

SOCIAL RESEARCH- INTRODUCTION

Unit Structure:

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1.0 OBJECTIVES

- To understand the historical methods which implies the use of research.
- To realize the scope of research and its relevance in social science.

1.1 INTRODUCTION

Research is an essential and powerful tool leading man towards progress. Without systematic research there would have been very little progress. John W. Best has rightly said “The secret of our cultural development has been research, pushing back the areas of ignorance by discovering new truths, which in turn, lead to better ways of doing things and better products.

Scientific research leads to progress in some field of life. New products, new facts, new concepts and new ways of doing

things are being found due to ever increasing significant research in the physical, the biological, the social and the psychological fields. Research today is no longer confined to the science laboratory. The manufacturers, the agricultural experts and the archeologists are carrying on research in their respective spheres, besides, the sociologists, anthropologists, economists and educationists.

1.2 DEFINITION OF RESEARCH

1. **C.C. Crawford** : “Research is simply a systematic and refined technique of thinking, employing specialized tools, instruments & procedures in order to obtain a more adequate solution of a problem than would be possible under ordinary means.”

It starts with a problem, collects data or facts, analyses these critically based decisions actual evidence. It evolves original work instead of mere exercise of personal opinion. It is quantitative, seeking to know not only what but much and measurement is therefore a central feature of it.

- 2) **Webster Dictionary** : “A careful inquiry or examination in seeking facts or principles, diligent investigation in order to ascertain something.”
- 3) **Francis Bacon**: “Research is a power of suspending judgement with patience of meditating with pleasures of asserting with caution, of correcting with readiness of arranging thought with scrupulous plan.

1.3 HISTORICAL CONTEXT OF RESEARCH

In modern times, a number of sociologists have made extensive historical studies of various social institutions. An eminent example of this type of study is Western mark’s “History of Marriage” in which the gradual evolution of the institution of marriage has been studied historically. The method of historical study in social sciences has had great impetus from Darwin’s studies of biological evolution. Another instance of social study being done on exclusively historical basis is oppenheimer’s “The State” in which it has been shown how the institution of state has developed in the course of human history. Many famous & influential social scientists have popularized the historical method of using it in their social studies, political & cultural development. Karl Marx, Max Weber, C.Wright Mills, Raymond Aron, to mention are a few of the stalwarts of Historical method.

What is historical context of research? The social scientists who have employed this method seem clearly to have been

influenced by Hegel's philosophy of history & Darwin's theory of biological evolution. The historical method is primarily concerned with the origin & development of social institutions & cultural forms & the progress of their evolution is charted. The historical method studies a particular institution in the background of entire human history. August Comte, Herbert Spencer & Hobhouse studied the same. Social institutions in the light of & in connection with other institutions, the entire history formed a background of their studies.

Some sociologists have vehemently opposed the extension of Herbert Spencer's methods. According to them the various treatises claiming to trace the origin & development of various social institutions were in fact no more than blind historical descriptions. As the theory of evolution was fashionable in the 18th & 19th C, every social scientist wished to base his studies on evolutionary basis & follow the pattern of simple to complex form as is the case with Darwin's theory of evolution. But this extension of biological methodology to social science is considered illegitimate by many modern sociologists. To follow the biological method of simple forms to complex forms blindly in social science tantamount to fill in material dyes already cast. This makes the study superficial & artificial still we cannot condemn the contribution of evolutionary method in social sciences.

The Bases of Historical context:

The historical method is based upon historical facts. These are collected from various sources. The first sources include those documents, relics & historical materials that are kept in archives & museums. Historians reach their conclusions by study of this material. Data about cultural history are provided by stone inscriptions, coins & articles obtained from excavations. Reliable observers provide reliable information about phenomena. Ancient books & relics have contributed towards understanding ancient society. Travelogues have proved helpful in understanding society.

1.3.1 Strength of Historical context of Research:

One can know with the help of historical method the circumstances in which a particular phenomenon or institution was possible. What was the nature of change in society? What were the reasons that caused them? How did the altered phenomenon change further? What were the reasons behind these changes? Thus one comes to know systematically about the altered conditions of an institution through a long period of time. It also shows how a particular institution attained its present form.

A scientific evaluation of the past may be given through this method. It helps in studying the rites & rituals, practices, ideals & values of traditional society. While attempting such evaluation, it is necessary to keep in mind the historical background. It is essential

to adopt an objective point of view otherwise the scholar may reach subjective conclusions. It is improper to evaluate an ancient society on the basis of modern values since values are created in the real condition of a society.

Historical context is helpful in the understanding of not only the past but also the present. It unravels the social values & relationships over which the present social values & relationships are moulded. One also comes to know the changes & the organizations which give society its present form. Society's past is responsible for its present. The historical method acquaints us with the special forces of the past responsible for the changes. Sociologists have special interest in change. Change in social conditions & social institutions leads to change in various social units & social organizations. Historical method proves very helpful in studying these changing forms.

1.3.2 Limitations of Historical context of Research:

However, historical method has its own limitations. In this method it is necessary to obtain reliable facts. But collecting reliable facts is a difficult task particularly where ancient books are concerned. Every country has an institution which hunts archeological relics on the national level. It is necessary to arrange these ancient books & facts in order. Computers provide scientific help in collecting & arranging data. Such material is available in large quantity in National Archives. The research worker however has to hunt other museums too.

Max Weber is the modern sociologist to make extensive use of historical method. Though critical of many Marxian principles, Weber follows the historical method in his study. He has appreciated Marx's emphasis on economic factor in history. As a matter of fact modern sociologists are not in favour of wholesale application of historical method & the study of institutions in the background of entire human history. They are however, not opposed to the study of particular institutions in their evolutionary aspect. Max Weber has studied capitalism, modern government & religions in the light of economic determinism i.e. he has tried to see the role of economic factors on these. For these studies of popular institutions it is essential to study them in connection with other institutions. The historical context of research has proved useful in the study of particular human institutions.

Sociological approaches also called sociological perspectives are the different stand points in terms of which a phenomenon may be studied. Society being a complex system there are always alternative ways in which Social Phenomenon could be observed and analysed. Every science develops such approaches. In order to study anything, one must begin by making

some assumptions about the nature of what is studied. So, for example, Scientists assume that the Universe is orderly and operates in certain regular ways which we may be able to discover, 'Such working set of assumptions is called a Perspective', an 'approach' or sometimes a 'paradigm'. The development of Sociology has also seen through several standpoints 'approaches' or 'perspectives' for sociological studies.

The Sociological perspective involves seeing through the outside appearances of people's actions and organizations. The major goal of this perspective is to identify underlying, recurring patterns of and influences on social behaviour. It also attempts to provide explanation for such patterns. It helps to understand in the proper place the standpoint from which sociological investigation is done and also the specific methodological directions.

It provides the angle from which sociological descriptions, explanations or even predications are made. The sociological perspective or approach determines what one finds. Interesting and significant about social phenomena or social life as a whole and also it speaks of the particular. Orientation of the social scientist in his investigation.

1.3.3 Perspectives in Social Research:

A. Weber's Methodology:

Max Weber tried to give a scientific complexion not only to the study of sociology, but also to sociology itself. He wanted the method of natural sciences and physical sciences to be applied to sociology.

He was of the view that human behaviour and that values themselves are changeable and therefore. It is not possible to adopt definite laws in regard to the study of the social sciences. He has tried to link social science with 'Understanding of meaning'. According to him, Sociology, studies the process of the development of man's life and is linked with action as well as understanding.

According to him, "Sociology is the science which attempts the interpretative understanding of social action in order thereby to arrive at a causal explanation of its cause and results.

Interpretative Understanding:

Sociology interprets situations or phenomenon as it is most important in sociology. This interpretation may be of the following two types:

- 1) Average types of interpretation; and
- 2) The pure type of interpretation

Weber's laws of the scientific study of sociology are based on two fundamental characteristics namely meaningful social action and rational interpretation of social action. He has defined sociology as a Science of understanding. In sociology actions or actives are guided by the motive and have a meaning. This is not the case with the natural sciences. In natural Sciences, we confine our study to events and their general interpretation while in sociology we go deep into the motives and rationale of the meaning or we indulge in interpretative understanding. Sociology tries to establish the synthesis between causal relations and understanding.

Weber has not recognized the group or society as a social unit. on the other hand he has recognized an individual as a social unit. This is an important aspect of his methodology.

According to him, analytical method should be applied for the study of social events. He has kept his methodology quite. Free from value judgements because he wanted to confine his study an 'what is' and not on 'what ought to be' and he was of the view that through comparative analytical and cause and effect methods only. Sociology could became a real science.

According to Weber ideal type is a specific name for general nomenclature of the social phenomenon or the social events. this is based on rational understanding and characteristics. This ideal type forms basis of his methodology. In fact this ideal type is an attempt at scientific explanation of the social phenomenon. Ideal type is not a general or abstract concept but they are such assumed ideal units which have a realistic acceptance. These are in fact qualitative social facts and standards that are chosen an a rational basis.

In order to interpret the social phenomenon he has used the 'comparative method' on the basis of the ideal types. He was of the view that the results that are acquired as a result of study of a particular human group apply only on that particular group and they should not be applied on other situations and groups. He said that in order to have proper study of the human behaviour a comparative study of various drives and instincts should be made. He has accepted probability as an important aspect of his methodology. According to this concept no principle can be absolute similarly he has said that no factor is society responsible for a particular or different social events on the other hand various social events and phenomenon are inter-dependent and therefore it is not proper to interpret every social events on the basis of predominance and one factor or one event.

B. Comte's Methodology:

Methods of Inquiry:

The methods of inquiry used by the natural sciences are observation, experimentation and comparison.

Observation:

Observation or use of the physical senses is a powerful method which can yield a wide and rich array of data. However in Comte's view mere observation will not be effective. It could be carried out effectively only when guided by theory. Comte states that but for the guidance of a preparatory theory the observer would not know what facts to look at even if he observes and collects facts without the guidance of a theory such facts can have no scientific meaning unless they are connected with some other facts by a preliminary theory.

Experimentation:

Experimentation is a widely practiced scientific procedure. But experimentation of a direct sort as done in natural sciences is not feasible in the study of social phenomena what effects are produced by a particular variable. Say for example natural disaster. Can be observed and recorded Comte may mean only this procedure. When he speaks of experiment in the context of social science. Since in the French language experiment often connotes controlled observation.

Comparison:

Comparison is a crucial Method in sociology. It performs the great service of casting out the spirit of absolutism Comte opines that as far as the social science is concerned fruitful comparison could be made between human and animal societies between co-existing Societies and between social classes in the same Society. However, he holds that central to social science is "The comparison of the different co-existing states of human society on the various parts of the earth's surface" because it would help us to trace the different stages of evolution. Though the human race as a whole has progressed in a single and uniform manner through what phases the development has passed is not known. By comparing the different co-existing states of human society particularly by comparing primitive societies the phases of development of the human race can be known.

Question of Search of Causes:

Comte strongly believes that with these three elements of inquiry positivism can cover that world of phenomena and help us know about it positivism or science does not attempt to go beyond the world of phenomena Comte admits that there exists an unknown even unknowable reality "He is" says Bridges. "Well

aware of the mystery that lay beyond the world of phenomena. He felt it at every step, as the sailor is aware of the unfathomable ocean across which he steers his path. But since it is not given to man to penetrate that mystery, he has to turn his activities to the region where they will bear fruit "According to Comte, there are certain things in the universe that remain mysterious and are for ever hid from us, for example, the ultimate source of gravitation, constitution of matter, origins of life first prompting of love. "The why and where of these things. We cannot know, enough for us to see something of the how of their working".

It is clear from the above statements of bridges that in the opinion of Comte, We can not an should not try to determine causes. Only what is observed and verified can be a reality. Mina should concentrate only on such a reality. As far as a phenomena is concerned its uniformities are a reality; they are observable on the basis of observation and classifications, we, can find out the uniformities and formulate the laws about their working. But the causes of these uniformities are not susceptible to observation and verification. If we claim to have determined the underlying causes of a phenomenon, it would be a mere speculation or "guess so Comte's positivism insists on the observation of uniformities and rejects the search of causes.

Comte claims that his positivism is neither atheistic nor, in any way, concerned with the supernatural "positivism is concerned with the rather than the fanciful, with useful knowledge rather than all knowledge, with facts that are certain to the degree that precision is possible. His concerned with precise knowledge rather than Vage impressions, with ever changing organic truth rather than the eternal varities, with the relative rather than the absolute.

The first and the greatest aim of positivism is to liberate human mind from the sphere of theological and metaphysical conceptions. That is why it emphasizes scientific approach to the world of phenomena in its perspective, what is observable is a reality. So the mind should concentrate only on those that are observable and verifiable.

C. Taylor's Methodology:

At the turn of the 20th C, Fedrick Winslow Taylor undertook researches in management of industry in the USA. Although he was not the pioneer in the study of management in a scientific way, none of his predecessors were engaged directly in the analysis of the work methods. Taylor believed that the principle "best management is a true science" is applicable to all kinds of human activities. Taylor attempted to bring the precision of science to the analysis & management of measurement of work. He wanted it to

be universally applicable to improve productivity by establishing a rationale for organizing work. Taylor's influence of management has been so profound that his methods are used in most countries. Therefore, he is generally regarded as the father of scientific management. The fundamental contribution of scientific management movement was the application of scientific method to discover new knowledge. It is the method of controlled experimentation, with well defined steps in proper sequence under controlled situation.

During the latter part of the 19th C a new industrial climate began to descend upon American business giving rise to the growth of managerial class. The practices of management began to change from a day-to-day problem solving approach to a more all inclusive, comprehensive, long-run approach to encounter multiple managerial problems which were not faced previously. Prominent leaders like Henry Towne, Henry Metcalf & F. Taylor tried to develop a unified system of management.

