for classification.

Objectives of Classification:

Following are the main object of the classification of data:

a. To express the complex, scattered haphazard into concise logical and intelligible form. The marks of a thousand students convey no sense, but when they we grouped into first class second class, third class and failures their significance can easily by followed.

b. To make the points of similarity and dissimilarity clear, classification makes the similarity and dissimilarity clear. Thus classification of people into rich, middle class and poor gives a clear idea about their similarity disparity regarding economic status.

c. To afford comparative study. Classification makes comparative study possible. If the marks gained by the students of two colleges are given, it is difficult to say which class is better, but when they are grouped into pass and fail the comparison becomes very easy.

d. To avoid strain to the mind in understanding the significance. Classification makes the complex data so simple that its significance be easily followed by the researcher without much strain on the mind. Besides avoiding undue strain on the mind, classification helps to follow the significance in its true form.

e. To display underlying unity of the items. The items placed in one class are similar in some respect. This helps us to understand those items more clearly. Thus if the workers are divided into skilled and unskilled classes, we can form an idea about the skill of a person by knowing the class to which he belongs.

Characteristics of Good Classification:

Following are the chief characteristics of a good classification:

a. The classes are clear cut and there is no over-lapping. Every unit of the group must find a place in some class on the other and no unit can be placed in more than one class. Thus classification of population into Hindus, Muslims, Christians only is not perfect because Buddhists cannot find a place in any one of these groups.

b. The unit lying within a group must be homogeneous in respect of the fact that has been the basis of classification. All the unit of group must either posses or should be lacking in the quality that has been the basis of classification.

c. The same basis should be applied throughout the classification. Thus, if the population is classified into Hindu, Muslims, Educated

and Poor it will be wrong classification as the basis of the first two religion while that of the third and fourth is education and economic status respectively.

Basis of Classification:

Statistical data can be classified according to the characteristics that they love. These characteristics can be either descriptive or numerical. Descriptive characteristics are known as attributes and are not capable of numerical measurement, e.g. literacy, blindness, sex, unemployment, etc. classification based on descriptive characteristics is known as classification according to attributes. Numerical characteristics are those which are amendable to quantitative treatment e.g. income, expenditure, age, height, etc. classification based on numerical characteristics is known as classification according to class intervals.

Kinds of Classification:

Classification is of two types
1. Classification according to attributes.
2. Classification according to class intervals.

Classification according to attributes: In such classification, the data are divided on the basis of attributes, an qualities. For considering one attribute, two classes are formed, one showing the presence of the attribute and the other absence of the attribute. Such classification in which more than one attribute is taken into consideration is known as manifold classification.

Classification according to class-intervals: Where the direct quantitative measurement of data is possible, the classification can be done according to class-intervals. Characteristics like height, weight, income, production, consumption, etc. can be measured quantitatively and are capable of taking different size. In such eases, data are classified, each of them is called a class-interval. The limits within which a class-interval lies are known as class-limits. The difference between two class-limits is called as class magnitude.

Classification according to class-intervals involves some basis issues.

a. Number of classes:

An ideal number of classes for any frequency distribution would be that which gives the maximum data in a clear fashion.

b. Size of class-intervals:

No hand and fast rule can be laid down for deciding the magnitude of class-intervals. This will depend upon the quantity and quality of data, the range of the data and number of other considerations. Keeping these things in mind, the magnitude of the class intervals should be such that it does not distort the important characteristics of the data.

c. Class-limit:

While selecting the class-limits, it is important that these should be selected in such a way that the mid-point of a class interval and the actual average of items of that class-interval should be close to each other as far as possible.

The same class-limit shown below

100	–	500
500	–	1000
1000	–	1500
1500	–	2000
2000	–	2500

Some time the class interval is done with inclusive number.

101	–	500
501	–	1000
1001	–	1500
1501	–	2000

In this type of class interval the upper and lower limit clearly mention.

D. Tabulation of Data

Tabulation comprises sorting of the data into different categories and counting the number of cases that belong to each category. The simplest way to tabulate is to count the number of responses to one question. This is also called univerite tabulation. The analysis based on just one variable is obviously meager. Where two ore more variables are involved in tabulation, it is called bivariate or multivariate tabulation in marketing research, projects generally both types of tabulation are used.

Definition:

Prof. Neiswanger has defined a statistical table as “In a systemic organisation of data in columns and rows.”

L. K Connor has defined tabulation as the orderly and systematic presentation of numerical data in a form designed to elucidate the problem under consideration.

Objects of Tabulation:

The following are the main objects of tabulation.

a. To make the purpose of enquiry clear tabulation in the general scheme of statistics investigation is to arrange in easily accessible form.

b. To make significance clear by arranging in form of table the significance of data, is made very clear. This is because table permits the observation of the whole data in one glance. The total information is clear to the view and the significance of different parts can easily be followed.

c. To express the data in least space table also permits the data to be represented in least possible space, making the whole information clear to the view. If it is expressed in form of a passage it would not only be difficult to follow, but would require more space too.

d. To make comparison easy mainly because of the arrangement of figures in it. When two sets of figures are given side by side, it is much easier to form a comparative idea of their significance classification of tabulation:

A. Simple Tabulation
B. Complex Tabulation.

A. Simple Tabulation:

It gives information about one or more groups of independent questions. This results, in one way table, provides information of one characteristics of data.

B. Complex Tabulation:

In this type of tabulation, the data is divided in two or more categories which gives information regarding more sets of inter-related question.

E. <u>Analysis of Data</u>

The data collected may or may not in numerical form. Even if data is not in numerical form still we can carry out qualitative analysis based on the experiences of individual participants.

When data is collected in numerical form than through descriptive statistics findings can be summarised. This includes measure of central tendency like mean range etc. Another way to summarised finding is by means of graphs and charts. In any of the research study there is experimental hypothesis or null hypothesis

one the basis of data of both hypothesis, various test have been devised to take decision. Where decision is taken on the basis statistical test, it is subject to error, and such correct decision is difficult. But some standard procedures followed to arrived at proper decision.

Analysis involves estimating the values of unknown parameters of the population and testing hypothesis for drawing inferences.

Types of Analysis:
a. Qualitative analysis
b. Content analysis
c. Quantitative analysis
d. Descriptive analysis
e. Bivariate analysis
f. Sequential analysis
g. Casual analysis
h. Multivariate analysis
i. Inferential analysis
j. Statistical analysis.

a. Qualitative Analysis:

It is less influenced by theoretical assumption. The limitation of this type of analysis is that the findings tend to be unrealisable. The information categories and interpreted after, differ considerable from one investigator to another one.

In this system researcher to go through, research cycle, to increase reliability, repeating the research cycle is of value in some ways, but it does not ensure that the findings will have high reliability.

Qualitative analyses are carried out in several different kinds of study like interview, case studies and observational studies.

b. Content Analysis:

Content analysis is used where originally qualitative information is reduced to numerical terms. It is a method of analysis media output includes articles published in new papers, speeches made in radio, television and various type of propaganda. This method of analysis is applied to all most all form of communications.

c. Quantitative Analysis:

The numerical data collected in study through descriptive statistics analysis can be conducted through measure of central tendency.

d. Descriptive Analysis:

This analysis of one variable is called one dimensional analysis. This analysis measures condition at particular time.

e. Bivariate Analysis:

The analysis in respect of two variables is called bivariate analysis. In this analysis collected data in placed into tabular form, so that the meaning of the data can be derived. In this method simple dimensional data is developed and put into two or more categories.

f. Sequential Analysis:

When only factor is revel in the table at one time, this type of analysis is called sequential analysis is called sequential analysis. If we do the further analysis of the same data regard four going showed that person with leave travel concession facilities are more frequently going on tourism than those who are not gating facilities of casual analysis.

It is concerned with study of one variable affecting another one.

h. Multivariate Analysis:

With an advancement of compute application there is fast development of multivariate analysis, in which statistical method simultaneously analysis more than two variables.

i. Inferential Analysis:

In order to decide the validity of data to indicate conclusion this analysis is concerned with tests for significance of hypothesis. One the basis of inferential analysis the task of interpretation is performed by estimating the population values.

11.3 QUESTIONS

1) Discuss the steps in data processing.
2) Write a note on
    1. Tabulating
    2. Coding

12

QUANTITATIVE TOOLS
(Measure of Central Tendency)

Unit Structure:

12.1 INTRODUCTION:

In the study of a population with respect to one in which we are interested we may get a large number of observations. It is not possible to grasp any idea about the characteristics when we look at all the observations. So it is better to get one number for one group. That number must be a good representative one for all the observations to give a clear picture of that characteristic. Such representative number can be a central value for all these observations. This central value is called a measure of central tendency or an average or a measure of locations. There are five averages. Among them mean, median and mode are called simple averages and the other two averages geometric mean and harmonic means are called special averages.

12.2 DEFINITION OF CENTRAL TENDENCY:

"A measure of central tendency is typical value around which other figures congregate"

"An average stand for the whole group of which it forms a part yet represents the whole."

"One of the most widely used set of summary figures is known as measures of location."

12.3 CHARACTERISTICS OF CENTRAL TENDENCY:

The following properties should posses for an ideal average.
1. It should be rigidly defined.
2. It should be easy to understand and compute.
3. It should be based on all items in the data.
4. Its definition shall be in the form of a mathematical formula.
5. It should be capable of further algebraic treatment.
6. It should have sampling stability.
7. It should be capable of being used in further statistical computations are processing.

12.4 TYPES OF MEASURES OF CENTRAL TENDENCY:

A measure if central tendency is single number used to represent a group of data. If reduces the complexity of the data and makes than easily comparable. The features or requirements of a good average are as follows.

a. It should be based on all the observations
b. It should be simple to understand
c. it should be rigidly defined.

One of the salient characteristics of the distribution of the sample data is that most of the observations tend to concentrate in the centre of the distribution.

Central tendency is usually expressed in three ways.
a. Arithmetic mean
b. Median
c. Mode

Besides these there are two minor measures.
a. Harmonic Mean
b. Geometric Mean

a) Arithmetic Mean ($\bar{x}$) (A.M)

The arithmetic mean is the average of all the values of the variate in the sample. If x, x_2, x_3, x_n are the n values of the variate x in the sample, then their A.M. is given by

$$\bar{x} = \frac{x_1 + x_2 + x_3 + ... + x_n}{n}$$

$$\bar{x} = \frac{\sum x}{n}$$

If n occurs of times x_2 occurs f_2 times etc. and lastly x_n occurs f_n times, there being (n) observation altogether.

i.e. $n = f_1 + f_2 + f_3 + ... + f_n$

Then
$$\bar{x} = \frac{f_1 n_1 + f_2 n_2 + f_3 n_3 + ... + f_n}{f_1 + f_2 + f_3 + ... + f_n}$$

$$\bar{x} = \frac{\sum fx}{\sum f} = \frac{\sum fx}{n}$$

The arithmetic mean or simple the mean is the value obtained by dividing the sum of the values of the given items by their number.

Thus,

$$\text{Mean} = \frac{\text{Agggregate of the Values of items in the series}}{\text{Total number of items}}$$

Suppose there are four workers earning a wage of Rs.12, Rs.18, Rs.16 and Rs.14. The mean wage of these will be obtained by the following question

$$= \frac{12 + 18 + 16 + 14}{4}$$

$$= \frac{60}{4}$$

$$= \text{Rs.}15$$

In order to sumbolise such computation of mean if one lets x_1, x_2, x_3,…x_n etc indicate the various values of the items and n, the number of items $\bar{x}$ (call 'x' bar) the arithmetic mean derived is

$$x = \frac{x_1 + x_2 + x_3 + ... + x_n}{n}$$

Mathematically, the formula may be abbreviated as:

$$x = \frac{\sum x}{n}$$

Where, $\sum$ (sigma- Greek capital letter) denotes the 'sums of' x represents values of the items, and n stands for the number of items.

The above formula is a direct method of computing a mean. Computing the mean from a discrete frequency distribution for finding the mean in a discreate frequency distribution, each variate is to be multiplied by its frequency and then aggregate of the products is to be divided by the number of items.

Thus,

$$\bar{x} = \frac{f_1x_1 + f_2x_2 + f_1x_2 + ... + f_nx_n}{f_1 + f_2 + f_3 + ... + f_n}$$

Or

Simply, $\bar{x} = \frac{\sum fx}{n}$

Where, f stands for frequency of the variate.
X stand for the variate
$n = \sum f$, referring to the total number of items.

The following problem will clarify the use of the formula.

Problem no.1

The following data indicate daily earning of 50 workers in a steel yard

Daily Earning (Rs)	2	3	4	5	6	7
No. of Workers	10	12	8	10	5	5

Calculate the average income per worker.

Daily Earning	No. of Workers	Product
(x)	(f)	(f × x)
2	10	20
3	12	36
4	8	32
5	10	50
6	5	30
7	5	35
	$\sum fx = n = 50$	$\sum fx = n = 203$

$$X = \frac{\sum fx}{n}$$
$$= \frac{203}{50}$$
$$= 4.06$$

Answer:

Average income per worker is Rs.4.06

Short-cut method of computing mean:

The direct method of computing means as shown above is used only when the items are not very large and their values are also small. If, however, the series is large and or the values are big, them a short-cut method may be resorted to minimise the calculate task.

In the short cut method, try to adopt the usual procedure of calculating mean by abbreviating the given data, on the basis of the deviation of the mid point (m) of class intervals in a given frequency distribution from an arbitrary chosen value of (m) as a starting point designated as (a)

In the short cut method, a is adopted as an arbitrary starting point for computation work. Many statisticism refer as guess mean or assumed mean.

The following formula is used

$$x = a + \frac{\sum fd}{n}$$

Where

x = mean

a = assumed mean

f = frequencies

d = (m-a) i.e. deviations of mid point value from the value of arbitrary origin and $n = \sum f$ (number of items)

Needless to say that in the case of discrete distribution,

D = x – a

Where, x is the variate

Problem 2

Daily Wages (Rs)	2	3	4	5	6	7
No. of Worker	10	12	8	10	5	5

Solution:

Daily Earning in Rs.	No. of Worker	Dev. From Assumed Meaning	Product
(x)	(f)	d = (x – 4)	(fd)
2	10	-2	-20
3	12	-1	-12
4	08	0	0
5	10	+1	+10
6	5	+2	+10
7	5	+3	+15
n=50			$\sum$ fd = 30

$$x = a + \frac{\sum fd}{n}$$
$$= 4 + \frac{30}{40}$$
$$= 4.06$$

b) Median

Median is value of item that goes to divide the series into equal pasts. It may be defined as the value of that item which divides the series into two equal parts one half containing values greater than it and the other half containing values less than it. Therefore the series has to b e arranged in ascending or descending order before finding the median. When all the observations are arranged in ascending or descending order, then the median is the magnitude of the middle case, if has half the observation above it and half below it.

If there are ‘n’ observation of the variate and they are arranged in ascending order then is given by

$$\left(\frac{n+1}{2}\right)^{th}$$

Value if ‘n’ is odd on the other hand if ‘n’ is even the median is taken as the average

$$\left(\frac{n}{2}\right)^{th} \text{ of}$$

And

$$\sigma = \frac{\sqrt{\sum x^2}}{}$$
$$= \sqrt{274}$$
$$= 523$$

The median is the second type of central measure tendency, which is the value of item that divides the series into equal parts.

The median is that value of the variable which divides the group into two equal parts, one part comprising all values greater and the other; all values less than median.

"The median as its name indicates, is the value of the middle item in a series, when items are arranged according to magnitude."

By Yau Lunchow

Calculation of median:

Problem No.1

The following are the marks obtained by 9 students. Find out the median marks.

Marks (out of 100)	47	35	19	58	70	32	45	67	55

Solution:
Before calculation of median, the above number i.e. marks will be arranged in ascending order and then median will be calculated as follows.

Marks (out of 100)	19	32	35	45	47	55	58	67	70

m = 9

m= the size of $\left(\frac{N+1}{2}\right)$

$$m = \text{The size}\left(\frac{9+1}{2}\right)^{th} \text{ item}$$

$$= \text{The size}\frac{10^{th}}{2} \text{ item}$$

$$= \text{The size } 5^{th} \text{item}$$

Therefore, the median marks
= 47

Problem No. 2
Find out the median from the following:

Values	59	53	64	41	39	66	74	68

Solution	39	41	53	59	64	66	68	74

Therefore n = 8

$$m = \text{The size of } \left(\frac{N+1}{2}\right)^{th} \text{ item}$$

$$= \text{The size of } \left(\frac{8+1}{2}\right)^{th} \text{ item}$$

$$= \text{The size of } 4.5^{th} \text{ item.}$$

$$\text{Size of } 4.5^{th} \text{ item} = \left(\frac{4^{th} \text{ item} + 5^{th} \text{ item}}{2}\right)$$

$$= \left(\frac{59+64}{2}\right) = \left(\frac{123}{2}\right)$$

$$m = 61.5$$

c) Mode

It is the value which occurs with the maximum frequency. It is the most typical or common value that receives the highest frequency. It represents fashion and often it is used in business. Thus, it corresponds to the value of the variable which occurs most frequently. The modal class of a frequency distribution is the class with the highest frequency, it is denoted by a symbol 'l'.

Mode is the value of variable which is repeated the greatest number of times in the series. It is the usual and not casual size of item in a series. It lies at the position of greatest density. If we say that modal marks obtained by students m a class are 40, we mean that the largest number of student have secured 40 marks. It means around 40 the number of students tend to be heavily concentrated.

Mode is the value that occurs most frequently, in a frequency histogram or frequency polygon, it is the observed value corresponding to the high point of the graph. However, the mode is not a rigidly defined measure. In fact mode is the most unstable average and its true value is difficult to determine.

For example, the recorded observations are:
(a) 2, 3, 2, 4 ,5, 2, 7, 6, 2, 4, 2
Here, 2 occurs most frequently,
Hence mode = 2
(b) 4, 3, 2, 3, 2, 3, 5, 2, 3, 2
In this case 2 and 3 both occur equal number of times, hence there are two modes.

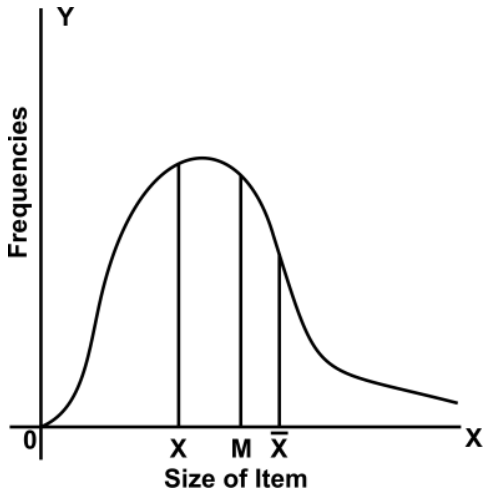
Merits and Demerits of Mode

Merits:
1. It is widely used in production and trade.
2. It is easy to understand and can be located even by inspection.
3. All the items are not needed in estimating mode.
4. It unaffected by the extreme items.
5. It can be located graphically.

Demerits:
1. Mathematical manipulation is not possible
2. It is uncertain and indefinite.
3. There can be more than one mode in a distribution.

12.5 RELATIONSHIP BETWEEN MEAN, MEDIAN AND MODE:

Mean, Median and Mode have their distinct role in statistical analysis. In no case they can be substituted for on another.

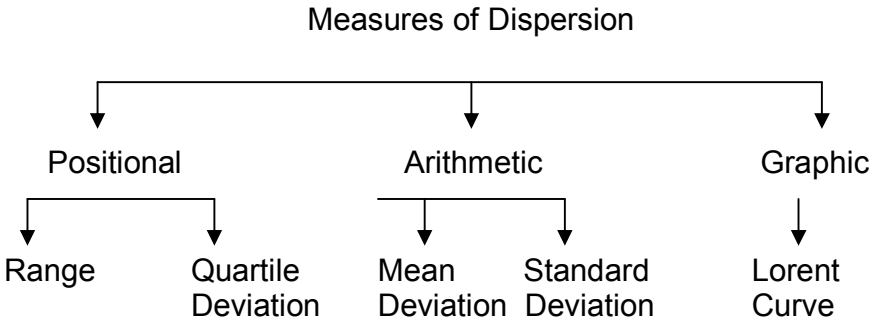


ox = mode
om = median
$o\bar{x}$ = arithmetic mean
$m\bar{x}$ = mean – median
xm = median – mode
$\bar{x}$ = mean – mode.

12.6 MEASURES OF DISPERSION:

The word dispersion, literally, means deviation, difference or spread over of certain values from their central value. Further, the word measure means a method of measuring or ascertaining certain values. Thus the phrase measures of dispersion means the various possible methods of measuring the dispersions or deviations of the different values from a designated value of a series. The designated value may be an average value or any other extreme value.

The main objects of measuring dispersion are as:
i) To determine the reliability of an average.
ii) To serve as a basis for the control of variability
iii) To compare two are more series with regard to their variability.
iv) To facilitate other statistical computation.



a) Range

Range is the simplest method of calculating dispersion. It is defined as the difference between the largest and the smallest values of the data.

Range = Largest Value – Smallest Value
R = L – S

$$\text{Coefficient of Range} = \frac{\text{Largest Value} - \text{Smallest Value}}{\text{Largest Value} + \text{Smallest Value}}$$

$$\text{Co of R} = \frac{L - S}{L + S}$$

Example 1 – The following are the marks obtained by six students in English calculate the range and the coefficient of range of marks.