Taylor's work on 'Piece-Rate System' was considered as an outstanding contribution to the principles of wage payment. He proposed a new system consisting of four parts:

- a) Observation and analysis of work through time study to set the 'rate' of standard.
- b) a 'differential rate' system of piece work.
- c) Paying men & not positions.
- d) Management has to apply scientific methods of research & experiment to the management problem.

Taylor experienced bitter labour management conflict particularly between foreman & workers over the quantity of output. He failed to resolve the problems by persuasion & force. Realising that a new industrial scheme was essential to prevent encounters, he began searching for a science of work. In the process he conducted series of experiments for more than two decades. He experimented with machine tools, speed, metals, materials etc. His experiments at the Midvale & Bethlehem steel company led to the discovery of high speed steel & revolutionized the art of cutting metals. His work on 'art of cutting metals' was considered as the most remarkable piece of research ever presented at a conference. The paper was based on the longest & most exhaustive series of about 30,000 experiments conducted over a period of 26 years, at a cost of about \$ 2,00,000. The achievements of metal cutting experiments were considered more important than Taylor's other contributions, because they initiated a major break through in the development of American industry.

In his other experiments he studied through motion & time study & analysed how the workers handled materials, machines & tools & developed a coordinated system of shop management. Taylor set out to determine scientifically the ability of workers in dealing with experiments.

In the development of his shop system Taylor wished to know that under optimum conditions, how long a man or a machine would or should take to perform a given task, in a specified process, using specified materials & methods. He used scientific fact-finding methods to determine empirically the right ways to perform tasks with the help of stop watch. This enabled to find out the need to recruit night man for the right job.

1.4 SCOPE OF SOCIAL RESEARCH

To the question “what is the scope of social research?” one may reply “of what use is a new born child?” in the manner of Benjamin Franklin who replied thus, when asked about the utility of his findings about the relationship between thunder clouds & electricity. This means that new knowledge is like a new-born baby, it holds great potential of growth & maturity.

From the foregoing discussion it is amply clear that social research as a scientific tool to study & analyze social problems has immense value. It studies them in a purely scientific spirit i.e. with a view to understand their structure. A social scientist records & collects significant facts & figures of social problems & this in turn makes possible correct generalizations about them. The basic scope of social research is to understand sooner or later but correctly the nature of social events & processes & though this is done without any motive of particular reforms the conclusions cannot be ruled out. In brief, following are the scope of social research.

1. Knowledge Building:

Generalizations drawn have a certain effect on the established corpus of knowledge. A general proposition having been established as an outcome of research may extend the bounds of knowledge existing at a point in time. It may, if it does not fit a certain body of existing knowledge in the sense of not arguing well with the expectations that can be legitimately drawn from it, exert pressure on the scientist to bring about certain amendments or modifications in this body of knowledge in view of the discordant note struck by this new general proposition. Contrarily, if the generalization fits the established corpus of knowledge, it lends added credence to it.

It will be in order to elaborate at some length the points made above. The role of general propositions in enlarging or extending systematic knowledge may take various forms. It is thus that a new set of facts is brought within the grasp of the established corpus of knowledge in a meaningful way. In consequence, the bounds of knowledge get enlarged not just quantitatively but also qualitatively. Eg. A general conception of “relative deprivation” may serve as a useful means for examining the relation between rise in wages & productive efficiency of worker.

Another way in which a general conception may enlarge systematic knowledge is by bringing to light the seeming inconsistencies in the existing corpus of knowledge & attempting to reconcile these. Eg. The findings of studies on the effects of “authoritarian” & “democratic” classroom atmospheres on learning & not seen to be consistent. A new general conception in the nature of a research finding helps us to reconcile these findings by pointing that whatever the classroom atmosphere, the important thing is the extent to which the teacher behaves according to the expectations of the students.

Yet another way in which a new general conception extends knowledge & attempting to point out certain gaps in the existing corpus of knowledge & bridge these gaps. The general conception or finding emanating from research may have another impact on the established body of knowledge i.e. correcting the errors in it. If the new general proposition derived through manipulation of things, concepts or symbols is discordant with what one would expect logically on the basis of the existing body of knowledge or theory, the only alternative is to effect corrections or modifications in the original theory in the light of new evidence.

Thus the new statements of generality emanating as research outcomes serves as scales for verification of the existing system of knowledge is only repeating the obvious. As has been noted research involves testing to find out whether the empirical observations presented as general statements are in accord with the predictions that may be made on the basis of the existing body of knowledge. If such is not the case, the system needs to be revised or even rejected. An important aspect of scientific activity is verification of conclusions which have found place in the established system of knowledge.

2. Study of Social Problem:

Where there is knowledge, ignorance cannot exist. The best way of removing superstitions, blind beliefs etc. is to transplant true knowledge in their stead. Eg. Before the intensive social research came into crime the social causes of crime were not realized & people thought that propensity to crime was inherited. But now all

this has changed. Thanks to social research, we no longer divide people into criminal & non-criminal tribes. We know what are the social surroundings which encourage criminal tendencies in man. J.C. Merriam has very aptly observed- Much of the difficulty we encounter today is due to ignorance. The cure for these situations is new knowledge.

The scourge of ignorance is one greatest block to social progress. It breeds superstitions & blind faith in traditions, it keeps orthodoxy alive. By unraveling the intricate & complex phenomenon of popular beliefs, social research enables us to attack vigorously the citadels of orthodoxy & stop its growth. Gradually new knowledge seeps in popular mind & thus superstitions become diluted & ultimately removed. The key to the solution of social problems is their accurate & unbiased analysis & thereby to understand the causal factors responsible for them. The analysis of an untrained observer is not dispassionate & precise. Only a social scientist is competent to undertake this task. Social scientists have successfully analyzed the problems of regionalism, casteism, linguism, communalism etc.

3. Theory making and policy making:

The extended, corrected & verified knowledge may be put to two possible uses:

a) Theoretical b) Practical

Knowledge thus acquired may be used for constructing theoretic models. In other words, knowledge may be organized into propositions & these propositions may then be meaningfully articulated to form a more abstract conceptual system affording estimations about a class of thing or phenomena governed by a specified set of conditions. Such use of knowledge is often labelled as theory-oriented & the activities of a scientist who seeks knowledge for the sake of building theories of 'non-utilitarian' import are often known as 'pure' 'basic' or 'theoretical' research. Knowledge for the sake of knowledge i.e. only for the satisfaction of 'knowing' is the attitude that underlies scientific activity of this order.

The researches which seek knowledge will be used mainly for policy making which can be used to solve various problems confronted by our society. They may serve some practical ends which are often called 'applied' 'action-oriented' or 'practice-oriented'. We shall be considering this aspect in greater details when an action oriented research has to be taken up. One should not consider these two orientations as comprising a perfect dichotomy. There is nothing as practical as a good theory & that endeavours to solve practical problems have many a time given birth to theories i.e. practice is quite often "blessing for the development of theory". Theory helps us to identify gaps in our

knowledge & seek to bridge them with institutive, impressionistic or extensional generalizations.

Laws propogate when they are united in a theory. As Karl Jespers said 'It is only when using methodologically classified sciences that we know what we know & what we do not know. This way, theory constitutes a crucially important guide to designing of fruitful research.

1.5 SUMMARY

Research is considered to be the more formal, systematic, intensive process of carrying on the scientific methods of analysis. It involves a more systematic structure of investigation, usually resulting in some sort of formal record of procedures & report of result or conclusion.

It is also the activity of collecting information is an orderly & systematic fashion. Research is literally speaking, a kind of human behaviour, an activity in which people engage. In education, teachers, administrators, scholars or others engage in educational research when they systematically assemble information about schools, school children, the social matrix in which a school system is determined, the characteristics of the learner or the interaction between the school & pupils.

1.6 CHECK YOUR PROGRESS

1. What do you mean by research?

2. Explain the historical context of research.

3. State the scope of research in the study of a social problem.

1.7 REFERENCES

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1.8 QUESTIONS

1. Define research. Explain the strength and limitations of historical context of research.
2. Explain the basis of historical context of research in social science.
3. Discuss the scope of research in:
 - a) Knowledge building.
 - b) Theory Building & Policy Method.



SURVEY APPROACH

Unit Structure :

- 2.0 Objectives
- 2.1 Introduction
- 2.2 Meaning and Definition
- 2.3 Aims of Social Survey
- 2.4 Types of Survey
- 2.5 Methods of study
- 2.6 Advantages
- 2.7 Disadvantages
- 2.8 Summary
- 2.9 Check your progress
- 2.10 References
- 2.11 Questions

2.0 OBJECTIVES :

- To understand the term survey as a means for collection of data or information.
- To study survey as a process by which quantitative facts are collected.
- To familiarise the students with the organisation of survey is a important form of data collection.

2.1 INTRODUCTION :

The word survey has been derived from the word 'Sur' and 'Veeir' which mean 'over' and 'see' respectively. Literally survey means something taken from a high place but it has come to be used as a term with specific purpose of its own. In other words the term Survey is used for method of investigation by direct observation of a phenomina or getting information theory interview or questionnaire thus the term survey is not applicable to direct contact but also to the other means says for collection of data or information.

2.2 MEANING AND DEFINITION :

The Survey is defined as fact finding study dealing chiefly with working class poverty and this the nature in the problem of community. Heriman N Morse defines it as “a method of analysis in Scientific and orderly form for defined purpose of a given social situation activities.” According to Mark Abrams “a social survey is a process by which quantitative facts are collected about the social aspect of community composition and activities from the above definition.

It may be drawn the characteristic feature of a social survey. It is a story of immediate and burning problem of the social and constructive programme of social research for removing the social evils the scope of its limited and localized geographically. And it may form the basis of for further social research on the matter. In brief, the social survey is designed to investigate some course relationship of the some aspect of human life. A social survey is to perceive with the aims given below.

2.3 AIMS OF SOCIAL SURVEY :

- 1) As we know that the survey will become a basis for further investigation. Supply of information to needs one is its main objective. The needy one may be an institution or individual thus survey is utilitarian in nature and meant to provide information regarding the practical problems of the society. A researcher of himself may carry on survey but there are some agencies that carry survey for other.
- 2) Survey describes the phenomena to a social scientist a survey may have descriptive as a way of studying social condition, relationship and behaviour for example survey communities. Socio economic survey describes the living condition of people of a geographical area. The description would be accurate as well as complete if we became to face with it. Further the purpose of the social survey is to get information and it is not meant to test an hypothesis but simply describe the things therefore survey may be started without any hypothesis the description of data. So collected may serve as a basis for hypothesis later on.
- 3) Alongside of the description, the social survey explains the determinants for the state affairs may be so specific and purposive. Social survey has intensive usage and is widely used in a number of disciplines. In social sciences it can be used for variety of purpose availability of nature of the source of

information is the main and source of undertaking a survey. Broadly the subject matter of social surveys are divided into

- 1) Demographic Features
- 2) Social conditions
- 3) Opinion and attitudes

Demographic features come under the purview of organisation and working of family regarding such information as household composition, marital status are family planning programmes etc. the social conditions to which people are subjective this includes occupation, incomes, a housing amenities many of social action as conditioned by the social condition i.e. Social environment in which people live. So social condition are helpful to get the following information and there upon to establish the casual relationship to study the family relation. One would require information on the location the extent of relationship with elders etc. a survey of deliquenets would in complete unless. Following knowledge of their homes and family environment is available.

Social activities such as expenditure pattern, radio listening newspaper reading social mobility information for example to know the expenditure putter of a group of family house. It requires to the survey or following knowledge on expenditure habit say, expenditure towards family, clothing, education, cigarettes, cinema and other.

Opinion attitude service, includes information regarding opinion and attitudes of the people toward various factor and the motives and the expenditure of them this information may be necessary as the basis of nature of question that may safety be asked for electing rich response. For eg. The opinion or attitude person toward social economic political, incident survey.

2.4 TYPES OF SURVEY :

- a) General or Specific Survey
- b) Regular and Adhoe Survey
- c) Preliminary and final survey and
- d) Census and sample survey

The general survey concerns with collecting general information about population institution or phenomena with out any specific object or hypothesis. The types of survey are mostly taken by the government for providing regular data on may socio economic problems. A good example for this surveys is census of

population once in a decade. Any it is termed as specific survey information collected through the specific survey is general of very little outside the problem under study. For example, marketing survey on a particular issue, say people, attitude about the use of television.

Regular survey is survey of regular intervals. To this permanent machinery for collecting information is to be set up. Many of such surveys are mainly economic surveys. For example, a study of family budget can be cited as example. Another example is the rural credit survey of the Reserve Bank of India which collects data regarding the rural conditions annually.

Adhoc Survey is undertaken for all it may be conducted in phases if the area of investigation a large. Because of completion of survey in phases due to its largeness, it never initials as regular or repetitive survey. A preliminary survey is one which is to be undertaken well in advance to get the hand knowledge of the universe to be surveyed. Further, it helps the survey or to get acquaint himself with the nature of the problem so that he can be able to get the rich response. After conducting the preliminary survey only, the construction of schedule or questionnaire may be taken into picture. And it also guides the way of planning as well as organizing survey on proper lines. The preliminary survey may also be called 'pilot study'. A pilot study is one which is to be conducted well before taking a detailed study about the main work. After the pilot study has been completed from the final survey is made.

Every unit in the universe is to be contacted and data collected from it called census survey while a few units of the universe covered it refers to sample survey. Planning of a social survey : the quality of survey results to be considerable degree on the preparation made before the survey is conducted so planning a survey is paramount importance in social sciences. The surveyors has to give careful and conductive though out the planning of a survey. Planning of social research programme must for its successful execution part on remarked that only be carefully planning the survey from start to finish can reliance be place upon results and in many cases will the finding ever rich the publication stage therefore it is pertinent to think twice properly at the planning of a social survey with regards to the following points. Scope of the survey : next to the purpose of survey, scope of it is important step regarding to the type of information, subject matter, geographical area. For instance, an enquiry may reliable to India or a particular style or an industrial level town or a particular industry in particular location the small coverage of the survey the less represent purpose the survey however, will determine the scope of the survey. Apart from the object of enquiry availability of time and availability of resources are exert great influence on scope.

2.5 METHOD OF STUDY :

The method of study : in selecting a particular method for a survey. The surveyor should take the consideration of its suitability and has own knowledge of it.

Unit of data collection and the unit or units of universe must be clearly defined for the purpose of an enquiry before taking the task of collection information. However, defining the units is not as simple as it appear to be for eg. to study the size of a mill we have different oriteria of measuring the size of a small such as capital employed number of employees production etc. for efficient collection of information the unit of data collection should have the characteristic which are as under.

- a) the purpose of enquiry being studied to the unit.
- b) the unit should be specific.
- c) the unit should be stable in character.
- d) the unit should be uniform though out the report.

Sources of Data :

After the purpose, scope and methodology have been defined clearly and properly the investigator has to plan about the sources of data the sources of daily may be either primarily or secondary. Either the two devices or only one device to be used in the investigator may be depended upon the objective and purpose of the survey quite often in social sciences investigation both may be used mode of data collection of social phenomena is very complex and influence by a number of variables. Therefore, it is essential to decide hand what type of information is to be collected adopting the questionnaire or schedule.

Organisation :

Organisation of survey is very much important from the point of getting quantitative as well as qualitative data. A number of field worker may be require and training must be given to them if necessary. Arrangement with regarding and supervision should be made to avoid giving to them if necessary. Arrangement with regard to checking and supervision should be made so as to avoid giving false information. Editing and coding if needed have to be undertaken following it classification and analysis of data has to be carried out. All this organisation work should be pre planned.

Report :

After the data have been classified and analysed the next of a survey is to be drafting the report to whom it meant determines the style of presenting the port.

In a survey utmost case and continuousness at each phase of the activity is to be given poor plan or poor work in one phase may be in survey exerting else in done well.

It is noted that social survey and social research is identical in nature in many respects social phenomena is the area of the investigation use in similar the other point which is identified in respect of social survey and social research is both are independent and are influence by each other. However, there are some fundamental differences existed between them which are as under :

2.6 ADVANTAGES :

The following advantages have with the survey method in compensation to other methods they are :

- 1) The surveyor comes in contact with the people whom he wants study. And with this he can observe things personally with relatives and there upon his inferences are not based upon any other theory or dogma till upon the fact of the life.
- 2) The survey method leads is greater objectivity many field worker use in the survey remove possible faios and collect correct information like the operation of law of interia. Because of having the merit with the survey method which has been used for testing the validity of the undertaking the more work.
- 3) Survey may very well lead to the introduction of new theory for example poverty was regarded as the course of crime for fairly long time till increasing crime in advanced countries have falsified this theory.
- 4) Survey method enables to have fill knowledge of social institution. The actual experiance with the situations amounts none to any amount of investigation.

2.7 DISADVANTAGES :

- 1) For carrying the survey field workers are to be recruited and training is to be given to them. All this need for money.
- 2) It prolonged and time censuring process.
- 3) The reliabilityn and validity of the data collected through survey is not always without doubt, honesty and efficiency of the field worker's the co-operation of the respondents the suitability of schedule etc. paramount for collecting valuable data. But all these requirement are very seldom and the data collected may obtain invalid data.
- 4) Survey is conducted on sample basis and therefore it is subject of the sampling error.

2.8 SUMMARY :

A social survey in its broadest sense, has a reference to a first hand investigation analysis and co-ordination of economic, sociological and other related aspects of a selected community group. A survey may be undertaken with the primary purpose of a selected community or group. A survey may be undertaken with the primary purpose of formulating a programme for amelioration of the conditions of life and work of a community or a group, implying some frame in the mind of the survey or as to what the conditions ideally ought to be. The purpose of a social survey may also be to provide scientifically gathered facts or materials affording some empirical basis for the social theorist to set up their conclusions.

2.9 CHECK YOUR PROGRESS :

- 1) What do you mean by Survey?
- 2) Discuss aims of Survey Method.
- 3) Explain various types of survey method.
- 4) Highlight advantages of survey.
- 5) Analyse disadvantages of survey.

2.10 REFERENCES :

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- 3) Bryman A; Quantity and Quality in Social Science Research, London Routledge 1988.
- 4) Dillon W. R. and Goldstein M. : Multivariate Analysis Methods and Applications, New York, John Wiley and Sons 1984.

2.11 QUESTIONS :

- 1) Discuss survey method and highlight advantages and disadvantages of survey.
- 2) What do you mean by survey method? Explain advantages and disadvantages of survey method.



HISTORICAL APPROACH

Unit structure:

- 3.0 Objectives
- 3.1 Introduction
- 3.2 Meaning
- 3.3 Purpose of Historical research
- 3.4 Characteristics of Historical research
- 3.5 Approaches to the study of history
- 3.6 Steps in historical research
- 3.7 Sources of historical data
- 3.8 Problems and weakness
- 3.9 Summary
- 3.10 Check your progress
- 3.11 References
- 3.12 Questions

3.0 OBJECTIVES

- To understand the students meaning of historical approach its purposes ad characteristics, scope and approaches to the study of research.
- To familaise students with the steps of historical research and its importance to understand the research.
- To make students aware with the weaknesses to be avoided in historical research.

3.1 INTRODUCTION

History usually refers simply to an account of the past of human societies. It is the study of what “can be known (to the historian). Through the surviving record”. Gottschalk referred to this as history as record. He further stated that “The process of critically examining and analyzing the records and survivals of the part is.. called “Historical method. The imaginative reconstruction of the past from the data derived by that process is called “historiography”.

3.2 MEANING

Historical research has been defined as the systematic and objective location, evaluation and synthesis of evidence in order to establish facts and draw conclusions about past events. It involves a critical inquiry of a previous age with the aim of reconstructing a faithful representation of the past. In historical research, the investigator studies documents and other sources that contain facts concerning the research there with the objective of achieving better understanding of present policies, practices, problems and institutions. An attempt is made to exclusively past events or predicts future events. Historical research is a type of analytical research. Its common methodological characteristics include i) identifying a research topic that addresses past events. ii) review of primary and secondary data, iii) systematic collection and objective evaluation of data related to past occurrences with the help of techniques of criticism for historical searches and evaluation of the introduction and iv) synthesis and explanation of findings in order to test hypotheses concerning causal effect or trends of these events. Historical studies attempt to provide information and understanding past. Historical techniques and guidelines by which historians use historical sources and other evidence to research and then to write the history.

3.3 THE PURPOSE OF HISTORICAL RESEARCH

Conducting historical research Researcher must serve several purposes as follows.

- It enables researcher to find out solutions to contemporary problems which have their roots in the past i.e. it serves the purpose of bringing about reforms in society. The work of a historical researcher sometimes sensitizes researcher to unjust or continued into present and require reform. A historical researcher studies the past with a detached perspective without any ego involvement with the past practices. Hence it could be easier for researcher to identify the misguided practices thus establishing them to bring about reforms.
- It throws light on present trends and can help in predicting future trends if we understand how an individual or a group of researchers acted in the past we can predict how they will act in future. Similarly studying the past enables a researcher to understand the factors causing present trends. In order to make such future predictions reliable and trustworthy the historical research needs to identify and clearly describe

in which way the past differs from the present context and how the present social, economic and political situation and policies could have been an important impact on the present and the future.

- It enables a researcher to re-evaluate data in relation to selected hypothesis theories and generalization that are presently held about the past.
- It emphasizes and analyzes the relative importance and the effect of the various interactions in the prevailing cultures.
- It enables us to understand how and why educational theories and practices developed.

3.4 CHARACTERISTIC OF HISTORICAL RESEARCH:

These are as follows:

- It is not a mere accumulation of facts and data or a mere record of past events.
- It is a living vibrant report of past events which involves an analysis and explanation of these occurrences with the objective of capturing the nuances, personalities and ideas that influenced these events.
- Conducting historical research involves the process of collecting and reading the research material collected and writing the manuscript from the data collected. The researcher often goes back and forth between collecting, reading and writing. In the process of data collection and analysis, these two activities are not two distinct phases of research.
- It deals with the discovery of data that already exists and does not involve the creation of data using structured tools.
- It is analytical in that it uses logical induction.
- It has a variety of foci such as issues, events, movements and concepts.
- It records and evaluates the accomplishments of individual agencies and institutions.

3.5 APPROACHES TO THE STUDY OF HISTORY

According to Monaghan and Hanuman there are four major approaches to the study of the past.

- **Qualitative Approach:** This is what most lay persons think of as history. The search for a story inferred from arrange of written or printed evidence. The resultant history is organized chronologically and presented as a factual tale: a tale as a person who created reading text book. Such as biography and William. Homes Mc Geofley. (Sullivan 1944) on the lindley murray family. (Monagham 1998) in the Western context the sources of the qualitative history range from manuscripts such as account book, school records, margin illa, letters, diaries and memories to imprints such as text book, children's books, journals, and other books of the period under consideration.
- **Quantities Approach :** Here rather than relying on "history by quotation" as the former approach has been negatively called researcher intentionally look for evidence that lends itself to being counted and that is therefore presumed to have superior validity and generalisability. Researcher have sought to estimate the popularity of a particular textbook by tabulating the numbers printed, based on copyright records. The assumption is that broader question such as relationship between education and political system in India or between textbooks and their influence on children can thus be addressed more authoratively.
- **Content analysis :** Here the text itself is the focus of examination. This approach uses published works as its data (in the case of history of textbook these might be readers or examples of the content of school textbook in. successive edition) and subject them to careful analysis that usually includes both quantitative and qualitative aspect content analysis has been particularly useful in investigating construct such as race caste etc.
- **Oral History:** Qualitative, quantitative and content approaches use written or printed text as their database. In contrast the fourth approaches, oral history, turns to living memory. For instance, oral historians interested in women's education could ask their respondent about their early experience and efforts in women's education.

- These four approaches are not of course, mutually exclusive indeed historian's avail themselves of as many of these as their question, topic, and time period permit. This integration is possible because the nature of historical research at across a variety of all approaches all of which commence with the recognition study may be quantitative in nature, qualitative in nature or a combination of the approaches.

Its purpose can be mainly descriptive aiming to understand some specific development in a particular period of time in a particular culture, or it could be explanatory, trying to test accept / reject widely held assumptions.

A historical investigation is conducted with objectivity and the desire to minimize bias, distortion and prejudice. Thus, it is similar to descriptive method of research and this aspect. Besides, it aims at describing all aspects of the particular situation under study (or all that is describe) in it's for the truth. Thus, it is comprehensive in nature and is similar to the interactive approach. Though it is not empirical in nature (does not collect data through direct observation or experimentation), it does make use of reports call the available written and / or and material) it definitely qualifies to be a scientific activity. This is because it requires scholarship to synthesis of evidence so as to arrive at conclusions on other words historical research is scientific in nature.

Moreover, many competent researcher in other type's empirical review the related literature so as to find out period researcher and theoretical work done on a particular topic. This requires study journals, bodies encyclopedias run published these and so on this so followed by interpretation of their significance.

These steps all common to historical research i.e. Som extent, every researcher makes use of the historical method in his/her research.

However, it should be mentioned have that historical researcher of education "discovers" already existing data from a wide range of historical sources such as documents, relies, autobiographies, diaries or photographs. On the other hand, in other types of educational studies, the researcher" creates data through observations, measurement through texts and experimentation. To this extent historical research differs from descriptive and experimental researches.

3.6 STEPS IN HISTORICAL RESEARCH

The essential steps involved in conducting a historical research as follows:

- Identify a topic / subject and define the problems / questions to be investigated.
- Research for sources of data.
- Evaluate the historical sources.
- Analyze, synthesize and summarize interpreting the data information.
- Write research report.

Since most historical studies are largely qualitative in nature, the search of sources of data, evaluating, analyzing, synthesizing and summarizing information & interpreting the findings may not always be discrete, separate sequential steps i.e. the sequence of steps in historical research is flexible.

Beach has classified the problems that prompt historical inquiry into five types:

- Current social issues are the most popular source of historical problems in education e.g. Rural education, adult and continuing education, positive discrimination in education etc.
- Histories of specific individual, histories of specific education institutions and histories of educational movement. These studies are often conducted with “the simple desire to acquire knowledge about previously phenomena.”
- A historical study of interpreting ideas or events that previously had seem unrelated for the example, history of educational financing and history of aim of education in India may be unrelated. But a person reviewing these two researches separately may detect some relationship between two histories and design study to understand this relationship.
- A historical study aimed by synthesizing old data or merges them with new historical facts discovered by the researcher.
- A historical inquiry involving reinterpretation of next event that have been studied by other historical researches. These is known as revisionist history.

On the other hand, in order to identify a significant research problem, Gottschalk recommends that four questions should be asked.

- i) Where do the events take place?
- ii) Who are the persons involved?
- iii) When do the events occur?
- iv) What kind of human activity are involved?

The scope of the study can be determined on the basis of the extent of emphasis placed on the four questions identified by Gottschalk i.e. the geographical area included. The number of persons involved, the time span included and the number and kinds of human activities involved often, the exact scope and delimitation of a study is decided by a researcher only after the relevant material has been obtained the selection of a topic in historical research depends on several personal factors of the researcher. i.e. researcher ability, ability to interpret historical facts and so on. If the problem selected involves understanding in event, on institution a person, a past period, more clearly, it should be taken up for a research. The topic related should be defined in terms of the types of written materials and other resources available to you.

This should be followed by formulating a specific and testable hypothesis of a series of research questions, if required. This will provide a clear focus and direction to data collection, analysis and interpretation i.e. it provides a structure to the study.

According to Boug, without hypotheses, historical research often becomes little more than an aimless gathering of facts.