Serial No. of Student	1	2	3	4	5	6
Marks in English	20	25	80	30	90	45

Solution: L = 90
S = 20

Range = L – S = 90 – 20 = 70 marks.

$$\text{Coefficient of Range} = \frac{L-S}{L+S} = \frac{90-20}{90-20}$$
$$= \frac{70}{110}$$
$$= 0.64$$

Example 2

Find the range and coefficient of range from the following data.

Weight in lbs	No. of persons
85 – 95	4
95 – 105	8
105 – 115	12
115 – 125	14
125 – 135	07

Range = L – S
L = 135, S = 85

Range = 135 – 85 = 50 lbs

$$\text{Coefficient of Range} = \frac{L-S}{L+S}$$
$$= \frac{135-85}{135+85}$$
$$= \frac{50}{220}$$
$$= 0.227$$

b) Quartile Deviation

It is nothing but a 'semi-inter quartile range'. With some modification, it is similar to the range. In the distribution, we consider Q3 as the largest value and Q, as the smallest. It means the items below the lower quartile and the items above the upper quartile are not at all included in the computation. Thus we are considering only the middle half portion of the data.

Thus the Quartile deviation measures the difference between the values of Q, and Q3 it is denoted symbolically by 'Q.D'.

a) Quartile Deviation

$$Q.D. = \frac{Q3 - Q1}{2}$$

b) Coefficient of C of Q.D.

$$= \frac{Q3 - Q1}{Q3 + Q1}$$

Example 1

Calculate the quartile deviation and its coefficient from the following figures of daily expenses of seven boys

Rs. 18, 20, 35, 41, 25, 15, 13.

Solution:

Arrange the data in ascending order.

13, 15, 18, 20, 28, 35, 41.

$$Q1 = \text{Size of } \left(\frac{N+1}{4}\right)^{th} \text{ item}$$

$$= \text{Size of } \left(\frac{8}{4}\right)^{th} \text{ item}$$

$$= \text{Size of } 2^{nd} \text{ item} = \text{Rs. } 15$$

$$Q3 = \text{Size of } 3\left(\frac{N+1}{4}\right)^{th} \text{ item}$$

$$= \text{Size of } 3\left(\frac{8}{4}\right)^{th} \text{ item}$$

$$= \text{Size of } 6^{th} \text{ item}$$

$$= \text{Rs. } 35$$

$$\text{Quartile Deviation} = \frac{Q3 - Q1}{2}$$

$$= \frac{35 - 15}{2}$$

$$= \text{Rs. } 10$$

$$\text{Coefficient of Q.D.} = \frac{Q3 - Q1}{Q3 + Q1}$$
$$= \frac{35 - 15}{35 + 15}$$
$$= \frac{20}{50}$$
$$= 0.4$$

c) Mean. Deviation (δ= Delta) (M.D.)

The range and quartile deviation are not based on all observations. They are positional measures of dispersion. M.D. is the arithmetic mean of the deviation of a series computed from any measure of central tendency i.e. the mean, median or mode, all the deviations are taken as positive i.e. (+) and (-) sign are ignored

$$\text{Mean Deviation} = \frac{\sum |di|}{n} \text{ (read as mod.d)}$$

Where $|di|$ = the deviation from the median with positive sign

n = total number of items.

The corresponding relative measure, called the coefficient of mean deviation, is given by

$$\text{Coefficient of M.D.} = \frac{\text{M.D.}}{\text{Median}}$$

Example 1

Calculate the mean deviation and its coefficient from the following data.

Salaries in Rs. 150, 210, 240, 280, 300, 330, 360.

Solution:

First locate the median and then take the deviation of each value from the median with positive sign. The median is Rs. 280

Salaries	$\|di\|$
150	130
210	70
240	40
280	0
300	20
330	50
360	80
n = 7	$\sum \|di\| = 390$

$$M.D. = \frac{\sum |di|}{n} = \frac{390}{7} = 55.7$$

$$\text{Coefficient of M.D} = \frac{M.D.}{\text{Median}} = \frac{55.7}{280} = 0.19$$

d) Standard Deviation

Of all the measures of dispersion, standard deviation is by for the most important. Its chief merit is that it is based upon all observations and hence, is more reliable than any other. It is defined as the square root of the arithmetic mean of the squares of the deviations from the mean, sometimes it is therefore, called the root. mean. square deviation. It is denoted by σ (sigma), symbolically. If $\bar{x}$ is the mean of the n observation x_i then.

$$\sigma = \sqrt{\frac{\sum \left(x_i - \bar{x}\right)^2}{n}}$$

Further, it can be shown that if x_1, x_2….x_n are the n observation then,

$$\sigma = \sqrt{\frac{\sum x_i^2}{n} - \left(\frac{\sum x_1}{n}\right)^2}$$

If f_1, f_2….f_n are the frequencies of x_1, x_2…..x_n then

$$\sigma = \sqrt{\frac{\sum f_1 x_1^2}{n} - \left(\frac{\sum f_1 x_1}{n}\right)^2}$$

Where $n = \sum f_i$

e) Coefficient of Variation

The standard deviation as defined above is an absolute measure of dispersion. Though it shows the variability of actual values from their arithmetic mean of the data, it can hardly be used comparing the variability of different groups. For comparison we need a relative measure. For the matter, one way of achieving a pure number would be to find the ratio of standard deviation to the mean. This is called “The coefficient of standard deviation”.

$$\text{Coefficient of S.D.} = \frac{\sigma}{\bar{x}}$$

A still better way to compare the variability of different groups is to express this ratio in percentage. This is called coefficient of variation.

$$\text{Coefficient of variation} = \frac{\text{S.D.}}{\text{Mean}} \times 100$$

$$\text{C.V.} = \frac{\sigma}{\bar{x}} \times 100$$

Example 1
From the following data calculate the standard deviation and the coefficient of variation.

Marks is statistics: 40, 48, 50, 53, 58, 60, 66, 70, 72, 73.

Calculation of standard deviation

Marks X_1	X_1^2
40	1600
48	2304
50	2500
53	2809
58	3364
60	3600
66	4356
70	4906
72	5184
73	5329
$\sum x_1 = 590$	$\sum x^2 = 35946$

$$\bar{x} = \frac{\sum x_1}{n} = \frac{590}{10} = 59 \text{ marks}$$

$$\sigma = \sqrt{\frac{\sum x_1^2}{n} - \left(\frac{\sum x}{n}\right)^2}$$

$$= \sqrt{35946 - (59)^2}$$

= 10.66 marks

$$\text{C.V.} = \frac{\sigma}{\bar{x}} \times 100 = \frac{10.66}{59} \times 100$$

$$= 18.06\%$$

f) Lorent Curve

This curve was used for the fixed time for measuring the distribution of wealth and income. The following steps are to be taken up in turn for drawing such curves.

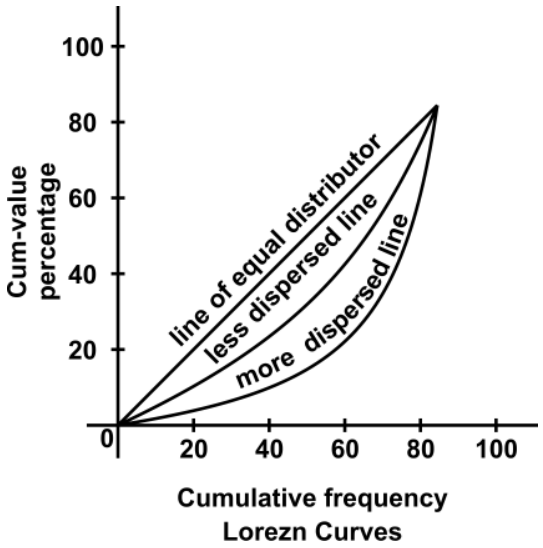
1. Cumulative both values and their corresponding frequencies.

2. Find the percentage of the cumulated figures taking the grand total of each corresponding column as 100.

3. Represent the percentage of each of the cumulative frequencies.

4. Draw a diagonal line.

5. Plot the percentage of the cumulated value against the percentages of the cumulated frequencies of a given distribution.



Lorezn Curves

12.7 QUESTIONS

1) Write note on
   1) Mean
   2) Median
2) Define central tendency.
3) Discuss the types of measures of central tendency.

13

QUANTITATIVE TOOLS
(Correlation and Regression Analysis)

Unit Structure:

13.1 INTRODUCTION:

We have studied problems involving a single variable. Many a time, we come across problems which involve two or more than two variates are called Bivariate Data. For example, if a car owner maintains the record of petrol consumption and mileage, he will find that there is some relation between the two variables. On the other hand, if we compare the figures the rainfall with the production of cars, we may find that there is no relation between the two variables. Thus correlation means "the study of existence and the magnitude and direction of variation between two or more variables"

13.2 LISE OF THE STUDY OF CORRELATION:

Most of the variables in practice are correlated. If we can find the degree and direction of correlation between such variables, it can help us to predict to control and to plan our activities for future.
1. To predict: If we know that two variables are correlated and if we know the relationship between them, we can estimate the value of

one of them when that of the other is known. In business the ability to predict is particularly useful.

2. To control knowledge of correlation between two variables also enables us to control a phenomenon. For example, if we know the relationship between the petrol consumption and mileage of can and if we find that the mileage drops down below the standard, we can control the performance of the car.

3. To plan: Knowledge of correlation also helps us in planning production, sale, supply, etc.

13.3 TYPES OF CORRELATION:

Correlation may be classified as
1. Positive and Negative
2. Linear and Non-linear

1. Positive and Negative Correlation:

The distinction between the positive and negative correlation depends upon the direction of change of two variables. If both the variables change in the same direction i.e. if one variable increase, the other also increases one as one variable decreases the other also decreases, the correlation is called positive. If on the other hand the variable change in opposite direction i.e. if as one variable increases, the other decreases the vice-versa, then the correlation is called negative.

2. Linear or Non-Linear Correlation:

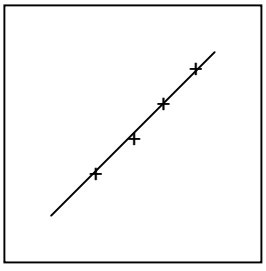
This distinction is based upon the nature of the graph of the relation between the variables. If the graph is a straight line the correlation is called linear and if the graph is not a straight line but a curve if it called non-linear correlation.

13.4 SCATTER DIAGRAM:

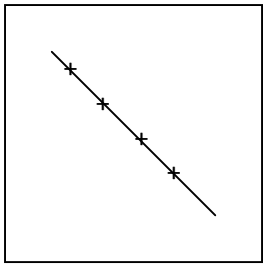
One of the most simple methods of studying correlation between two variables is to construct a scatter diagram.

(a) Perfect positive correlation

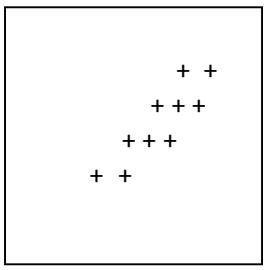
r = +1



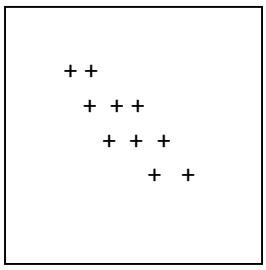
(b) Perfect Negative Correlation (r = -1)



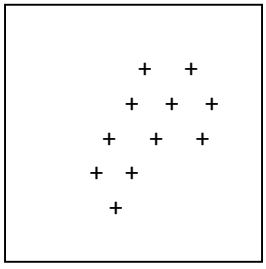
(c) High Degree of Positive Correlation (r = +)



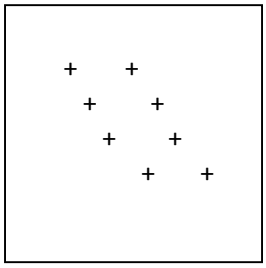
(e) High Degree of Negative Correlation (r = -)



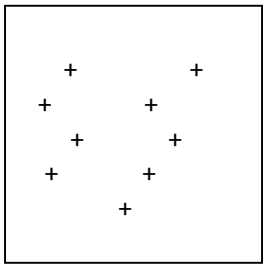
(f) Low Degree of Positive Correlation



(g) Low Degree of Negative Correlation (r = -)



(h) No Correlation (r = 0)



To obtain a scatter diagram, one variable is plotted along the x axis and the other along the y axis, on a graph paper. By plotting data in this way, we get the points which are generally scattered but which show a pattern.

13.5 KARL PERSON'S COEFFICIENT OF CORRELATION:

The method of scatter diagram is descriptive in nature and gives only a general idea of correlation. The most commonly used method which gives a mathematical expression for correlation is the one suggested by Karl Person (1867 – 1936) a British Biometrician.

Just as $\sigma_n^2 = \frac{1}{N}\sum\left(x_1 - \bar{x}\right)^2$

Gives us a measure of variation in x and

$$\sigma_y^2 = \frac{1}{N}\sum\left(y_1 - \bar{y}\right)^2$$

Gives a measure of variation in y we may expect.

$\frac{1}{N}\sum\left(x_1 - \bar{x}\right)\left(y_1 - \bar{y}\right)$ to give the measure of simultaneous variation in x and y.

But this will depend upon the units of x and y. To find a ratio which is independent of these units, we divide it by the quantities of the same order that is by $\sigma_x.\sigma_y$ with this view in mind Karl Person suggested in 1890 the following coefficient of correlation between x and y.

It is denoted by μ

$$\mu = \frac{\Sigma\left(x_i - \bar{x}\right)\left(y_i - \bar{y}\right)}{N\sigma_x \times \sigma_y}$$

Since $\frac{1}{N}\Sigma\left(x_1 - \bar{x}\right)\left(y_1 - \bar{y}\right)$ is called the canvariance between x and y

from we have $\mu = \frac{\text{cov.}(x,y)}{\sigma_x.\sigma_y}$

If we put $\sigma_x = \sqrt{\frac{\Sigma\left(x_1 - \bar{x}\right)^2}{N}}$

$$\sigma_y = \sqrt{\frac{\Sigma\left(y_1 - \bar{y}\right)^2}{N}}$$

Then

$$\mu = \frac{\Sigma\left(x_1 - \bar{x}\right)\left(y_1 - \bar{y}\right)}{\sqrt{\Sigma\left(x_1 - \bar{x}\right)^2 \Sigma\left(y_1 - \bar{y}\right)^2}}$$

If we write $x_i - \bar{x} = x_i^1$

$y_i - \bar{y} = y_i^1$ then

$$\mu = \frac{\Sigma x_i^1 y_i^1}{\sqrt{\Sigma x_i^{1^2} \Sigma y_i^{1^2}}}$$

The Karl Person's coefficient of correlation is also called the product moment coefficient correlation.

But $\text{Cov.}(x,y) = \mu_{"}$ hence

We can write

$$\mu = \frac{\mu_{"}}{\sigma x\, ' \sigma y}$$

Problem 1
Calculate Karl Person's coefficient of correlation by direct method.

Capital 10 20 30 40 50 60 70 80 90 100

Profit 2 4 8 5 10 15 14 20 22 30

Solution: It is assumed that capital = x series and profit = y series

x	dx=55	dx^2	y	dy=13	dy^2	dxdy
10	-45	2025	2	-11	121	495
20	-35	1225	4	-9	81	315
30	-25	625	8	-5	25	125
40	-15	225	5	-8	64	120
50	-05	25	10	-3	9	15
60	+05	225	15	2	4	10
70	15	225	14	1	1	15
80	25	1625	20	7	49	175
90	35	1225	22	9	81	315
100	45	2025	30	17	289	765
M=10		$\Sigma dx^2 = 8250$	N=10		$\Sigma dy^2 = 724$	$\Sigma dxdy = 2325$
EX=550			$\Sigma y = 130$			

- mean x series

$$\bar{x} = \frac{\Sigma x}{n}$$

$$\bar{x} = \frac{550}{10} = 55$$

- SD of x series

$$\sigma x = \sqrt{\frac{\Sigma dx^2}{n}}$$

$$\sigma x = \sqrt{\frac{8250}{10}}$$

$$\sigma x = \sqrt{825}$$

$$\mu = \sigma x = 28.722$$

•mean y series

$$\bar{x} = \frac{\Sigma y}{N}$$

$$\bar{x} = \frac{130}{10} = 13$$

S.D of x series

$$\sigma y = \sqrt{\frac{\Sigma dy^2}{n}}$$

$$\sigma y = \sqrt{\frac{724}{10}}$$

$$\sigma y = \sqrt{72.4}$$

$$\sigma y = 8.509$$

Then by applying K.P. coefficient of correlation

$$\mu = \frac{\Sigma dxdy}{n \times \delta n \times \delta y}$$

$$= \frac{2350}{10 \times 28.722 \times 8.509}$$

$$= \frac{2350}{2443.95}$$

$$\mu = 0.96$$

Or

$$\mu = \frac{\Sigma xdy}{\sqrt{\Sigma dx^2} \times \sqrt{724}}$$

$$\mu = \frac{2350}{\sqrt{59.73000}}$$

$$\mu = \frac{2350}{2443.97}$$

$$\mu = 0.96$$

13.6 SPEARMAN'S RANK CORRELATION:

The method developed by spearman is simpler than Karl Pearson's method since, it depends upon ranks of the items and actual value of the items are not required. Hence, this can be used to study correlation even when actual value are not known. For instance we can study correlation between intelligence and honesty by this method.

Le x_i, y_i be the ranks in the two characteristics of the i^{th} member

When i=1,2 .. n. we assume that no two member have the same rank either of x or for y.

Thus x and y take all integral values between I and n

$$\bar{x} = \frac{1}{2}(1+2+3+....+n) = \frac{n+1}{2}$$

Similarly

$$\bar{y} = \frac{1}{2}(1+2+3+...+n) = \frac{n+1}{2}$$

$$\bar{x} = \bar{y}$$

This coefficient is denoted by R.

$$R = 1 - \frac{6\Sigma d_i^2}{n^3 - n}$$

The value of R, as of r, lies between +1 and -1 if R=+1 there is perfect positive correlation.

13.7 REGRESSION:

'Regression' means returning of stepping back to the average value with the help of values of one variable we values of one variable we can establish most likely values of other variable. On the basis of two available correlated variables, we can forecast the future data or events or values. In statistics, the term 'regression' means simply the average relationship. We can predict or estimate the value of dependent variable from the given related value of independent variable with the help of regression technique.

Example: Find the angle between the lines of regression using the following data.

$$n = 10, E_x = 270, E_g = 630, \sigma_x = 4, \sigma_y = 5, \mu_{xy} = 0.6$$

Solution:

The angle between the line of regression is given by

$$= \left[\frac{1-\mu^2}{\mu}\right]\left[\frac{\sigma_x \sigma_y}{\sigma_x^{\,2} + \sigma_y^{\,2}}\right]$$

Putting the given value:

$$= \left[\frac{-0.6^2}{0.6}\right]\left(\frac{4\times 5}{16+25}\right)$$

$$= 0.52$$

13.8 TIME SERIES ANALYSIS:

In economic and business research, research often obtain data relating to a phenomenon over a time period. Such data are called a time series. A time series is set of ordered observation of a quantitative variable taken at successive point in time in terms of year, month, weeks, day or hours e.g. annual data of industrial production in a country.

A time series is influences by a variety of forces which operate continuously at recurring intervals or at random. The data of the series we decomposed to study each of these influences in isolation. This study is known as time series analysis.

This analysis identifies four kinds of charge or variation in the given phenomenon-

1. Secular trend (T)
2. Cyclical fluctuation (C)
3. Seasonal variation (S)
4. Irregular variation (I)

The combined influence of all the four components is often represented by a multiplicative model.

$$Y = T \times C \times S \times I$$

OR

$$Y = T + C + S + I.$$

The time series analysis aims at measuring each of these kind of variation. When one kind of variation is measured, the other kinds are eliminated from the series.

13.9 TREND ANALYSIS:

Of the four kinds of variation in time series the secular trend represents its long-term direction. The past trend may be used to evaluate the success or failure of a policy or program, and also to predict the future patterns. A trend may be lines, curvilinear or straight line.

13.10 METHODS OR MEASURING TREND:

There are various methods of isolating the trend from the given series, viz, the free hand method, semi-average method, moving average method and the method of least squares. The last two methods are more important. They are described below.

a) The Moving Average Method:

This method of measuring trend is based upon the idea that if the value of that if the value of the series for a sufficient period of time are averaged, the influence of shorter-term fluctuations will be eliminated. This is one of the methods aiming at elimination of seasonal variations.

A moving average is computed by adding the values for number of year both before and after to the value for the year for which the average is being obtained and then dividing the total value by the total number of years included.

The curve joining the point shows the rising or declining trend. See the following table.

Three Year Moving Average

Year	Production	3- year Moving Total	3-Year Moving Average (Trend)
1981	80	-	-
1982	90	262	87.3
1983	92	265	88.3
1984	93	269	89.6
1985	94	276	92.3
1986	99	265	95.3
19986	92	-	-

In this case there is a rising trend in production over the year.

b) Method of Least Squares:

This method is the most popular method of computing the secular trend in a time series. This is used far fitting a line cove of best fit. The least squares method gives a formula for getting the straight line that will best fit the data the equation of straight line is express.

$$y_e = a + b_x$$

Where,

y_e = the calculated value of the trend

a = the intercept of Y
the height of the line of the origin.
When X = 0 a = Y

b = the amount by which the stop of the trend line rises or falls.
y = the number of units of time each given year lies always from the middle year of the period.