Search of sources of Data:

Historical research is not empirical in that it does not include direct observation of events or persons. Here, the researcher interprets past events on the basis of traces they have left the uses the evidence of past acts and thoughts. Thus, through he/she does not use his/her own observation but another person's observation the researcher's job has to do with the truthfulness of the reports of other people's observations these observations are obtained from several sources of historical data not as now try to discuss various sources of historical data

3.7 SOURCES OF HISTORICAL DATA

These sources are broadly classified into 2 types:

a) Primary Sources: Gottschalk defines a primary data source as “the testimony of any eye writers by any other of the sencer, out of a mechanical device like the Dictaphone that is, of one who was present at the events of which he tells a primary source must thus have been produced by a contemporary of the events it nauates.” In other words primary sources are tangible materials that provide a description of an historical event and were produced shortly after the event happened. They have a direct physical relationship to the event being studied examples of primary sources include new paper report, letters, public document, court decisions, personal diaries, autobiographies, artifacts and eye witness’s verba accounts. The primary sources of data can be divided into two broad categories as follows.

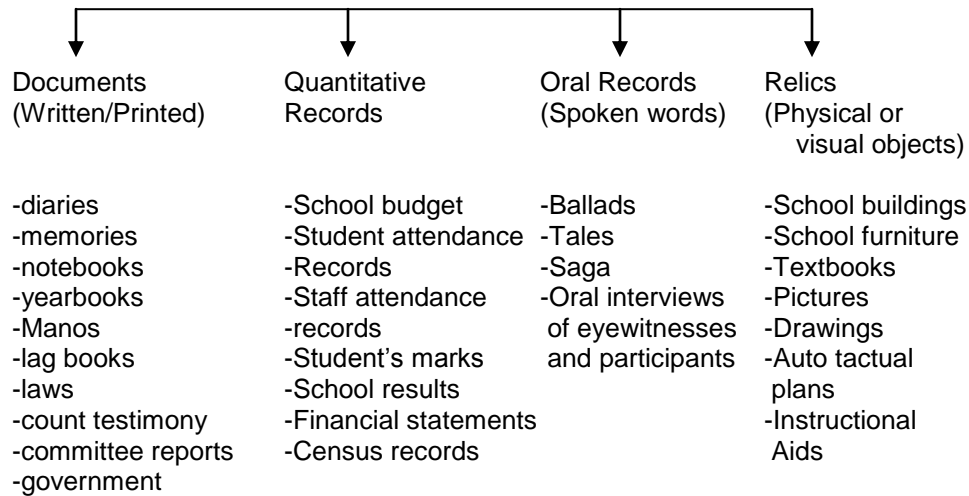
i) The remains or relics of given historical period. These could include photographs, corves skeletons, fossils tools, weopens, utensils furniture, buildings and pieces of out & culture object d’ out. Though these were not originally meant for transmitting information to future generations. They would prove very useful sources in providing reliable and sound evidence about the past, a last of these relics provide non-verbal information.

ii) Those objects that have a direct physical relationship with the events being reconstructed. This includes documents such as laws, files, letters, manuscripts, government resolutions, characters, memoranda, wills, news papers, magazines, journals, files, government or other official publications, maps, charts, loy-books, catalogues, research reports, record of minutes of meetings recording inscription, transcriptions and so on.

b) Secondary Sources: A secondary source is one in which the eyewitness or the participant i.e. the person describing the event was not actually present but who obtained his/her descriptions or narrations fromarushes person or source. This another person may or may not be a primary source. Secondary sources, thus, do not have a direct physical relationship with the event being studies. They include data which are not original example of secondary sources include text books, biographies, encydopedias, reference books, replicas of out objects and paintarings and so on. It is possible that secondary sources contain eroes due to passing of information from one source to another. These enous could get multiplied when the information passes through many sources there by resulting in an euor of great magnitude in the final data. Thus, wherever possible, the researcher should try to use primary sources of data. however, that does not reduce the value of secondary sources.

In conclusion, the various sources of historical information both primary and secondary con be summarized as follows:

Sources of Historical Information



It must be mentioned here that the branch of historical research using all or some types of our records is known as oral history.

It should also be mentioned here that some object can be classified as documents or relics depending on how they are used in historical study. For example, in a research study on how a historical figure (a politician or freedom fighter or social reformer) is presented in textbooks of different periods, the textbooks of different periods will be classified as documents as the emphasis here is on analyzing its content matter given in verbal form.

Searching for Historical Data:

The procedure of searching for historical data should be systematic and pre-planned. The researcher should know what information he needs so as to identify important sources of data and provide a direction to his research for relevant data. Using his knowledge, imagination and resourcefulness. This will help him to identify the kinds of rewards he requires and whom he should interview? Since a historical research is mainly qualitative in nature, all the primary and secondary sources cannot be identified in advance. It is possible that as one collects some data, analyses and interprets it, the need for a further interpretive framework. This will enable him to identify other primary or secondary sources of data.

However, it is not possible for a historical researcher to examine all the material available selecting the best sources of data is important in historical study. In a historical study the complete "population" of available data can never be obtained or known one what it represents and what if fails to represent should be considered. The researcher needs to identify and use a sample that should be representative enough for wider generalization.

3.8 PROBLEM AND WEAKNESS

Some of the weakness, problems and mistakes that need to be avoided in a historical research are as follows.

- 1) The problem of research should not to be too broad.
- 2) It should be selected after ensuring that sources of data are existent, accessible and in a language known as the researcher.
- 3) Excessive use of easy to find secondary sources of data should be avoided. Though locating primary sources of data time consuming and requires efforts they are usually more trustworthy.
- 4) Adequate internal and external criticism of sources of historical data is very essential for establishing the authority and validity of the data. It is also necessary to ascertain whether statement concerning evidence one participant have influenced opinion of other participant witness.
- 5) The researcher needs to be aware of his / her own personal values interest and biases for this purpose it is necessary for the researcher to quote statements along with the context the context show's the intention of persuading the readers. The researcher also need to avoid both extreme generosity or administration as well also needs to avoid both extreme generosity or administration as well as extreme criticism. The researcher needs to avoid reliance on beliefs such as "old is gold" "new is always better" or "change implies progress". All such beliefs indicate researcher bias and personal values.
- 6) The researcher needs to ensure that the concept borrowed from other discipline are relevant to his / her topic.
- 7) He / she should avoid unwarranted casual references arising accounting of
 - a) Over simplification (causes of historical event may be multiple, complex and interactive.

- b) Faculty interpretation of meaning of words.
- c) Inability to distinguish between facts opinion and situation.
- d) Inability to identify and discard irrelevant or unimportant facts and
- 8) Faculty generalization based on inadequate evidence, faculty logic and reasoning in the analysis of dates use of wrong analogy and faculty comparison of events in unsimilar cultures.
- 9) The report should be written in a logical and scientific manner it should avoid flowery or flippant language emotional words dull and colourless language or persuasive style.
- 10)The researcher should avoid projecting current problems onto historical events as this is likely to create distortions.

CRITERIA OF EVALUATING HISTORICAL RESEARCH:

Mouly has provided the following criteria of evaluating historical research.

- 1) Problem : Has the problem been clearly defined? It is difficult enough to conduct historical research adequately without adding to the confusion by starting out with the nebulous problem. Is the problem capable of solution? It is with the competence of the investigator.
- 2) Data : Are data of a primary nature available in sufficient completeness to provide a solution or there has been a over independence on secondary or unfavorable sources.
- 3) Analysis : Has the dependability of the data been adequately established. Has the relevance of the data been adequately explored?
- 4) Interpretation : Does the author display adequate mastery of this data and insight into their relative significance? Does the display adequate historical perspective? Does he maintain his objective evidence? Are the hypothesis is plausible? Have they been adequately tested? Does he take a sufficiently broad view of the total situation? does he see the relationship between his data and historical facts.
- 5) Presentation : Does the style of writing attract as well as inform? Does the report make a contribution on the basis of newly discovered data of new interpretation or is simply uninspired back work? Does it reflect scholarliness.

3.9 SUMMARY :

In historical search perceptions are individualized and selective, if eye witness are competent and truthful, they could record different descriptions of the events they witnessed or experienced.

3.10 CHECK YOUR PROGRESS :

- 1) What care will you take to avoid weakness in conducting historical research?
- 2) State the criteria of evaluating historical research.

3.11 REFERENCES :

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3.12 QUESTIONS :

- 1) Explain Historical approach and highlight steps involved in historical research.
- 2) What do you mean by historical approach and discuss problems and weakness of historical approach.



OBJECTIVITY AND ETHICAL NEUTRALITY

Unit Structure :

- 4.0 Objectives
- 4.1 Introduction
- 4.2 Approaches in objectivity and ethical neutrality
- 4.3 Objectivity in research methodology
- 4.4 Value orientation in research
- 4.5 Connection between value and science
- 4.6 Ethical consideration in research
- 4.7 Ethical issues relating to the respondents
- 4.8 Summary
- 4.9 Check your progress
- 4.10 References
- 4.11 Questions

4.0 OBJECTIVES :

- To enable students to develop an ability to examine evidence without any bias or prejudice.
- To familiarize students with the concept of objectivity and ethical neutrality in research.

4.1 INTRODUCTION :

The problem of objectivity in Social Research is an important consideration. Objectivity in Social research refers to impartiality in research in social research. The researcher studies people who are living and thinking through his interaction. The researcher may become a person involved with the people, he has studied such involvement would make the study unscientific and biased. Therefore the researcher needs to remain detached from the object of the study maintaining objectivity while concluding research is crucial in any scientific investigation.

Besides maintaining objectivity, the social sciences must also remain ethically neutral i.e. the researchers must not allow his personal feelings of likes and dislikes idea of right or wrong to either into his investigation. He must remain neutral while studying the social phenomena as it exist same society. Personnel phenomena as it exist same society personnel prejudices and biases must be avoided in the collection and analysis of data objectivity may approached in 2 ways.

4.2 APPROACHES IN OBJECTIVITY :

- 1) We may ask in general terms what effects the general circumstances of social enquiry are likely to have an objectivity of the scientist crossing it.
- 2) We can start with social theories and ask what influences might have contributed to there expectance and generalized these.

Though it is necessary for the Social Science to maintain objectivity it is not easy. The failure to maintain objectivity in research is often attributed to the simple fact that the researcher is also a social being who activity participate in social life. Therefore, it may be difficult for him to completely detach himself from the social environment of which he is a part this social behaviour is contract around the inter relationships with other people sometimes he may be emotionally involved giving rised to prejudice or biased in such cases maintaining objective is not easy for the Social researcher.

4.3 OBJECTIVITY IN SOCIAL RESEARCH :

There are certain basic pre-requirements with the researcher has to allow. They include the use of relevant concept, piscations based on probability a commitment to objectivity, value and ethical consideration objectivity value orientation and ethical consideration in social research there are variety of arguments which are put forward.

Though it has been argued that social scientist are necessarily have less objectivity than the natural scientist. This is because the subject matter of social sciences itself contributes as a major obstacles for the researcher to maintain an objective outlook. By objectivity or an objectivity outlook we man impartially. Being objective outlook. By objectivity or an objective outlook we mean impartially. Being objective is infect an aspect of knowing the reality it also involves two other consideration, namely logic i.e. the correct method of dealing with any question of epistemology i.e. the question of how we know anything.

There is another significant aspect related to objectivity than the natural scientist. This is because. According to this it is not just the subject matter is difficult to understood objectively but we also have take into the fact that the social researcher himself is a human being living in societies having certain social attitudes value, beliefs and introst participating in a particular way of life the problem of rank objectivity i.e. emotional detachment arises from the fact that social scientist may not always be in a position to consciously detach himself from the area of problem that he is studying the attitudes and values are usually accepted as well which provide a complete and adequate view point of the researcher with such an assumption. The researcher ran these attitudes and values to prejudge the social situation that he is studying.

It is argued that to achieve objectivity in social research is a difficult especially when the inquiry prevents the social scientist to approach the problem objective manner.

According to the critics of the objectivity in social research, there are certain influences which prevent the Social Scientist to have an objective perspective. They are as follows.

- 1) Personal Motives : One's personal motives does affect beliefs adversely which may lead the researcher to adopt these beliefs without considering any evidence or may also lead him to make a defective of the evidence.
- 2) Custom : Sometimes it is customary to think in a particular way which may affect or prevent the researcher to develop objectivity.
- 3) Social Situation : The social scientist himself is a part. According to the critics a social, person social situation give rise to certain interest which lead to biases and prejudices and this creates and adverse effect on objectivity.

Thus there are the influences which prevent the social research from taking a complete account of evidence that they have. However, it is important to know whether this influence can really prevent objectivity thus to conclusion the failure of objectivity is often because of the simple fact that the social scientist as a social being is participating in Social affair which makes it possible for him to so complete detachment towards his own attitudes and value and to maintain an impartial look this is the general assumption of critics.

However, there are counter argument put in favour of social research which are as follows.

- 1) It can be argued that no researcher is detached from the subject matter from the social environment because of the influence of interest emotion which are centered around this interaction with other people. However, it is not always necessary that these interest and emitters will give rise to biases and prejudice it is noted that it possible for the social research to maintain a realistic or an positive approach in situations which demands such a view point. They can not after the court of events according to their own linking or beliefs.
- 2) It is considered that the Social research scientist lack a sense of detachment from the Social environment because of the influence of interest emotion which are centered around their interrelations with other people. However, it is not always necessary that these interest and emitters will give biases and prejudice. It is noted that it is possible for the social research to maintain realistic or an positive approach in situation which demand a view point they can not after the course of event according to their own liking and beliefs.
- 3) Social prejudices and custom based on beliefs have their own Survivor these social prejudices do not always have a negative aspect. In other words they definitely have some advantage in than an irrational faith may serve as an energizer providing the necessary encouragement to the researcher to study only particular aspect where as an unbiased faith may provide discouragement which result in failure.
- 4) It should be kept in mind that sometimes a researcher view about a particular theory may coincide with his interest and motives this does not mean necessarily mean that the theories and has put forward are not based a proper consideration of evidence is wrong or incorrect to assume that the researcher views on theories have to be interest motives which will prove his objectivity.

Thus from the discussion above it can be concluded that objectivity is a complex aspect and it can not be measured directly through a reliable source the social research has to take a great amount of care to maintain an objective approach and to prove his objectivity.

4.4 VALUE ORIENTATION IN RESEARCH :

The relationship between science and value is a complex relationship. The work of science is not persuatic but rather a

demonstration that given certain condition events automatically follows.

Persuasion may be systematic. It may be make use of scientific findings. However, fundamentally different from demonstration.

The function of persuasion is to continue that something is right goods, proper or desirable on the other hand demonstration aims morely at stating that a particular relationship exist regardless to its rightness or beauty. It means that science is devoid of values and judgement.

In any scientific research, researcher must be careful about certain ethical values scientific obligation revolves around appropriate position of personnel value. The question believe the social behavioural scientists is what position should be taken should the researcher be concerned only about his scientific investigation. Again should the scientific approach be moral or should the research concern itself with social values & morality. The central flows of this debates is whether the social sciences can be free from values & ethical considerations. It is possible to make social sciences independent of values & ideology. In this sense social research posses special problems for the researcher. Any observation of one set of human beings by another includes values that one important in all human activity.

Social scientist like pioneer suggest that social science can be objective independent for values & ideology other scholars like Mannhein believed that on social research & scatological thinking is found to be effective by social & cultural values of the researches & the group that he is studying.

Gray in 1968 wrote a paper, "value free sociology" Gray angues that values. The suggest that the works Max Weber & distinction is made between fact & statement of value.

However in Weber's classic works the prostent ethic & of ethic & spirit of capitalism is an example of the values of sociologists entering into the study similarly Dankeim's classic work suicide is not value free Cooley's study of primary groups Veblens study of Conspicuous insure are all example of value commitment of social scientist.

Gray concludes the value face of Social Scientist is not really possible while grounder attempts to explode the myth of a value free sociology.

If value free sociology is not possible then can be researcher judge the people he is studying the issues make it important for the researcher to know that he has no authority to judge another such problems as racial ethic & communal rights are studied by various sociologists in such research & investigation who is to judge? Is an obvious question.

Sociologist like more Durkheim , Weber Baer, Emile Durkheim studied the scientific problems during their times Similarly studying racial, conflict a communal conflict violence in the present times need to be any different what is important in use science methodology in the research study.

He suggest that if the social researcher takes an attitude of neutrality then he accepting the existing value system. This posture is there forced on of irresponsibility the man judgement of a considered of values. Cannot be avoided in any social research infact the very selection of a problem has value co-nation. The debt of argument for a against value free approach in social sciences are apposed to value free position & which other are infavour of it.

4.5 VALUES AND SOCIAL SCIENCE :

Sciences of values thus are different from each other. However a total separation between the two is impossible infact is the study of the sociologist to analyze the through understanding of relationship between values of science. Before analyzing this relationship several other connection between values of science can be noted of which some are of more significance.

- 1) Problem of all concern to the science is cursed by the destructives which is because of some of the applicants of modern society. As question can be asked as to what is the moral responsibility of the scientist in today's world scientist of all branches have indicated their awareness of this problem. It is significant to note that special organisation concerning this problem have also been setup. This problem basically refers to the use of science rather than the method of science.
- 2) The interaction between value & science is of particular interest to sociologist. There are a 2 aspects involved or related to this interaction.
 - a) Much of the subject matter of sociology is values, therefore, it becomes necessary to investigate how this fact may possibly interfere with the application of scientific method to sociology.

b) The moral involvement of the social scientist with his subject matter may result in certain biases & prejudice. It can happen that the social scientist may bias his results favour of his own values. "This value also play an important role in social science as composed to the physical science."

These above mentioned points indicate that science & values are interrelated & it is necessary to develop a need of systematically analyses this relationship value judgement play an important role in social science data. It is mainly because of the fact that values are major determinants of human behaviour & therefore it is difficult to keep them apart. The social scientists who studies the values of his own coller is infect the receiver of the same value system. It therefore is difficult for him to stop these value from interfering with his scientific work. The situation becomes more complex when the social scientist is not only investigating confiding values. In such a case, he value system out of the conflicting value system.

The role of science is to search for facts or knowledge which is precise & accurate. In other words, science aims at finding the ultimate truth or reality. In this process, it may put forward facts which run opposite to an existing value. This is because there are certain values which are based on superstitious defiles or prrational thoughts, science goes on destroying such values.

Thus with the help of a background of value systems science seeks to find out the validity of certain beliefs & practices in the society when values themselves are used as data for interpretation the resultant is verification of the value system itself.

Research in social sciences involves study of people, their behaviour in their social cultural concert the researcher has a moral obligation to the people he is studying when the social researcher adopts unethical strategies, it may disturb the functions of the social scientist various association have formulated ethical code of conduct for their member. This proves that the researcher need to maintain certain moral values while conduction their studies. "However this is not easy as a number of issue are involved".

4.6 ETHICAL CONSIDERATION IN SOCIAL RESEARCH:

Ethics are an important part of any research activity though ethics are different form sciences & are closely related to values they still play a significant role.

Ethical issue of Research Sponsorship:

Many research studies are funded by the research bodies Research (ICSSR) University grants commission (UGC) government departments (GD) & other voluntary & financial institutions when financial is in the form of research grant three research initiates is taken by the researcher itself. In such cases, the researcher has ample freedom to conduct his study & accomplish the results.

When the research study is sponsored by an organisation, the organer decides the nature of work to be done & the conditions relating to the use of the result of the study such constructed research contract has its main aim, the objective of the organisation, therefore the researcher has no freedom & several restrictions are imposed on them. The ethical question's before the researcher is whether the researcher imposed upon him by the financing body.

An another important ethical contradiction in Social Science Research is the access to data Social Science Research requires collection of data from documents, records or from the employees. In such cases, the permission form head of institutions has to be taken various ethical isseus before the researcher use:

- 1) Should the nature of research & its objective be discussed with the head of the institutions while taking permission.
- 2) Should the name of the institutions where the data is collected to keep anonymous.
- 3) Should the individual responce identity be anonymous.
- 4) Should be the results & the finding of study be may available to the institutions.

It is difficult to provide an answer to these questions. It is for the researcher to decide how to handle these ethical isseus.

In sciences, the basic value is the faith that "It is better to known that not to known." It means knowledge must be actively sought. This value tat is seeking of knowledge is further extended to state that it is important to spread knowledge since knowledge is believed to be better than ignorance not only for the scientific but for ordinary people as well-the findings of science must be made public. It means these findings are not be kept as secrets but rather must be spread freely among all the people. This is one important feature of ethical consideration. The students cannot keep knowledge only for himself or consider it to be his private property. He has to share knowledge within his society. Gaining knowledge is a important value for the scientist this automatically puts forwards

the assumption that those factors which acts as obstacles in the process of achieving knowledge are undeniable. Such factors bring about a risk in the proper access to knowledge. One such important danger is the personal involvement of the scientist in his results. The scientists must always be ready to give up his own ideas if the evidence is contradicting his ideas. Any scientific who fails to follow this ethics will come under severe criticism. Hence, scientist are trained in such a way so that they behave in accordance with this ethic.

Absolute honesty is another important ethic. The scientist cannot & should not distort the facts to suit his own consideration. This essentially means that honesty is the important precondition for any research. The acceptance of this kind of honesty requires that the scientist must admit his error when he is wrong because truth is the highest value as compared to the scientist own reputation.

The scientific invention and discoveries have helped in acquainting a vast amount of knowledge which is used for human progress & development a same invention & discoveries have positive as well as negative aspects can be given about the use of radiative isothermally for the reduction of certain discussion of how every this isotopes can also be used to produce an atomic bomb or the more destructive hydrogen bomb. Thus science give poser but is ethical consideration which decides the direction of these power either in an positive way or negative way.

Ethical consideration becomes important in social science. This is because social sciences deal with human behaviour, it is therefore not possible to manipulate human behaviour. A social scientist cannot conduct all types of experiment. On human subject he has to take into account the needs the emotions of the human beings. In other words, he has to follow certain ethics which will keep the dignity & respect of human beings.

Thus, a social scientist has to take up a complex responsibility. On one hand, he has to maintain objectivity, reliability & validity of his research. An on the other hand, he also cannot discard value & ethical consideration.

4.7 ETHICAL ISSUES RELATING TO THE RESPONDENCE:

The ethical issues concerning the response are the most important one the response form the subject of the research study. They are also individual & people at the sometime they provide data. Some of the major ethical issues are:

1) Sometimes the respondent are not aware about the research project. They participate in it without knowledge or consent. Some times studies of rural communities or among tribes are conducted without the knowledge or consent of the people. The researchers fear what if they are total about the research then their response may not be natural.

In some cases, the employers meet direct the employees to cooperate with the research project & other times incentive & rewards may be offered to the response to participate into research. Ethically such coercion must be avoided & the respondent must have freedom to decide whether to participate in research or not.

2) In some research, the consent of the response may be obtained without informing them about the objectives of the research. Such concealment is ethically.

3) Sometimes the research may give incorrect information about the research proposal these by receiving the response.

4) If the research wants to study human value he may create a situation where the respondent may be forced to cheat or lie. The ethical question is whether the researcher can expose his responses to such moral reception.

5) Through this study the researcher may expose the response to mental & physical stress with a view of study their reaction can the researcher expose response to stressful situation.

6) Research study may center on private & personal information such as marital life, religious faith etc. such studies are an invasion on the privacy of an individual.

7) The researcher may promise to keep the information a secret but by publishing the results of the study through & reports his confidence is violate.

Ethical Dilemma:

Its only in the social sciences, the researcher is faced with these ethical issues. When the researcher is faced & as well as used questionable practices like delite, it is best for the researcher to terminate his study. It would mean sacrificing the research study for ethical values.

However, in the large interest of knowledge, it is messed for the researcher to be cautious & to strike a balance between the requirements of his study & the moral values, he needs to paradise

as a researcher it is necessary for the researcher to avoid unethical practice or device codes of ethics which he must maintain.

4.8 SUMMARY

There is no reliable direct measures of objectivity in social science research. Yet, it is wrong to conclude that there is a general failure of objectivity among social scientist & hence their enquires as futile or worthless. It is necessary to look at the problem of objectivity as an issue of scientific bias which is not necessarily dependent on a researcher individually or opinions. Thus, bias may arise out of larger & varied experience of researchers & the fact that they please the scientific truth above their personal interest or convictions or conveniences. Inflects such as scientific bias alone can help in building owthetic knowledge which can provide a link between theory & action. It would lead to controversy & criticism as Karl person remarks criticism is the very life blood of science.

4.9 CHECK YOUR PROGRESS :

- 1) What is objectivity in research can it be achieved in social science research.
- 2) Write in detail, the objectivity in social science research.
- 3) Explain the importance of value-orientation & ethical consideration is social science research.

4.10 REFERENCES :

- 1) Borwankar P.V.: Research Methodology, Seth Publishers: 1995.
- 2) Pavline V. Young: Scientific Social Surveys & Research, Prentic, Hall of India Private Ltd., 1984.
- 3) Ghosh B.N: Scientific method & Social Research, Sterling Publishers Pvt. Ltd., 1982.

4.11 QUESTIONS :

- 1) What do you mean by objectivity?
- 2) Discuss approaches in objectivity.
- 3) How value and science are related to one another?
- 4) Analyse ethical consideration in research.



EXPLORATORY OR FORMULATIVE RESEARCH

Unit Structure:

- 5.0 Objectives
- 5.1 Introduction & Meaning
- 5.2 Levels of exploratory studies
- 5.3 Meaning of descriptive research
- 5.4 Usefulness and limitations
- 5.5 Summary
- 5.6 Check your progress
- 5.7 References
- 5.8 Questions

5.0 OBJECTIVES

- To provide students an understanding of scientific method.
- To acquaint students with research design in social science.

5.1 INTRODUCTION & 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 the form of a pilot study.

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.

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 avoid 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 as definite information as possible for a set of research objectives.

5.2 LEVELS OF EXPLORATORY STUDIES

Katz conceptualizes two levels of exploratory studies. “At the first level is the discovery of the significant variables in the situation; at the second, the discovery of relationship between variables.”

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. Researches 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 into the problems for the purpose of formulating them for more precise investigation. Hence, it is also known as formulative research.

The Steps in Exploration

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

- a) A review of pertinent literature
- b) An experience survey
- c) An analysis of ‘insight stimulating’ cases.

Literature survey: A study of related and pertinent books, articles and reports turns up a number of leads clues for further investigation that will advance the research. A workable hypothesis may be formulated; important variables 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 researcher 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, an 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 who provide 'insight-stimulating' information could include the following:

1. New comers to the scene.
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 isolates in a group who hold a different view from the majority.

5. 'Pure' cases or cases that should be extreme examples 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.

5.3 DESCRIPTIVE RESEARCH

Meaning:

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

Criteria:

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."

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. Exhaustiveness is achieved when all the important elements are identified. 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 Study:

A descriptive study identifies relevant variables but does not aim at testing hypothesis. On the other hand, an 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 approximates 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.

5.4 USEFULNESS AND LIMITATIONS:

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."
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 is 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.

Diagnostic Study:

Meaning:

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

Purpose:

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

Requirements

Both descriptive and diagnostic studies share common requirements, viz., prior knowledge of the problem, its thorough 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 than is required in an exploratory study. Moreover, the amount of work involved is considerable and so concern with economy of research effort is extremely important.

5.5 SUMMARY

Though these two types of studies have in common emphasis on the specific characteristics of given phenomenon, they differ from each other in some respects. First, a diagnostic study is more directly concerned with causal relationships and with implications for action than 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.

5.6 CHECK YOUR PROGRESS

- 1) Explain levels involved in descriptive research.
- 2) What are the advantages and disadvantages of descriptive research?
- 3) Discuss meaning of descriptive research.