13.11 QUESTIONS

1) Write a note on :
   1) Scatter Diagram
   2) Trend Analysis.

14

HYPOTHESES

Unit Structure:

14.1 INTRODUCTION:

Hypothesis is the proposed assumption explanation, supposition or solution to be proved or disproved. It is considered as main instrument in research. It stands for the midpoint in the research. If hypothesis is not formulated researcher cannot progress effectively. The main task in research is to test its record with facts. If hypothesis is proved the solution can be formed and if it is not proved then alternative hypotheses needs to be formulated and tested.

So, with hypothesis formulated it will help up to decide the type of data require to be collected.

The important function in research is formulation of hypothesis. The entire research activity is directed towards making of hypothesis. Research can begin with well formulated hypothesis or if may be the end product in research work. Hypothesis gives us guidelines for an investigation to the basis of previous available information. In absence of this research will called underquired data and may eliminate required one. Thus hypothesis is an assumption which can be put to test to decide its validity.

14.2 HYPOTHESIS TESTING:

In business research and social science research, different approaches are used to study variety issues. This type of research may be format or informal, all research begins with generalized

idea in form of hypothesis. A research question is usually there. In the beginning research effort are made for area of study or it may take form of question abut relationship between two or more variable. For example do good working conditions improve employee productivity or another question might be now working conditions influence the employees work.

14.3 PROCESSION OF HYPOTHESES TESTING:

Hypotheses testing is a systematic method. It is used to evaluate the data collected. This serve as aid in the process of decision making, the testing of hypotheses conducted through several steps which are given below.

a. State the hypotheses of interest
b. Determine the appropriate test statistic
c. Specify the level of statistical significance.
d. Determine the decision rule for rejecting or not rejecting null hypotheses.
e. Collect the data and perform the needed calculations.
f. Decide to reject or not to reject the null hypotheses.

In order to provide more details on the above steps in the process of hypotheses testing each of test will be explained here with suitable example to make steps easy to understand.

1. Stating the Hypotheses

In statistical analysis of any research study if includes at least two hypotheses one is null hypotheses and another is alternative hypotheses.

The hypotheses being tested is referred as the null hypotheses and it is designated as HO. It is also referred as hypotheses of difference. It should include a statement which has to be proved wrong.

The alternative hypotheses present the alternative to null hypotheses. It includes the statement of inequality. The null hypotheses are and alternative hypotheses are complimentary.

The null hypothesis is the statement that is believed to be correct through analysis which is based on this null hypotheses. For example, the null hypotheses might state the average are for entering management institute is 20 years. So average age for institute entry = 20 years

2. Determining Appropriate Test Statistic

The appropriate test statistic which is to be used in statistic, which is to be used in statistical hypotheses testing, is based on

various characteristics of sample population of interest including sample size and distribution.

The test statistic can assume many numerical values. As the value of test statistic has significant on decision one must use the appropriate statistic in order to obtain meaningful results. The formula to be used while testing population means is.

Z - test statistic, x - mean of sample μ - mean of population, σ - standard deviation, n – number of sample.

3. The Significance Level

As already explain, null hypothesis can be rejected or fail to reject null hypotheses. A null hypothesis that is rejected may in really be true or false.

A null hypothesis that fails to be rejected may in reality be true or false. The outcome that a researcher desires is to reject false null hypotheses or fail to reject true null hypotheses. However there is always possibility of rejecting a true hypotheses or failing to reject false hypotheses.

Type I and Type II Errors

Type I: error is rejecting a null hypotheses that is true

Type II: Error is failing to rejected a false null hypotheses

Table

	DECISION	
	Accept Ho	Reject Ho
Ho (True)	Correct Decision	Type I Error
Ho (True)	Type II Error	Correct Decision

The probability of committing a type I error is termed as aA and Type II error is termed as B.

4. Decision Rule

Before collection and analyses of data it is necessary to decide under which conditions the null hy7potheses will be rejected or fail to he rejected. The decision rule can be stated in terms of computed test statistics or in probabilistic terms. The same decision will he applicable any of the method so selected.

5. Data Collection and Calculation Performance

In research process at early stage method of data collection is decided. Once the research problem is decided that immediately decision in respect of type and sources of data should be taken. It must clear that fact that, which type of data will be needed for the

purpose of the study and now researcher has a plan to collect required data.

The decision will provide base for processing and analysing of data. It is advisable to make use of approved methods of research for collecting and analysing of data.

6. Decision on Null Hypotheses

The decision regarding null hypotheses in an important step in the process of the decision rule.

Under the said decision rule one has to reject or fail to reject the null hypotheses. If null hypotheses is rejected than alternative hypotheses can be accepted. If one fails to reject null hypotheses one can only suggest that null hypotheses may be true.

7. Two Failed and One Failed Tests

In the case of testing of hypotheses, above referred both terms are quite important and they must be clearly understood. A two failed test rejects the null hypotheses.

a. if sample mean is significantly
b. higher or lower than the
c. hypothesized value of mean of the population
d. such a test is appropriate, when the null hypotheses is some specified value and the alternate hypotheses is a value not equal to the specified value and the alternative hypotheses is value not equal to the specified value of null hypotheses.

14.4 PROCEDURE FOR TESTING OF HYPOTHESES:

Testing of hypotheses mean to decide the validity of the hypotheses on the basis of the data collected by researcher. In testing procedure we have to decide weather null hypotheses is accepted or not accepted.

This requirement conducted through several steps between the cause of two action i.e. relation or acceptance of null hypothesis. The steps involved in testing of hypotheses are given below.

1 Setting up of Hypotheses

This step consist of hypotheses setting. In this step format statement in relation to hypotheses in made. In traditional practice instead of one, two hypotheses are set. In case if one hypotheses is rejected than other hypotheses is accepted. Hypotheses should be clearly stated in respect of the nature of the research problem.
There are hypotheses are.

a. Null hypotheses and
b. Alternative hypotheses.

Acceptance or rejection of hypotheses is based on the sampling information. Any sample which we draw from the population will vary from it therefore it is necessary to judge whether there difference are statistically significant or insignificant.

The formulation of hypotheses is an important step which must be accomplished and necessary care should be taken as per the requirement and object of the research problem under construction.

This should also specify the whether one failed or two failed test will be used.

2. Selecting Statistical Technique

In this stage we will make selection of statistical technique which are going to he used. There are various statistical test which are being used in testing of hypotheses. There tests are

Z – Test
T – Test
F – Test
X2

It is the job of the researcher to make proper selection of the test.
Z- Test is used when hypotheses is related to a large sample. (30 or more)

T- Test is used when hypotheses is related to small sample (Less than 30)

The selection of test will be dependent on various consideration like, variable involved, sample size, type of data and whether samples are related or independent.

3. Selecting Level of Significance

This stage consists of making selection of desired level of significance. The researcher should specify level of significance because testing of hypotheses is based on pre-determined level of significance. The rejection or retention of hypothesis by the researcher is also based on the significance level.

The level of significance is generally expressed in percentage from such as 5% or 1%, 5% level of significance is accepted by the researcher, it means he will be making wrong decision about 5% of time. In case if hypotheses is reject at this level of 5% he will be entering risk hypotheses rejection ???out of 100 occasions.

The following factors may affect the level of significance.

- The magnitude difference between sample mean
- The size of sample
- The validity of measurement

4. Determining Sampling Distribution

The next step after deciding significance level in testing of hypothesis is to determine the appropriate sampling distribution. It is, normal distribution and 't' – distribution in which choice can be excised.

5. Selecting Sample and Value

In this step random sample is selected and appropriate value is computed from the sample data relating to the test statistic by utilizing the relevant distribution.

6. Performance Computation

In this step calculation of performance is done. The calculation includes testing statistics and standard error.

A hypothesis is tested for the following four possibilities, that the hypotheses is-

a- True, but test lead to its rejection
b- False, but test lead to its acceptance
c- True, but test lead to its acceptance
d- False, but test lead to its rejection

Out of the above four possibilities a and b lends to wrong decision. In this case a lends to Type I error and, b lends to Type II error.

7. Statistical Decision

Thus is the step in which we have to draw statistical decision involving the acceptance or rejection of hypotheses.

This will be dependent on whether the calculated value of the test falls in the region of acceptance or in the region of rejection at given significance level.

If hypotheses is tested at 5% level and observed set recorded the possibilities less than 5% level than we considered difference between hypothetical parameter and sample statistics is significant.

14.5 TESTING OF HYPOTHESIS USING VARIOUS DISTRIBUTION TEST:

A. The Parametric Tests:

The test of significance used for hypothesis testing is of two types the parametric and non-parametric test.

The parametric test is more powerful, but they depend on the parameters or characteristics of the population. They are based on the following assumptions.

1. The observations or values must be independent.
2. The population from which the sample is drawn on a random basis should be normally distributed.
3. The population should have equal variances.
4. The data should be measured at least at interval level so that arithmetic operations can be used.

a) The Z – Test

Prof. R.A. fisher has develop the Z Test. It is based on the normal distribution. It is widely used for testing the significance of several statistics such as mean, median, mode, coefficient of correlation and others. This test is used even when binominal distribution or t distribution is applicable on the presumption that such a distribution lends to approximate normal distribution as the sample size (n) become larger.

b) The T – Test

The T – Test was developed by W.S. Gossel around 1915 since he published his finding under a bon name 'student', it is known as student's t – test. It is suitable for testing the significance of a sample man or for judging the significance of difference between the mams of two samples, when the samples are less than 30 in number and when the population variance is not known. When two samples are related, the paired t – test is used. The t – test can also be used for testing the significance of the coefficient of simple and partial correlation.

In determining whether the mean of a sample drawn from a normal population deviates significantly from a stated value when variance of population is unknown, we calculate the statistic.

$$t = \frac{\bar{x} - \mu}{s} \times \sqrt{\eta}$$

Where,

$\bar{x}$ = the mean of sample

μ = the actually or hypothetical mean of population

η = the sample size

s = standard deviation of the samples

$$s = \sqrt{\frac{\Sigma\left(x - \bar{x}\right)^2}{\eta - 1}}$$

Example

Ten oil tins are taken at random from an automatic filling machine the mean weight of the 10 tins is 15.8 kg and standard

deviation 0.5 kg. Does the sample mean differ significantly from the intended weight of 16 kg?
(given for $\nu = 9$, to 0.05 – 2.26

Solution:

Let us make the hypothesis tat the sample mean does not differ significantly from the intended weight of 16 kg applying t – test .

$$t = \frac{|\bar{x} - \mu|}{s}$$

$$\bar{x} = 15.8 \quad \mu = 6.5 = 0.05 \quad \eta = 10$$

$$t = \frac{|15.0 - 16|}{0.5} \times \sqrt{10}$$

$$= \frac{0.2 \times 3.162}{0.5}$$

$$= 1.27$$

$$\upsilon = \eta - 1 = 10 - 1 = 9$$

$$\nu = 9$$

t 0.05=2.26

For

The calculated value of t is less than the table value. The hypothesis is accepted.