5.7 REFERENCES

- 1) Borwankar P.V. – Research Methodology Seth Publisher 1995.
- 2) Ghosh B.N. Scientific Method and Social Research – 1982.

5.8 QUESTIONS

- 1) Write short note on descriptive research.
- 2) Explain in your own words exploratory research.



ACTION RESEARCH

Unit Structure:

- 6.0 Objectives
- 6.1 Meaning
- 6.2 Typologies of Action Research
- 6.3 Evaluation in Action Research
- 6.4 Experimental Research Design
- 6.5 Quas Experimental Design
- 6.6 Summary
- 6.7 Check your progress
- 6.8 References
- 6.9 Questions

6.0 OBJECTIVES

- To familiarize students with knowledge of research design.
- To enable students to understand action research programme to solve situational problem.

6.1 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 worth while 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.

6.2 TYPOLOGIES OF ACTION RESEARCH:

Prospero R. Covar categorizes action research into 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 researcher 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 hypothesis 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, personal contact with both husband and 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 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 recorded what happens under specified conditions. They may vary the conditions if they want.

6.3 EVALUATION IN ACTION RESEARCH:

Action research always has an evaluative component. As an action programme is designed to bring about some change, an action research usually studies the following questions as proposed by Hinkle:

1. What is it that has changed?
2. How much has it changed (extent)?
3. How quickly has it changed (rate)?
4. What were the conditions before and after the change?
5. What were the stimuli that induced change?
6. What occurred during the transition?
7. Through what mechanisms did change occur?
8. What brought stabilization at a particular point in change?
9. Can directionality be observed in the change?

These questions indicate the problem areas, which can be the focus of evaluation. They are:

- a) Impact of the programme on intended recipients.
- b) Extent of the programmes effect on the intended recipients.
- c) Time involved in bringing about the impact of effects.
- d) Before-after measures of the variables, which are supposed to undergo change.
- e) Identification of the events and processes that took place between the before-and-after measures.
- f) Analysis of the subject matter or content of the programme.
- g) Organizational, structural and operational aspects of the programme.
- h) Factors in the change introduced.
- i) Direction of the changes observed relative to the objectives of the programme.

The Phases in the Action Research

The different phases in the action research are:

- 1) a baseline survey of the pre-action situation;
- 2) a feasibility study of the proposed action programme;
- 3) planning and launching the programme;
- 4) concurrent evaluation of the programme;
- 5) Making modifications and changes in the programme and its method of implementation in the light of the research finding; and
- 6) Final evaluation, if the programme is tom-bound.

The success of the action research depends on the cooperation of action implementing people and the beneficiaries of the action programme.

The Action Research Model developed and adopted by Akhilesh and Ganguly in their study on organizational development through participation and communication programme (1980) provides a good illustration for action research. This model embodies six major steps:

(1) Diagnosis, (2) sharing of diagnostic information, (3) planning: developing change programme, (4) initiation of organizational change, (5) implementation of participation and communication process, and (6) post-experimental evaluation. This action research attempted to solve the actual problems in the work situation in a large public sector organisation at Bangalore through participation and communication programme. This research was mostly successful in bridging the perceived gap between the system practiced and the system desired and demonstrated the efficacy of the action research as an effective approach to organization development.

6.4 EXPERIMENTAL RESEARCH DESIGN

Introduction and Meaning:

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.

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, maturing 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 form of causal hypothesis. A closely controlled procedure is adopted to test them. The testing of the hypothesis is described in detail 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 stimatulus. Control group is not exposed tot eh experimental variable. the difference between the experimental and control groups outcome is attributed to the effect of the experimental variable.

Illustration:

An agricultural scientist desires to study the impact of application of a particular chemical fertilizer (say urea) on the yield of a crop.

He selects two identical plots of land in a farm. All conditions – soil fertility, climate, irrigation, seed, cultural practice – are the same. Thus, all variables are kept constant.

In the experimental plot alone, he applied chemical fertilizer. This is the only variation between the two plots. Hence the difference in yield is attributable to the application of the chemical fertilizer.

In some cases, a single group may be used as both control and experimental group. For example, a cooperative extension worker wants to know the effect of a member-education programme on the cooperative knowledge of the members of a cooperative. He

selects a cross section of members of a society at random. He measures the type and extent of cooperative knowledge of the group. He then expose them to a member-education programme. He again measures their knowledge. The difference in knowledge can be attributed to the programme.

Conditions

From an analysis of the above procedure, the conditions required for an experimental study may be identified. They are:

1. It should be possible for selecting exactly identical groups. This possibility exists in physical and natural sciences, but not so in social sciences, which deal with human life. It is difficult to find exactly identical groups of persons. We may get approximately similar groups only.
2. The target groups should be amenable for experimentation. This is ensured in physical sciences. But human beings may not always be willing to be subject to experimentation.
3. It should be possible to identify all the independent variables that affect the dependent variables under study. This again is ensured in physical sciences, but not in social phenomena, as our knowledge of human mind and behaviour is limited.
4. It should be possible to keep non-experimental variables constant so as to study the effect of experimental variables on the phenomenon. Such close controls over the subject variables are possible in laboratory experimentation. But they are almost impossible in human life situations, which are dynamic and complex. Thus, strictly controlled experimentation is rarely feasible with human beings.

6.5 QUASI - EXPERIMENTAL DESIGNS

The relationships studied by scientists, according to Rosenberg, may be classified into following kinds:

1. Stimulus-response relationship:

It is characterized by an independent specific external variable with a dependent variable being a particular response to it, e.g., relationships between reward and satisfaction; between advertisement and consumption patterns.

2. One shot case study:

This involves an observation of a single group at one point in time, usually subsequent to an event supposed to have produced change, e.g., a study of a rural community after a rural

development programme; study of a political system after a general election.

This is a study of only what exists at the time of study; therefore, it has no control over extrinsic and intrinsic factors. Besides, it does not allow for manipulation of the independent variable or for before after or control experimental group comparison. Further, a case study analyses a single unsampled system, it is weak on generalization as well. It has also no checks on internal validity and thus is of little use in testing causal relations. However, this study is useful in exploratory research.

3. Cross-section study (or correlation design):

This is the most predominant design employed in survey research. It is an attempt to approximate the after only control group design by using cross tabulations and statistical techniques like correlation and multi variate analysis. (see Chapter 11, Statistical Analysis, below)

A sample of individuals is drawn and data relating to their background characteristics and dependent variables under study are collected from them. For example, to test a hypothesis: “the birth rates vary inversely with socio-economic status.” Data may be collected from a sample of families belonging to various socio-economic levels; the relations between variables may be studied by using correlation technique. The important limitation of this analysis is that the time order of direction of causation cannot be easily determined.

4. Ex-post-facto-design:

This is a variation of the correlational design. It provides a partial solution to the time order problem. This is retrospective or after-the-event study. It looks from the past to the present.

It requires information about the past by asking retrospective questions regarding an earlier period. For example, an investigator desiring to assess the effect of a family planning publicity programme on the attitude of women could ask them about their present views as well as about their views before their exposure to the publicity programme. The drawback of this approach is the bias arising out of respondent’s memory distortions. A partial solution is to introduce checks for detecting gross inaccuracies in the memory of respondents.

6.6 SUMMARY:

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 rigorous requirements of measurement and analysis, and design approximated to the model of an experimental design.

6.7 CHECK YOUR PROGRESS :

- 1) How to evaluate action research?
- 2) Highlight typologies involved in action research.
- 3) Discuss experimental design.
- 4) Highlight various types of action/Design.

6.8 REFERENCES :

- 1) Borwankar P.V. – Research Methodology Seth Publisher 1995.
- 2) Ghosh B.N. Scientific Method and Social Research – 1982.

6.9 QUESTIONS :

Write short notes on:

- 1) Action Research / Experimental Research.



QUESTIONNAIRE

Unit Structure

- 7.0 Objectives
- 7.1 Introduction and Meaning
- 7.2 Objectives of Questionnaire
- 7.3 Advantages of Questionnaire
- 7.4 Disadvantages of Questionnaire
- 7.5 Techniques of constructing a Questionnaire
- 7.6 Summary
- 7.7 Check your Problems
- 7.8 References
- 7.9 Questions

7.0 OBJECTIVES

- 1) To make students aware about the teelines , uses and importance of the Questionnaire method as a tool of data collection.
- 2) To Tamilaise students to understand Questionnaire method as scientific method to collect reliable method for collection of data.

7.1 INTRODUCTION AND MEANING

Questionnaire is one of the important toals of data collection. It is defined as “A list of questions given to a human of persons for them to answer. It secures standardized result that can be tabulated and tested statistically. (Bogandus – Sociology) “A questionnaire refers to a device for securing answers to questions by using a form which the respondent fills in himself. (Goode Half-Methods of social Research) Questionnaire is a set of questions. Generally it is mailed to the respondents of collecting data. It is employed when the area of study is wide and the subjects are widely dispersed. In this method the researcher does not collect the data by himself. He relies on the information provided by the respondents.

7.2 OBJECTIVES AND TYPES OF QUESTIONNAIRE

There are two basic objectives of Questionnaire :

- 1) To collect information from the respondents who are scattered in wide area.

- 2) To achieve success in collecting reliable and dependable information.

Types of Questionnaire :

a) Structured Questionnaire :-

This questionnaire is named before the study is started and it is not possible to change it offer beginning the study.

b) Non Structured Questionnaire :-

This kind of Questionnaire is used more like a guide. It consists of definite subject matter areas, the coverage of which is required during the process of data collection. It is generally used in the technique of interview in which case it is called an interview schedule.

Questionnaire is also divided on the basis of nature of the questions that it contains. They are closed, open, pictorial and mixed. Closed questionnaire usually contains itemized answers to the questions being asked various alternatives to the real answer are also given. The respondent is only to select the answer and put it down.

Open Questionnaire is just the reverse of the closed questionnaire. It is used in the cases where new facts are to be found out. The respondent is given the liberty to express his views freely.

Pictorial questionnaire is similar to closed types of questionnaire. Generally it is use for children of small age group on illiterates on person with lower. I.Q. Along with the questions, pictures showing the meanings of those questions one given. The respondent is required to give out the answers on the basis of pictures.

Mixed questionnaire is neither completely closed non open. It consist of both the type of questions. Since it is combination of the types of the questions it is popular in social research.

7.3 ADVANTAGES OF QUESTIONNAIRE :-

Questionnaires are very cost effective when compared to face interviews. This is especially true for studies involving large sample size and large geographic areas. Written questionnaire become even more cost effective as the number of research questionnaire increases.

Questionnaires are easy to analyze. Data entry and tabulation for nearly all surveys can be easily done with many computer software packages.

Questionnaires are familiar to most people. Nearly everyone has had some experience completing questionnaires and they generally do not make people apprehensive.

Questionnaires reduce bias. There is uniform question presentation and no middleman bias. The researcher's own opinion will not influence the respondent to answer questions in a certain manner. There are no verbal or visual clues that influence the respondent.

Questionnaires are less intrusive than telephone or face-to-face surveys. When a respondent receives a questionnaire in the mail, he is free to complete the questionnaire on his own time-table. Unlike other research methods, the respondent is not interrupted by the research instrument.

7.4 DISADVANTAGES OF QUESTIONNAIRE :-

One major disadvantage of written questionnaire is the possibility of low response rates. Low response is the curse of statistical analysis. It can dramatically lower one's confidence in the results. Response rates vary widely from one questionnaire to another (10%-10%), however, well-designed studies consistently produce high response rates.

Another disadvantage of questionnaire is the inability to probe responses. Questionnaires are structured instruments. They allow little flexibility to the respondent with respect to response format. In essence, they often lose the "Flavor of the response (i.e. : respondents often want to qualify their answers). By allowing frequent space for comments, the researcher can partially overcome this disadvantage. Comments are among the most helpful of all the information on the questionnaire, and they usually provide insightful information that would have otherwise been lost.

Nearly ninety percent of all communication is visual. Gestures and other visual cues are not available with written questionnaires. The lack of personal contact can have different effects depending on the type of information being requested. A questionnaire requesting factual information will probably not be affected by the lack of personal contact. A questionnaire probing sensitive issues on attitudes may be severely affected.

When returned questionnaires arrive in the mail, it's natural to assume that the respondent is the same person you sent the questionnaire to. This may not actually be the case. Many times business questionnaires get handed to other employees for

completion. Housewives sometimes respond for their husbands. Kids respond as a prank. For a variety internet in questionnaires.

Finally, questionnaires are simply not suited for some people. For example, a written survey to a group of poorly educated people might not work because of needing skill problems. Non frequently, people are turns off by written questionnaires because of misuse.

7.5 TECHNIQUE OF CONSTRUCTING A QUESTIONNAIRE

In case, the study is to be conducted through questionnaire method, the questionnaire has to be drawn up in a scientific manner. The framer of questionnaire should keep certain things in view will constructing this device. In this method the respondent gives his answers from a distance. The language and the wordings of the questions should be stimulating to the respondents to give replies. The psychology of the respondent should be kept in mind and the questionnaire should be framed keeping in view the factors that are likely to encourage him to give correct answers.

1) Number of questions :-

A questionnaire should be contain a large number of questions. If there are two many questionnaire, generally respondents loose interest and start giving irrelevant answers. Thus a questionnaire should neither be too long non to brief.

2) Questions should be unambiguous, clean and simple :-

Double barreled questions should not be used. One should not include two or more question in one. (e.g. Does your department have a special recruitment policy for racial minorities and women). Such a question typically leads to hesitation and indecision on the part of the respondent. Some wounds are themselves vague and ambiguous. Themes such as social integration for example, many not well known to the respondents. The meaning of some wounds may be known only to highly educated respondents. Slang on colloquial phrases may be known only to one group, on may have different meanings to different groups. Such differences can present a real communication problem if the group of respondents is not homogeneous. After resolving to avoid ambiguous wordings is appropriate. This vary often depends upon the educational level of the respondents. Many researchers feel that they should phrase their questions in the respondents everyday slang so as to maximize rapport between respondent and researcher. This is perhaps on those matters for which there is no right or wrong choice. Moreover the questions should refer to concrete and specific matters like age on sex are

specific but opinion questions are especially difficult. The respondent often does not have an option because he or she has never thought about the topic. He or she is concerned about appearing stupid and must be measured that there is no right or wrong answer.