3 The f- test

The f – test is based on f – distribution (which is a distribution skewed to the right, and tends to be more symmetrical, as the number of degrees of freedom in the numerator and denominator increases)

The f- test is used to compare the variances of two independent sample means at a time. It is also used for judging the significance of multiple correlation coefficients.

B The Non-parametric Tests

The non-parametric tests are population free tests, as they are not based on the characteristics of population. They do not specify normally distributed population or equal variances. They are easy to understand and to use.

The important non parametric tests are:

- The chi-square test
- The median test
- The Mann-Whitney U test
- The sign test
- The Wilcoxin matched –Paris test
- The Kolmogorow Smornov test.

The Chi-Square Test (x^2)

The Chi-Square test is the most popular non-parametric test of significance in social science research. It is used to make comparisons between two or more nominal variables. Unlike the other test of significance, the chi-square is used to make comparisons between frequencies rather than between mean scares. This test evaluated whether the difference between the observed frequencies and the expected frequencies under the null hypothesis can be attributed to chance or actual population differences. A chi-square value is obtained by formula.

$$\kappa^2 = \sum \left[\frac{(\text{difference of actual and expected frequencies})^2}{\text{expected frequencies}} \right]$$

$$\kappa^2 = \sum \frac{(f_A - f_e)^2}{f_r}$$

Where,

κ^2 = chi-square

f_A = observed or actual frequency

f_e = expected frequency

κ^2 can also determined with the help of the following formula.

$$\kappa^2 = \sum \left(\frac{f_A}{f_e} \right) - N$$

N = total of frequencies

Example,

Weight of 7 persons is given as below:

Persons	Weight
1	40
2	45
3	50
4	60
5	55
6	52
7	48

In this information we can say, variance of distribution of sample of 7 persons was drawn is equal to weight of 30 kg.

Test this at 5% of 1% level of significance.

Solution:

Above information we will workout variance of sample data.

S. No.	X1	w/kg	(x,-x)	$(x,-x)^2$
1	40	-16	100	
2	45	-05	25	
3	50	+0	0	
4	60	+10	100	
5	55	+05	25	
6	52	+02	4	
7	48	-02	4	

n = 7, EX = 350, $\Sigma\left(x_1-\bar{x}\right)^2 = 258$

$$\bar{x} = \frac{\Sigma x1}{n} = \frac{350}{7} = 50$$

$$\delta = \sqrt{\frac{\Sigma\left(x_1 - x^2\right)^2}{x-1}} = \frac{\sqrt{258}}{7-1} = 43$$

$$x^2 = \frac{43}{30}(7-1) = 8.6$$

Degree of freedom is (n-1) = (7-1) = 6

At 5% Ye level of significance x^2=12.592
1% level = 16.812
Value are greater than x^2=8.6

So we accept null hypotheses and variance at both 5 and 1 pe level is significant. So sample of 30 kg is taken from the population.

14.6 QUESTIONS

1) Discuss the process of Hypotheses testing.

15

REPORT WRITING

Unit Structure:

15.1 INTRODUCTION:

The final and a very important step in a research study is a write report. The research report is a means for communicating our research experiences to others and adding them to the fund of knowledge. This chapter discusses the purpose of research reports types of reports, planning report writing, research report format, principles of writing, drafting and finalising the report, and evaluation of a research report.

15.2 MEANING AND PURPOSE OF A RESEARCH REPORT:

A research report is a formal statement of the research process and its results. It narrates the problem studied, methods used for studying it and the findings and conclusions of the study.

The purpose of a research report is to communicate to interested persons the methodology and the results of the study in such a manner as to enable them to understand the research process and to determine the validity of the conclusions. The aim of the report is not to convince the reader of the value of the result, but to convey to him what was done, why it was done, aid what was

its outcome. It is so written that the reader himself can reach his own conclusions as to the adequacy of the study and the validity of the reported results and conclusions.

15.3 CHARACTERICTICS OF A REPORT:

A research report is a narrative but authoritative document on the outcome of a research effort. It presents highly specific information for a clearly designated audience. It is non persuasive as a form of communication. Extra caution is shown in advocating a course of action even subordinated to the matter being presented. It is a simple readable and accurate from of communication.

15.4 FUNCTIONS OF A RESEARCH REPORT:

A well written research report performs several function:-

1. It serves as a means for presenting the problem studied methods and techniques used for collecting and analysing data, the findings, conclusions and recommendations, in an organised manner.
2. It serves as a basic reference material for future use in developing research proposals in the same or related area.
3. A report serves as a means for judging the quality of the completed research project.
4. It is a means for evaluating the researcher's ability and competence to do research.
5. It provides factual base for formulating policies and strategies relating to the subject matter studied.
6. It provides systematic knowledge on problems and issues analysed.

15.5 TYPES OF REPORTS:

Research reports may be classified into (a) technical report (b) popular report, (c) interim report, (d) summary report, (e) research abstract, and (f) research article. These types of reports vary from one another in terms of the degree of formality, physical form, scope, style and size.

(a) Technical Report/Thesis:-

This is a comprehensive full report of the research process and its outcome. It is primarily meant for academic community i.e. the scientists of the researcher's discipline and other researcher's. 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 field and other research procedures, sources of data, tools of data collection, methods of data processing and analysis, detailed findings and conclusions and suggestions. There is also a technical appendix for methodological details, copies of measuring instruments and the like. It is so comprehensive and complete that the study can be replicated by others.

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 section with appropriate heading and paragraphs.

(b) Popular Report:-

This type of report is designed for an audience of executives/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 findings to decisions.

The organization 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 thechnical 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 discussions are presented in the second part. More headlines, underlining pictures and graphs may used. Sentences and paragraphs should be short. There can be a liberal use of margins and blank space.

The style may be more journalistic but be precise and it should encourage rapid reading and quick comprehension.

(c) 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 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 analysed. Whatever may be the coverage of the interim report it fulfils certain functions. It facilitates the sponsoring agency to take action without waiting for the full report. It helps to keep alive the agency's interest in the study and prevent misunderstandings about the delay. In addition, it serves to spread over a longer period the time consuming process of discussion of research findings and their implication. The report also enables the researcher to find the appropriate style of reporting.

The interim report contains a narration of what has been done so far and what was its outcome. It presents a summary of the findings of that part of analysis which has been completed.

(d) Summary Report:-

A summary report is generally prepared for the consumption of the lay audience, viz. the general public. The preparation for this type of report is desirable for any study whose findings are general interest. It is written in non-technical, simple language with a liberal use of pictorial charts. It just contains a brief reference to the objective of the study, its major findings and their implications. It is a short report of two or three pages. Its size so limited as to suitable for publication in daily newspaper.

(e) Research Abstract:-

This is a short summary of the technical report. It is usually prepared by a doctoral students on the eve of submitting, his thesis. Its copies are sent by the university along with the letters of request to the examiners invited to evaluate the thesis. It contains a brief presentation of the statements of the problem, the objectives of the study methods and techniques used and an overview of the report. A brief summary of the results of the study may also be added. This abstract is primarily meant for enabling the examiner invites to decide whether the study belongs to the area of their specialization and interest.

(f) 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 rather than to crowd too many things into single article.

A research article must be clearly written in concise and unambiguous language. It must be logically organised, progressing from a statement of the problem and the purpose of study, through the analysis of evidence to the conclusions and implications.

A professional journal may have its own special format for reporting research. It is important to find out in advance whether the publication does have specific format requirements. For example,

the research articles submitted for publication in the journal of applied psychology should be prepared according to the publication manual of the American psychological association. The preferred format is:

1. **Introduction:-** A statement of the nature of the problem and a brief review of previous studies pertinent to the development of the specific questions or hypotheses to be tested.
2. **Method:-** A brief statement of what was done where and how it was done, and a statement of the specific techniques and tools used.
3. **Results:-** A presentation of the salient findings with tables or charts.
4. **Discussions:-** A discussion of the salient findings with tables or charts.
5. **Conclusion:-** A presentation of the contribution of the study to theory and /for practice and the brand implications of the findings.

The article must be accompanied by an abstract of 100-150 words typed on a separate sheet of paper.

Any reference to an article or other source is to be identified at an appropriate point in the text by the last name of the author year of publication and paglination where appropriate, all within parentheses e.g. Sherman (1980); Heller (1976 p. 701) no footnote is to be used for purpose of citation.

All references are to be listed alphabetically by author in an appendix titled 'Reference e.g. Grove, A.S. (1983) High Output Management, New York; Random House.

Tannenbaum A & Schmidt. W (1958) How to choose a leadership pattern. Harvard Business Review 36 95-10)

Similarly, the Indian Society of Agricultural Economics, Mumbai has prescribed guidelines for submission of papers of publication in the Indian Journal of Agricultural Economics. The preferred format is: 1. Introduction, 2. Methodology, 3. Results and discussion, and 4. Policy Implications/conclusion, followed by references. Only cited works should be included in the reference list. The style of citations to be followed is:

A.S Kahlon and K. Singh: Managing Agricultural Finance: Theory and Practice, Allied Publishers Pvt. Ltd., New Delhi, 1984.

Jairam Krishna, "Focus on Wateland Development; Degradation and Poverty." The Economic Times, April 13, 1986.

C.H. Hanumantha Rao, "Current Agrarian Scene: policy alternatives, "Economic and Political Weekly, Vol XXIII, no.13 March, 26, 1988.

An abstract not exceeding 100 words should be submitted along with the paper. The length of the article is limited to 20 (double space) typed pages ($8^{1/2}$ x 11^{m}).

Regardless of the format followed, however, the style of writing should be the same as that used for technical report thesis.

15.6 PLANNING REPORT WRITING:

After the data an analyst is over report writing cannot be started abruptly. It requires careful preplanning. This planning process involves the following considerations and steps.

As a research report is a means of communication we have to consider some basic questions, which determine the effectiveness of communication, namely, 'who' says 'what' to whom in which was with what effect.

1 The target Audience:- The first step in planning report writing is to determine the target audience. The form and style of reporting and other aspects depend upon the type of the reader, for whom the report is intended. The identification of the target audience depends on who is the researcher and what is his intention. The target audiences may be classified into (1) the academic (scientific) community (2) the sponsors of research, and (3) the general public.

The academic or scientific community will be the primary target audience in the following cases: (1) When the research is undertaken as an academic exercise for a master's degree or M. Phil. Degree or Ph.D. degree (in this case the thesis evaluation committee members will be the immediate target audience), (2) when a research student or social scientist plants to publish his research output in the form of a research monograph: (3) when a researcher plans to write research articles based on his research for publication in professional journals. (in the last two cases, the references, and the fellow scientists interested in the study will be the target audience).