3) Leading questions :-

Questions should be carefully structured in order to minimize the probability of biasing the respondents answer by leading him or her and thus artificially increasing the probability of a particular response. The researchers task is to avoid leading questions as far as possible or to use neutral wordings instead.

4) Technical and special words should be clearly explained :-

While using technical jargon the researcher needs to provide an adequate explanation to all the words so as to enable the respondent to understand it in a connect way.

5) Personal questions :-

Very personal questions should be avoided . Respondents are generally unwilling to write down such information. Personal questions should be asked only if completely required.

Besides these considerations certain technical considerations should be kept in mind like –

- a) Quality of paper used.
- b) Response category format.
- c) Mailing facilities etc.
- d) Layout of a questionnaire

When technique of questionnaire is used in scientific surveys and when the sample size is big ; it is always advisable to attach a Covering letter to the questionnaire. A good covering letter includes the following.

- 1) A brief introduction of a researcher/researchers and basic information about the institution involved in the process of research.
- 2) Statement regarding the purpose of survey undertaken.
- 3) Enclose a self-addressed envelope for the respondents convenience in returning the questionnaire.
- 4) Assume the respondent that the information he gives will be kept confidential.
- 5) Promise the respondent that he will bet solicited after he fills up questionnaire.

- 6) If the respondent is interested, promise a copy of the results of the survey to him.
- 7) If possible and if required after social incentives to the respondents on the return of the questionnaire.

7.6 SUMMARY :-

The successful are of questionnaire depends on devoting the right balance of efforts to the planning stage, rather than rushing too early administering the questionnaire. Therefore the researcher should have a clear plan of action in mind and costs, production, organization, time limit and permission should be taken care in the beginning when designing of questionnaire, the characteristics of a good questionnaire should be kept in mind.

7.7 CHECK YOUR PROGRESS:

- 1) Discuss meaning of questionnaire.
- 2) Analyze objectives of questionnaire.
- 3) What are the advantages of questionnaire ?
- 4) Explain disadvantages of questionnaire
- 5) What are the techniques is conduct questionnaire explain.

7.8 REFERENCES :-

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7.9 QUESTIONS :-

- 1) Explain questionnaire, Discuss advantages and disadvantages of questionnaire?
- 2) Write a detail notes on questionnaire method.



INTERVIEW SCHEDULE

Unit Structure :

- 8.0 Objective
- 8.1 Introduction
- 8.2 Definition
- 8.3 Purpose of interviews
- 8.4 Types of interview
- 8.5 Interview technique
- 8.6 Interview and rapport building
- 8.7 Carrying the interview forward
- 8.8 Critical evaluation of the interview
- 8.9 Limitations of interview
- 8.10 Summary
- 8.11 Check your progress
- 8.12 Reference
- 8.13 Questions

8.0 OBJECTIVES

- To acquaint student with the necessary requirement, features of the interview method as an important source of research in sociology.
- To analyse the importance interview method against other method of data collection.

8.1 INTRODUCTION AND MEANING

Social Research has one fundamental advantage over physical research in the sense that the researcher can talk to his subject to know his feeling and reactions. He need not very entirely on his own senses and perceptions as in the technique of observation but can take active help from the subject also. This fundamental advantage is put to its fullest use in case of interview.

8.2 DEFINITION

“Interview consists of dialogue on verbal responses between two persons or between several persons. (Lindman)

“Interview is a technique of field work which is used to watch the behaviour of individuals to second statements, to observe the concrete results of social or group interaction. (Pauline Young)

According to Young, therefore interview may be regarded as a systematic method by which a person enters more or less imaginatively into the life of a comparative stranger. It is more like a tape recorder in which past incidences, feelings and reactions of the subjects are played back to the living present to be listened to by the interviewer with a scientific approach.

8.3 PURPOSE OF INTERVIEW

The purpose of this technique of data collection is two fold

- a) To secure certain information from the subject, which is known only to himself and cannot be gathered from any other source.
- b) To study scientifically the verbal behaviour of the subject under given circumstances.

For the first purpose the interviewer tells the topic to the subject and the subject narrates his feeling and reactions pertaining to it. The interviewer listens to these narratives and tries to find how far they fit in the hypothesis framed by him.

For the second purpose the interest of the researcher is more centered in the attitude and expressions of the subject than the actual facts. Hence in this case the researcher acts more like a social psychologist than as a sociologist. His attention is more focussed at the reactions and the changes in the moods and gestures of the subject which he is narrating a particular incident. Both these purposes generally go hand in hand in any social research. As Lundberg rightly remarks “The researcher is interested in the objective data secured from the interview such as income, no. of children, their ages etc. and also in the personality of the informant – his attitude, prejudices, likes and dislikes as revealed by his verbal behaviour including the subtle gestures that accompany it, such as facial expression, tone of voice and so forth” Special emphasis may, however be given to any of the aspects. In a Social interview nonverbal communication is generally observed as an aid to judge the validity of the statements of the subject.

8.4 TYPES OF INTERVIEW

Different types of interviews have been classified differently by different people. Classifications are done on the basis of various criteria.

- 1) Some of the important classifications are –
 - a) Individual interview – i.e. One interview with one interviewee
 - b) Group interview – i.e. One interviewer with many interviewee on panel of interviewers with group of interviewee.

- 2) Classification on the basis of information gathered
 - a) Intensive interview.
 - b) Simple interview.

- 3) Sometimes interviews can be classified on the basis of the functions they perform/purpose they serve.
 - a) Diagnostic interviews.
 - b) Psychiatric interviews
 - c) Recruitment interviews.

- 4) But whatever the typology broadly speaking there are five types of interviews as given by Pauline Young.

a) Structured interviews :-

These are also called controlled guided or direct interviews. These interviews involve a set of predetermined question format which is strictly followed. Structural interviews mostly involve the use of fixed, close-ended questions. Sequence of questions, language used is also not changed by the interviewer. The interviewer only has the liberty to further explain the question or repeat the question if the subject has not understand it.

b) Un structured interviews :-

These are also called uncontrolled, unguided or non-direct interviews. There is not predetermined question format in this type of interview. The researcher is given certain broad topics upon which the information is to be collected it is held in the form of free discussions. This kind of interview is characterized by a far too greater flexibility of approach to questioning the respondents. Respondents are encouraged to relate freely their experiences. Such interviews permit a free flowing account of the personal and social contexts of beliefs and feelings. The interviewer involved is allowed much greater freedom to ask supplementary questions to change the sequence of questions or even offer explanations and classifications.

c) Focussed interview :-

These interviews are of semi standardized type Main purpose is to focus attention of the given experience of the respondent and its effect. The interviewer knows in advance the relevant aspects of the issue he has to cover. He has more or less a complete freedom to decide the manner

and the sequence in which the questions should be asked. The interviewer has complete freedom to explore reasons and motives, to probe further etc. In such interviews, although the respondent is free to express completely his own line of thoughts. The direction of the interview is mainly in the hands of the interviewer.

The focussed interviews have been used effectively in the development of hypothesis. The researcher tries to focus respondents attention the particular aspects of the problems and tries to know his experiences, attitudes, emotion and responses regarding the concrete under study.

d) Depth interviews :

This type of interviews are also semistandearize in nature. Dept interviews are often mistaken for focused interviews. Where the purpose of focused interviews is to focus attention on a particular phenomenon or a situation and to collect all possible information concerning it. Dept. interviews has a purpose of going deep into a person life to find out his motives, ideas opinion and attitudes for this type of interview the researcher has to be skilled and trained. He enjoys the freedom of altering the question and further explaining them or changing the order of it. This type of interview is often used in studying psychiatric problems.

e) Repeat interviews :-

Interviews are repeated when these are utilized to note that gradual influence of some social or psychological process. When the process is long-term and of evolutionary nature the data is collected in a chronological manner when repeat interviews serve the purpose. Repeat interviews are generally a very costly affair. A prolonged second has to be maintained to study the change in a continue sequence. Generally a permanent organisation is set up for the purpose. To make such a process successful, the number of cases under the study has to be limited. The cases must also be localised in particular place.

The conclude, though this typology is valued in social research it should be mentioned here that these types should not be looked at as watertight compartments. These are cross-classifications and thus one used in combination several times.

8.5 INTERVIEW TECHNIQUE

As good and flat put it, interviewing is fundamentally a process of social interaction its primary purpose may be research but this is its purposes for the investigator for the respondent. Its foundation and meaning may differ. Whatever the purpose the fact remains that the process of interviewing is basically a process of social inter action.

This process in the technique of interview is further complicated by the fact that the interview also has sight the interviewer and interviewee both human beings implies that the interviewer must not only attempt to be conscious of the real meaning of the answer given by the interviewee but he must also be aware on the fact of their respondent is turn in turn guessing at the motives of the interviewer reacting basically not to the interviewer but to the image that he has given of him.

Preparation stage :

Since the interviewer plays a keyrole in this process, he must interview be keen and alert to what he is bringing to the interview situation. It is appearance, his facial and manual gestures, his information, his fears and anxieties, his knowledges and cleverness. All these affects the interviewee. Thus the interviewer involved has to be experienced and skilled.

Once the interviewer receives a list of specific respondents whom he must interview personally, the very first task of his to contact them either on phone or through any other channel and fix up an appointment along with other details. The interviewer must identify himself and his institution and also the purpose of the interview must be discussed beforehand if possible. Sometimes, interviewee first contact is not with the interviewee but with a member of the family, friend or assistant. In such cases, the interviewer must also respect and understand these people because these are the members who influence the decision of the interviewee.

8.6 BEGINNING OF THE INTERVIEW AND RAPPORT BUILDING

The interview is not simply a conversation, it is rather a pseudo conversation. In order to be successful, it must have all the warmth and affection, mutual confidence and respect with the clarity and guidelines of scientific research. The interviewer must introduce himself as though beginning a conversation in a friendly manner but the additional element of professional competences should be always be maintained.

Same type of conversational statement is after useful in establishing friendly relations with the respondent. A simple statement that conveys the idea that the interviewer is not superior person, but a professional doing his job may help to start the interview on a warm basis.

Rapport building is one of the important requirements in this process. A state of rapport exists between the interviewer and respondent when the latter has accepted the research goals of the interviewer and actively seeks to help him in obtaining necessary information. The interviewer must convince the interviewee of the authenticity and

reliability of the research and secrecy and confidentiality of the information's he imports.

8.7 CARRYING THE INTERVIEW FORWARD

The process of continuing the interview varies depending upon the type of interview "carrying the interview forward" has different meanings in diff. types of interviews.

This process of carrying the interview forward is greatly helped writing the questions in a fashion which most closely approximates a conversation. The interviewer must be ready not with the lost of exact questions but questions draft or possible topics on which he would like to dwell upon. Certain introductory comments or appropriate transitional phrases help to build rapport. Once the informal environment has been created the silence or gaps that occur in between need no longer be filled quickly by hurried question.

The answer to the silence may sometime nearly an interested look or sympathetic half smile to indicate that the comment is being digested.

While continuing the interview; the interviewer must avoid the temptation to express his own views, even if given the opportunity. Nevertheless, the interviewer cannot be efficient if he tries to by obey a passive listener. He must be critical and intelligent listener.

Probe Question Stage :

The most significant or crucial questions in the schedule must be presented with great care. Sometimes answer given do not provide with satisfactory information such situations requires further questioning attempt to 'probe' more deeply into the meaning of the response given. There are various types of probe :-

- 1) First type of probe is required where the subject has failed to answer the questions concretely.
- 2) Second type of probe is required where the interviewee is not able to answer the xperquestions. When the respondent simply does not have the information, of course the probe will be of no use. But studies say that the respondent gives a 'don't known' answer because he is unable to think of the answer immediately or is afraid to attempt an answer or ha not understood the question. In all such cases, weapon of probe question serves the purpose.
- 3) Third type of probe is called 'Antagonistic probe' Though creating a friendly atmosphere while interviewing is necessity for better results; it is not the basic purpose. In situations where the respondent is found

to be giving false information, antagonistic probe is the weapon that the interviewer must use.

This weapons takes many forms. Sometimes this may take form of 'why' question or phrases like 'That's very interesting or just a gesture to indicate that you want to hear something more about it.

Recording the Interview :-

Increasingly now social research is a group research and the interviewer and tabularator are two persons. Then the work of recording the interview becomes important. Additional bits of information from the interviewer helps the experts to drive at a complete picture of the phenomenon under study.

So far as possible the exact words of the respondent should be recorded. They should not be edited for grammar or meaning. Such Things indicated the ethics or culture of the subject.

As an additional aid to complete reporting, the interviewer may taken it a practice to go directly from the interview to a computer or a typewriter or desk in order to write out the details while the information is still fresh in his mind. Delay of any proportion may quickly distort or blur the details.

Closing the interviews :-

In this techniques of social research because of face to face interaction with the respondent the researcher very often gets involved in a situation or in the intensive interview, if fairly deep and troubled matters are touched upon, the respondent may feel grateful and may be unwilling to let the interviewer leave. In such situations, the common experience for the interviewer is to find dosing of interview more difficult than the opening.

For the usual type of interview; a simple 'Thank You Very Much' with a friendly smile is an adequate good-bye. However in qualitative interview, the interviewer must select his occasion of departure more carefully. The departure should not be anrupt though it can be deliberate and open.

It is important to communicate to the respondent that the interviewer is happy and satisfied with his co-operation. This stage should always be accompanied by an expression of the tanks in recognition of respondent's generosity in time and attention

8.8 CRITICAL EVALUATION OF THE INTERVIEW

Interview as a technique of social research is quite popular. It is used extensively in different types of surveys.