The sponsors of research may consist of two categories:-
(1) research promotion bodies like Indian Council of Social Science Research, the University Grants Commission; and educational foundations which provide Financial support to social scientists working in universities and colleges for undertaking research with a view to encouraging them to do research; and (2) government

department, industrial and other organization which sponsor research for their own use in policy making and the like.

It the research is sponsored by a research promotion organization, the reporting has to follow its prevalent norms. In general, a full-fledged technical report is expected, along with an abstract of the report. When the research is sponsored by an organization for its own use, it has to be reported according to its requirements. It is to be written as a private documents emphasizing the findings and recommendations rather than methodology.

The general public is viewed as a cross-section of the society. This lay audience may be interested in the broad findings and the implications of research studies on socio-economic problems. The reporting for his audience may be in the from of a summary report or an article written in non technical journalistic language.

Can be multi-purpose report aiming at all categories of target audiences be within? The communication characteristics, viz. the level of knowledge and understanding, the information needs and the kind of language to which one is accustomed are not the same. They vary from one type of audience to another. The preferences and the requirements of different audiences differ widely and cannot be reconciled. Hence, it is neither possible nor desirable to attempt to write one multi-purpose report. A separate report tailored to the needs of each type of audience has to be written when there is a need for communicating to different types of audiences.

2) The communication characteristics of the audience. The second step in planning report writing is to consider the selected audience's communication characteristics. What is their level of knowledge and understanding? What is the gap in knowledge on the subject between the readers and the writer? The greater the knowledge gap, the more difficult it is to convey the full findings meaningfully and concisely.

What is the kind of language- scientific or journalistic that which the readers are accustomed? What do they need to know about the study? or, what is likely to be of interest to them? How can the needed information be presented best-verbal, a combined tabular or pictorial presentation? These questions determine the scope, form and style of reporting. The underlying purpose of a report should be noted. The purpose of report is not communication with oneself but communication with the target audience. Hence, we must constantly keep in mind the needs and requirements of the target audience.

3) The intended purpose of the Report: What is the intended purpose of the report? Is it meant for evaluation by expects for the award of a degree or diploma? It is to be used as a reference material by researchers and fellow scientists? Or it is meant for implementation by a user organization? This intend purpose also determines the type of the report and its contents and form of presentation.

4) The type of report: with reference to the intended use, the type of report to be prepared should be determined. When the research is undertaken to fulfil the requirements of a degree or diploma or funded by a research promotion agency, the report is prepared as a comprehensive technical report. When it is sponsored by a user organization, it is written as a popular or summary report.

5) The scope of the report: The next step is to determine the scope of the contents with reference to type of the report and its intended purpose. For example, a research thesis or dissertation to be submitted for award of a degree or diploma should narrate the total research process and experience the state of the problem. A review of previous studies objectives of the study methodology, findings, conclusions and recommendations.

6) The style of Reporting: What should be the style of reporting? Should it be simple and clear or elegant and pompous? Should it be technical or journalistic? These questions are decided with reference to the target audience for a detailed discussion on style, see section 12.5 principles of writing below.

7) The format of the report: The next step is to plan the format of the report, which varies according to the type of report, see section 12.4 research report format below.

8) Outline/table of controls: the final step in planning report writing is to prepare a detailed outline for each of the proposed chapters of the report. An outline lends cohesiveness and direction to report writing wok. Until an outline is prepared the researcher does not know that he has to do and how to organise the presentation.

A table of contents flows from the nature of the problem under study and the objectives of the study, the hypothesis to be tested and the variables studied.

15.7 STYLES OF OUTLINING:

There are two styles of outlining (1) topic outline and (2) sentence outline. In the topic outline the topic heading and the sub-

topic headings are noted and the points to be discussed under each, subheading may be denoted by one or two key words.

In the sentence outline the essential ideas to be discussed under each subtopic are stated. This requires more thought and decisions on what to include and how to say it. It guards later forgetting certain specific points that one wanted to make.

	Topic Outline Demographic control in primary cooperatives	Sentence Outline Democratic control in primary cooperatives.
1	Extent of members participation - measurement - categorisation	Extent of menbers participation - measured by a scale - on the basis of the score Respondents categorised into activists, non-activists and medium participants.
2	Factors influencing democratic control (a) Members characteristics and democratic participation - age - formal education	Factors influencing democratic control (a) member's personal characteristics and democratic participation. A person's social participation influenced by his personal characteristics like age, education, etc. It is expected that the older, better educate and higher status persons will be activists in social organization. Does this hold good in sample members? Age and democratic participation - Age as correlate of the membership, likely to influence participation - Testing this relationship - Presentations of the table and the result of chi-square test - Interpretation of the result.

Obviously, it is more difficult to write a sentence outline than a topic outline, but it is more useful than the latter. A report writes itself if it is based upon such an outline. Since it matches easier to change the outline than to change the rough draft of the report. It is preferable to write a sentence outline before drafting the report. Major omissions and commissions in the drafting stage can be avoided if writing is based on a detailed outline. Of course, an outline should not be considered as a rigid scheme to be strictly

followed. It is a tentative on and is likely to undergo changes while the report writing work proceeds. Exhibit 12.1 illustrates the two styles of outlining.

15.8 ARRANGEMENT OF MATERIALS:

After the detailed outline developed, it should be studied carefully to see whether all aspects have been fully covered and arranged in a logical sequence.

The notes cards have to be sorted out and grouped topic wise. The groups of cards have to be then arranged in the order in which the respective topics have been listed in the outline.

Arrangement of Materials:

After the detailed outline is developed, it should be studied carefully to see whether all aspects have been fully covered and arranged in a logical sequence.

The notes cards have to be sorted out and grouped topic wise. The groups of cards have to be then arranged in the order in which the respective topics have been listed in the outline. Similarly, the statistical tables and tables of statistical computation results have to be arranged in the order in which the related variables have been ordered in the outline with these arrangements the planning stage of report writing ends.

15.9 RESEARCH REPORT FORMAT:

In this section, the format of a comprehensive technical report of doctoral thesis is discussed.

Report outline.

A. Prefatory Items

1. Title page
2. Researcher's declaration
3. The certificate of the research Supervisor
4. Preface/Acknowledgements
5. Table of contents
6. List of tables
7. List of graphs and charts
8. Abstracts or synopsis

1 Introduction

a) Theoretical background of the topic
b) Statement of the problem
c) Review of Literature
d) The scope of the present study
e) The objectives of the study
f) Hypotheses to tested
g) Definition of concepts
h) Model, if any.

B Body of the Report

2 The design of the study

a) Methodology
   - overall typology
   - methods of data collection
b) Sources of data
c) Sampling plan
d) Data collection instruments
e) Filed work
f) Data processing and analysis plan
g) An overview of the report
h) Limitations of the study

3 Results:- Findings and Discussion

4 Summary, conclusions and Recommendations

C Terminal Items

1 Bibliography

2 Appendix

a) Copies of data collection instruments

b) Technical details of sampling plan

c) Complex tables

d) Glossary of new terms used in the report.

(A) PREFATORY ITEMS:-

Title Page:

The title page is the first page of a research report. It carries (1) the title of the study (2) the name of the degree for which it is submitted (3) the name of the author, (4) the name of the institution on which the report is submitted and the data of presentation.

The title should be precise and reflect the core of the problem under study. It should be printed in capital letters and cantered in the page. Exhibit 12.2 shows a sample of a title page.

Researcher's Declaration:-

In the case of a research undertaken by a student in fulfilment of the requirements of a degree, he may be required to make a declaration,

EFFECTIVE ORGANISATIONAL DEVELOPMENT THROUGH PARTICIPATION AND COMMUNICATION PROGRAMME

A Thesis submitted for the award of Ph.D. Degree

Department of Management Studies
INDIAN INSTITUTE OF SCIENCE, BANGALORE
December, 1980

DECLARATION:-

I declare that the thesis entitled " a study of the factors influencing the relationship between capital structure and cost of capital in selected larger cooperatives in Tamil Nadu" is a record of independent research work carried out by me under the supervision and guidance of prof. O.R. Krishnaswami. This has not been previously submitted for theaward of any diploma degree, associateship or other similar title.

Gandhiagram
February 9, 1989 N. Narayanasamy

Research Supervisor's Certificate:-

In the case of a student's research's work , his research supervision has to certify that is was a record of independent research work done by the students. See exhibit 12.4 for an illustration.

CERTIFICATE

I certify that this thesis entitled “A study of the factors influencing the relationship between capital in selected larger cooperatives in Tamil Nadu, submitted to the Gandhigram Rural Institute, Gandhigram for award of Ph. D. Degree, is a record of independent research work carried out by Mr. N. Narayanasamy lecturer in cooperation, Gandhigram Rural Institute, under my supervision and guidance. This has not been previously submitted for the award of any degree, diploma, a ssociateship or other similar title.

Banglore
February 9, 1989

O.R. Krishnasamy
Research

Acknowledgement:-

In this section, the researcher acknowledges the assistance and support received from individuals and organizations in conducting the research. It is thus intended to show his gratitude. Good taste calls for acknowledgements to be expressed simply and nicely.

In the case of a research undertaken by a non-student researcher, acknowledgements may be made in the preface itself, where a brief background of the study is given.

Table of contents:-

A table of contents gives an outline of the contents of the report. It contains a list of the chapters and their sub-titles with page numbers. It facilitates ready location of topics in the report. The chapter headings may be typed in capital letters and be the subtitles in small letters. For a mode, see exhibit 12.5.

DEMOCRATIC CONTROL IN PRIMARY COOPERATIVES

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List of tables:-

This comes after the table of contents. It is presnted in the following format:

Table number The title of the table page.

All the tables may be numbered serially as 1,2,3,4 in one continuous series, or tables in each chapter may be given a separate serial order as 1.1, 1.2, 1.3 for tables in chapter 1;2, 1,2,2, 2.3, 2.4 for tables in chapter 2: and so on.

Body of the Report:-

After the prefatory items, the body of the report is presented. It is the major and main part of the report. It covers the formulation of the problem studied, methodology, findings and discussion and a summary of the findings and recommendations. In a comprehensive report the body of the report will consist of several chapters.

1 Introduction:-

This is the first chapter in the body of a research report, it is devoted for introducing the theoretical background of the problem, its definition and formulation. It may consist of the following sections.

(a) Theoretical background of the topic:- The first task is to introduce the background and the nature of the problem so as to place into a larger context to enable the reader to know its significance in a proper perspective. This section summarises the theory or conceptual frame work within which the problem has been investigated for example, the theoretical background in the thesis entitled, “A study of social responsibilities of large scale industrial units in India discuses; the nature of the India economy , the objective of India’s constitution to establish an egalitarian social order, the various approaches to the concept of social responsibility property rights approach trusteeship approach, legitimacy approach, social responsibility approach and their implications for industries in the Indian context. Within this conceptual framework, the problem was defined the objectives of the study were set up the concept of social responsibility was operationalised and the methodology of investigation was formulated.

(b) The statement of the problem:- In this section, why and how the problem was selected are stated the problem is clearly defined and its facets and significance are pointed out.

(c) Review of Literature:- This is an important part of the introductory chapter. It is devoted for making a brief review of previous studies on the problem and significant writings on the topic

under study. This review provides summary of the current state of knowledge in the area of investigation. Which aspects have been investigated, what research gaps exist and how the present study is an attempt to fill in that gap are highlighted. Thus the underlying purpose is to locate the present research in the existing body of research on the subject and to point out what it contributes to the subject.

(d) The scope of the present study:- The dimensions of the studying terms of the geographical area covered the designation of the population being studied and the level of generality of the study are specified.

(e) The objectives of the study:- The objectives of the study and the investigative questions relating to each of the objectives are presented.

(f) Hypotheses:- The specific hypotheses to bestested are stated. The sources of their formulation may be indicated.

(g) Definition of concepts:- The reader of a report is not equipped to understand the study unless he can know what concepts are used and how they are used. Therefore, the operational definitions of the key concept and variable's of the study are presented giving justifications for the definitions adopted. How those concepts were defined by earlier writers and how the definitions of the researcher were an improvement over earlier definitions may be explained.

(b) Models:- The models, if any, developed for depicting the relationships between variables under study are presented with a review of their theoretical or conceptual basis. The underlying assumptions are also stated.

2 The design of the study:-

This part of the report is devoted for the presentation of all the aspects of the methodology and their implementation viz. overall typology methods of data collection sample design data collection instruments, methods of data processing and plan of analysis much of his material is taken from the research proposal plan. The revisions, if any made in the initial design and the reasons therefore should be clearly stated. If pilot study was conducted before designing the main study the details of the pilot study and its outcome are reported. How the outcome of the pilot study was utilised for designing the final study is also pointed out.

The detail of the study's design should be so meticulously stated as to fully satisfy the criterion of replicability. That is a it should be possible for another researcher to reproduce the study and test its conclusions.

Technical details may be given in the appendix. Failure to furnish them could cost doubts on the design.

(a) Methodology:- In this section, the overall typology of research (i.e. experimental, survey, case study or action research) used, and the data collection methods (i.e. observation, interviewing or mailing) employed are described.

The sources of data the sampling plan and other aspects of the design may be presented under separate subheadings as described below.

(b) Sources of Date:- the sources from which the secondary and or primary data were gathered are stated in the case of primary data. The universe of the study and the unit of study are clearly defined. The limitations of the secondary data should be indicated.

(c) Sampling Plan:- The size of the universe from which the sample was drawn, the sampling methods adopted and the sample size and the process of sampling are described in this section. What were originally planned and what were actually achieved and the estimate of sampling error are to be given. These details are crucial for determining the limitations of generalisability of the findings.

(d) Data-collection Instruments:- The types of instruments used for data collection and their contents, scales and other devices used for measuring variables, and the procedure of establishing their validity and reliability are described in this section.

How the tools were pre-tested and finalised are also reported.

(e) Field work:- When and how the field work was conducted, and what problems and difficulties were faced during the field work are described under this sub-heading. The description of field experiences will provide valuable lessons for future researches in organising and conducting their field work.

(f) Data processing and analysis plan:- The method manual or mechanical adopted for data processing, and an account of methods used for data analysis and testing hypotheses must be outlined and justified. If common methods like chi-square test, correlation test and analysis of variance were used, it is sufficient to say such and such methods were used. If an unusual or complex method was used. It should be described in sufficient detail with the formula to enable the reader to understand it.

(g) An overview of the report:- The scheme of subsequent chapters is stated and the purpose of each of them is briefly

described in this section in order to give an overview of the presentation of the result of the study.

(h) Limitations of the study:- No research is free from limitations and weaknesses. These arise from methodological weaknesses, sampling, imperfections, non-responses, data inadequacies, measurement deficiencies and the like. Such limitations may vitiate the conclusions and their generalisability. Therefore, a careful statement of the limitations and weaknesses of the study should be made in order to enable the reader to judge the validity of the conclusions and the general worth of the study in the proper perspective. A frank statement of limitations is one of the hallmarks of an honest and competent researcher.

Summary Conclusions and Recommendations:-

The presentation on analysis and results is followed by a separate final chapter. This chapter is more extensive than the abstract give in the beginning of the report.

This chapter should be a self-contained summary of the whole report, containing a summary of essential background information, findings and inclusions and recommendations.

After a brief statement of the problem, the purpose of the study and the methodology used in the investigation the findings and conclusions are presented. This summary may be more or less a reproduction of the topical sentences of the various findings and conclusions presented in the main body.

TERMINAL ITEMS

Bibliography:-

This is the first of the terminal items presented at the end of the research report. The bibliography lists in alphabetical order all published and unpublished reference used by the writer in preparing the report. All books articles and reports and other documents may be presented in one common list in the alphabetical order of their authors alternatively bibliography may be classified into three or four sections: (a) books (b) articles (c) reports, and (d) other documents, and in each section relevant references may be arranged in alphabetical order.

15.10 QUESTIONS

1) What are the types of Report?

220

RESEARCH METHODOLOGY

Year 2010

N.B. 1) Attempt any two questions from each section.
2) Figures to the right indicate full marks.
3) Answer-books of both the sections should be tied together.
4) Give suitable illustrations wherever necessary.

Section – I

1. What do you mean Research Methodology? Explain the merits and demerits of Scientific Methods in Research.

2. A) What is the importance of hypothesis in research?

B) Discuss the characterstics of a good hypothesis.

3. What is meant by Sampling? Critically examine the various types of sampling techniques.

4. How can the appropriateness of a method of data collection be determined? State the various sources of collecting data.

Section – II

5. Explain the significance of data processing. Discuss the stages involved in data processing.

6. Evaluate the various statistical measures used in research study.

7. What are the various components of research report? Explain the various types of research reports.

B) What are the different types of Research Report?

8. Write critical notes on any two of the following :

a) Footnotes and Bibliography

b) Moving averages

c) Interpretation of data

221

RESEARCH METHODOLOGY
Year 2011

N.B. 1) Attempt any two questions from each section.
2) Answer-books of both sections to be tied together.
3) Give suitable illustrations wherever necessary.
4) Figures to the right indicate full marks.

Section – I

1. A) What do you mean by Research? Explain its significance.

B) "Interdisciplinary approach is necessary in Social / Commerce Science research", Discuss.

2. A) Examine the need for Research Design in research.

B) State the objective and procedure of diagnostic research design.

3. A) Explain Sample Design. What points should be consider while developing sample Design?

B) Discuss Sampling Techniques.

4. Explain in detail the various sources of collecting Primary and Secondary data.

Section – II

5. "Processing of research data implies Editing, Coding, Classification and Tabulation". Describe.

6. A) How interpretation is a fundamental component of research process?

B) Describe the precautions that the researcher should take while interpreting his findings.

7. A) What points will you keep in mind while preparing a Research Report?

B) What are the different types of Research Report?

8. Write short notes on (any two) :

a) Testing of Hypothesis.

b) Chi-square Test.

c) Measures of Central Tendency.

222

RESEARCH METHODOLOGY
Year 2012

N.B. 1) Attempt any two questions from each section.
2) Figures to the right indicate full marks.
3) Give suitable illustrations wherever necessary.

Section – I

1. Define Research. Explain the scope and limitations of the application of scientific methods in Social Science Research.

2. What is a research problem? Discuss the sources from which research problems are identifiex?

3. What is research design? Explain the various steps involved in formulating of research design.

4. Describe different methods of collecting data. Explain merits and demerits of observation method in collecting data.

Section – II

5. What is data processing? Discuss the various stages involved in data processing.

6. A) Define a research report and explain its purposes.

B) Why is a 'review of literature' included in a research report?

7. A) What is correlation? What are the various types of correlation?

B) What is time series? Explain its components.

8. Write short notes on **(any two) :**

a) Interpretation of data

b) Technical report.

c) Testing of hypothesis.

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M.Com. (Part - II)
Research Methodology
{April – 2016}

QP Code : 24456

(3 Hours) **[Total Marks : 100**

N.B. : (1) **Attempt** any **two** questions from each section.
(2) **Figures** to the **right** indicate **full** marks.
(3) Give suitable example wherever necessary.

Section - I

1. Define and explain the term 'research'. Explain the importance of research in business. Briefly explain the objectives of research. **25**

2. What is 'research methodology'? Explain the steps in scientific research process. Briefly explain about 'review of liteature'. **25**

3. What is hypothesis? Explain its importance and the types of hypothesis. **25**

4. Explain the significance of primary data. What are the limitations of primary data? Explain the types of questionnaire. **25**

Section -II

5. Explain in brief the stages in data processing. **25**

6. Briefly explain the significance of data processing. What are the problems associated with data processing? **25**

7. What do you mean by 'research report'? What is the importance of research report? Explain the characteristics of research report. **25**

8. Write short notes on **(any two)** of the following:- **25**
   1) Editing of data
   2) Footnotes and Bibliography
   3) Central Tendency

[TURN OVER

(मराठी रूपांतर)

सूचना : (१) खालील प्रत्येक विभागांपैकी कोणत्याही दोन प्रश्नाचे उत्तर दया.
(२) उजवीकडील अंक गुण दर्शवितात.
(३) योग्य उदाहरणे दया.

विभाग पहिला

१. संशोधनाची व्याख्या स्पष्ट करा. व्यवसायात संशोधनाचे महत्व स्पष्ट करा. संशोधनाचे उद्देश थोडक्यात स्पष्ट करा. २५

२. संशोधन पद्धतिशास्त्र म्हणजे काय? शास्त्रीय संशोधन पद्धतीच्या पायऱ्या स्पष्ट करा. साहित्य परीक्षण थोडक्यात स्पष्ट करा. २५

३. अनुमान म्हणजे काय? अनुमानाचे महत्व स्पष्ट करा. त्याचे प्रकार स्पष्ट करा. २५

४. प्राथमिक माहितीचे महत्व स्पष्ट करा. प्राथमिक माहितीच्या मर्यादा कोणत्या आहेत? प्रश्नांचे प्रकार स्पष्ट करा. २५

विभाग दुसरा

५. माहिती पद्धतीमधील पायऱ्या स्पष्ट करा. २५

६. माहिती पद्धतीचे महत्व स्पष्ट करा. माहिती पद्धतीशी संबंधित कोणते प्रश्न आहेत? २५

७. संशोधन अभिप्राय म्हणजे काय? संशोधन अभिप्रायाचे महत्व काय आहे? संशोधन अभिप्रायाची वैशिष्ट्ये स्पष्ट करा. २५

८. खाली दिलेल्यापैकी **कोणत्याही दोन** टिपा लिहा. २५
(अ) माहितीची अेडिट्रीग
(ब) फूटनोट्स आणि ग्रंथकोष
(क) मध्यवर्ती प्रवृत्ती