Advantages of interviews :-

- 1) It is a face to face interaction between the researcher and the respondent. Because the data collection in this process is directly based upon respondent's narration, it is possible for a researcher to collect primary information successfully. Primary information is more or less reliable.
- 2) Data collection through this technique is based upon verbal (words and phrases) as well as non-verbal (gestures, facial expression, body language etc) indicators. Since it is based on a combination of facts, data are more scientific and accurate.
- 3) Scope of the technique of interview is quite wide. It is quite wide. It is only through this technique that the events that are not open to observation can be studied and analysed. E.g. Family problems, Abstract factors like attitudes, feelings, emotions, perceptions can also be studied with the help of the technique of interview.

8.9 LIMITATIONS OF INTERVIEWS

- 1) In the technique of observation, the researcher notes down what he gets to study. Therefore, he records things as they are on the other hand in the technique of interview, interviewee is more or less removed from the situation he talking about. Therefore, there is a total reliance on his memory. He narrates what he recalls. Moreover, he narrates what he chooses to recall. An interviewee can put up a front or offer justification.
- 2) Scope of the technique of interview is limited. Because this technique demands active assistance on the part of the respondent situations where respondent is unwilling to cooperate or is too busy do not cater to the technique of interview.
- 3) There is a lot subjectively involved in the process of interviewing. The researcher there fore has to be skilled and experience. Only a trained researcher can carry out this process of interviewing successfully.

8.10 SUMMARY

Interview consists of a dialogue between two or more persons. The fundamental advantage of this technique is that the researcher can actually interact with the subject on slides under consideration. Generally speaking, there are 5 types of interviews in social research. Structured interviews, Unstructured interviews, Focused interview, Depth interviews, Repeat interviews. Because interview is a process of interaction, interviewing goes through various stages like preparation stage, rapport

building sage, carrying the interview forward, probe questioning, recording the interview, closing the interview. In spite of the limitations of the technique, closing the interviews, interview is said to be the best technique of data collection.

8.11 CHECK YOUR PROGRESS

- 1) What do you mean by interview ?
- 2) Analyse unstructured interview.
- 3) Highlight focus interview.
- 4) Explain Interview technique.

8.12 REFERENCES

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8.13 QUESTIONS

- 1) State the important classifications of interviews and discuss in detail Pauline Young's typology of interview.
- 2) Write a note in the 'Technique of Interview' with reference to various stages involved in the process of interviewing.
- 3) Critically evaluate the potential of interview as a technique of data collection.
- 4) "Interview is the best tool of data collection". Comment



SCALINE TECHNIQUES

Unit Structure :

- 9.0 Objectives
- 9.1 Introduction of Scale of measurement and Definition
- 9.2 Level of measurement
- 9.3 Meaning of Sociometry
- 9.4 Definition of Sociometry
- 9.5 Techniques in Sociometry
- 9.6 Summary
- 9.7 Check your progress
- 9.8 References
- 9.9 Questions

9.0 OBJECTIVES :

- To acquaint students with different types of measurement with examples.
- To familiarise students with meaning of sociometry and various techniques used in sociometry.

9.1 INTRODUCTION :

The concept of measurement refers to the process of describing abstract concepts in terms of specific indicators by assigning numbers to these indicators in accordance with rules. In social research measurement of social phenomena has become an essential prerequisite because of a number of reasons. One of the important reason for measuring social phenomena is to allow the researcher the opportunity of using those phenomena is hypothesis to determine the effects of a set of variables to others (Black and Champion 1976 : 170)

Monette.et.al (1986) defines measurement as a process of describing abstract concepts in terms of specific indicators by the

assignment of number of others symbol to this indicator in accordance with rules.

In very broad sense measurement determines the extent to which involves operation to determine the extent to which a variable is present or absent let us consider the following examples.

A social worker who is working with street children, interviews a child asking following questions.

- 1) Do you save money? Yes / no.
- 2) If yes, how much?
- 3) "Child labour in our country must be banned. (Strongly Agree) (Agree) (Underfed) (Disagree) (Strongly Disagree)

The three questions attempt to measure some of the aspect of street children the first question measure one aspect by determining the presence or absence of a characteristic 'saving habit' among street children, the second question tries to measure in a more specific way in valuing the amount saved which tries to determine the degree of intensity of saving. Finally a reaction or comment to a statement is in a sequence of responses which in turn can be converted into sources and would measure the phenomena in more specially.

9.2 LEVEL OF MEASUREMENT :

A social phenomenon can be measured in various way, such as asking questions or through noting behaviour (observation measurement refer to a setoff rules that define permissible mathematical functions that can be performed on numbers 1 scores produced by a measure there are four level of measurement, namely, nominal ordinal, interval and ratio.

Nominal Level of Measurement :

Nominal level is the lowest and most simple level of measurement when a variable is classified into sexual nominal sub-classes, it is said that the variable in question is measured on a nominal level for example, the variable – sex – has two nominal sub-classes namely, male and female. Similarly, religions have many sub-classes, if not infinite among which are included Hindus, Muslims, Christians and Sikhs.

Number assigned to nominal sub-classes at his level of measurement represent social order only. The numbers do not have mathematical values. Hence, no mathematical function is

possible with nominal data for example, let us consider the classification.

- 1) Hindu 2) Muslim 3) Christian

In this example, suppose we add 1 and 2, we will get 3, which would be equivalent of saying that a Hindu plus a Muslim equals a Christian. This is not true. In other words, 1, 2 and 3 here represent first, categories of respondents who are Hindus, second categories of respondents who are Muslims and third, categories of respondents belonging to Christianity. Another example of nominal level of measurement is getting information about marital status in the following forms.

- Marital Status : 1) Unmarried ()
 2) Married ()
 3) Divorcee ()
 4) Widow ()

Ordinal Level of Measurement :

When the relative positions of objects or persons with respect to some characteristics are defined, measurements are possible, ordinal levels. The fundamental requirement of an ordinal level of measurement is that one to be able to determine the order of positions of objects or persons in terms of characteristics under study ordinal level measurements are considered of high level than nominal level because in addition to being mutually exclusive (feature of nominal level of measurement) the categories have a fixed order. Level of education for example, constitutes an ordinal variable and measures levels of education or ordinal scales.

Following illustration shows level of education, divided into ordinal categories. In ordinal level of measurement, the number are used not only to differentiate sub-classes, but also to determine less than or greater than relationship between them. For example, see the responses given to the level of education.

- Level of Education : 1) Graduate ()
 2) Intermediate ()
 3) High School ()
 4) Middle School ()
 5) Primary ()
 6) Illiterate ()

The responses have numbers ranging from 1 to 6 are designed to identify ordinal differences between levels of education. Each level is assigned a particular number relative to others and it can be determined readily that Graduate level of Education is higher than intermediate. However, there is no attempt to say that an equal distance will be found amongst all numbers. We can not say that the same distance exists between 1 and 2 exists between 3 and 4.

Interval Level of Measurement :

Interval level of measurement between the categories of measurement has equal spacing in addition to the characteristics of nominal level (mutually exclusive) and ordinal level having fixed order). In interval measures, the positions are not only ordered either in ascending order (lower, middle and higher) or in descending order (higher, middle and lower) but the intervals of measurements are also equal. In other words, the distance between the positions is equal, such as the degree of a temperature scales. The examples of true interval scales are Fahrenheit and Celsius temperature scales. The unit of measurement of both the scales is degrees are both are based on equal spacing characteristics of interval is level of measurement.

In on interval scale on equal distance between units will be found. That means 2 are same distance from 3 as 6 are from 5 and so on. For example, in thermometer having Celsius as unit of measurement, 60 degree is 10 degree more than 50 degree. However, we can not compare the ratios of two temperatures. It would be erroneous to refer that 100 degree is twice as hot as 50 degree. This is because interval scale does not have an absolute zero.

9.3 MEANING OF SOCIOMETRY :

The Sociometric technique is closely identified with the work of J.C. Moreno entitled 'Who shall survive?' Sociometry is concerned with charting out the attractions and repulsion among the members of a group among groups (miniature social system) or sub-groups or between the sub groups and individuals. Sociometry involves a set of a perations that depart fundamentally from the method employed by Emory Bogardos for the measurement of social distance.

9.4 DEFINITION OF SOCIOMETRY :

According to Helen Jennings one of the pioneers in the field of Sociometric studies, describes Sociometry as a device for a

graphic and straight forward portrayal of the total configuration of relations among the members of a group at some given point in time. Such a picture affords at a glance the main lines of communication and the whole Ruleidoscope of attraction and repulsion among members of the group for Franz. "Sociometry is a method used for discovery and manipulation of social configuration by measuring the attraction and repulsion among individual in a group.

9.5 TECHNIQUE IN SOCIOMETRY :

The basic technique employed in Sociometry is the sociometric test sociometric techniques have a cluster of devices, sociometric test included, which consist in having each group with whom he / she would like to or would not like to engage in some activity that is relevant to the life of the group. Depending on the character of the group the member may be asked to indicate whom (from among the members of the group) he / she would like to be associated or not like to be associated with in play, studies, problem solving dinner, lending and borrowing etc.

What type of interaction among members become the focus of the researcher attention depends his objectives on the nature and function of the group. Generally sociometric studies employ observations questionnaires, and interview schedules. Sometimes examination of records may also be employed to secure the relevant information. But sociometry should more properly be considered a method of focusing on a particular type of subject matter and a related method of analysis rather than simply a method of data collection.

The researcher needs to conduct observation of the behaviour of members if he wants to know the actual happenings in the group. During such as observation, the researcher concentrates on how the members he have how they interact with another what the nature of the relationship is who initiates interaction (Orientation role) and who plays the object role etc.

Suppose we conduct an observation aimed at ascertaining the pattern the students of a class in public school exhibit in respect of exchanging the New Year greeting. We may find one student may be taken to be the most popular member of the class in as such as he receives maximum number of greetings a sociometric terminology. These are the isolates. We may further find that there are has been among students incidence of mutual exchange of greeting cards eg. A sends to B and B sends to A. This is know as the mutual choice in the course of our observation, we may come

across some cliques i.e. sub group of students with each of which mutual exchange of greeting has taken place.

The sociometric questionnaire and interviews are employed in securing information from each persons about the other members of the group with whom they would like to or would not like to engage in a particular type of interaction are also, their thoughts about this interactions question included in the sociometric questionnaire / schedule are directed toward seeking information from each person in one group. He would like to as his playmate, roommate colleague etc. sometimes the person is asked to name all the person in the group whom he would like or not like to choose or reject that there is no problem or restriction on the respondent to confine his choices or rejections to the first three or four person in order of preference. But it is the group is numerically large the individual respondent is usually asked to indicate his choice or rejection to the first few person in order or preference.

Moreno himself insisted on soliciting unrestricted number of choices or rejection i.e. he recommends that the respondent should be allowed to indicate the total range of choices or rejection without any limitation there is of course no denying that such as freedom allowed to the individual members of the group would go a long way in affording a sensitive and objective portrait of the independent in the group. But practical consideration often warrant a restriction on the individual respondent to indicate his choices or rejection only upto a certain numerical limit (three or four). As has been said above, if he group subjected to sociometric analysis is a large one, such a restriction largely becomes necessary.

9.6 SUMMARY :

Measurement refers to the relationship among the values that are assigned to the attributes for a variable. It is important to understand the level of measurement as it helps to decide how to interpret the data from the variable concerned. Level of measurement helps us to decide which appropriate for the numerical values. Sociometry shows the total freedom without any limitation while doing the research.

9.7 CHECK YOUR PROGRESS :

- 1) What do you man by nominal scale?
- 2) Analyse interval scale.
- 3) Highlight ordinal scale.
- 4) Explain in your own words sociometry.

9.8 REFERENCES :

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9.9 QUESTIONS :

- 1) Explain various scales of measurement? Discuss advantages and disadvantages.
- 2) Analyse sociometry and highlight its importance.



OBSERVATION

Unit Structure:

- 10.0 Objective
- 10.1 Introduction
- 10.2 Characteristics of Observation
- 10.3 Components of Observation
- 10.4 Difficulties in the process of Observations
- 10.5 Problem involved in observation
- 10.6 Types of observation
- 10.7 Limitations of observation
- 10.8 Summary
- 10.9 Check you program
- 10.10 Reference
- 1011 Question

10.0 OBJECTIVES

- To provide student with a basic understanding about the technique of observation
- To enable students of research to acknowledge the different process of data collection.

10.1 INTRODUCTION

Data collection is one of the crucial stages in social research Unlike in pure research, tools of data collection have to be constructed in social research. Some of the important tools of data collection are observation, interview, Questionnaire & schedule.

Our Knowledge about the universe begins with observation, practically all human beings are involved in observation We observe things that happen around us While on street, in market, at home, at the work place we are constantly involved in observation.

But all these cannot be called scientific observations. Observation becomes scientific only when the following characteristics prevail.

10.2 CHARACTERISTICS OF OBSERVATION

- 1) It is goal oriented. It must serve a formulated research purpose.
- 2) It must be planned systematically. The stages & substages involved should be clearly designed & stated.
- 3) It should be recorded by the researcher.
- 4) It must be linked to general theoretical assumption. Therefore, observations can be defined as –
 - i) “Systematic Viewing coupled with the consideration of the seen phenomenon.”
 - ii) “Accurate watching & noting of phenomenon as they occur in nature with regard to cause & effect or mutual relations.”

(Oxford concise dictionary)

As rightly stated by M.H. Gopal; (An introduction to Research produce in social science) observation is “Seeing with purpose”. It is looking closely & purposively at the situation as whole & at the same time in the results without completely losing oneself in the situation.

10.3 COMPONENTS OF OBSERVATION:-

Observation is a process which consists of three important aspects:

- 1) Sensation,
- 2) Attention,
- 3) Perception.

Sensation stands for a sensory image. The image that our sense organs enable us to achieve. This is a more or less objective or natural stage. The facts present are reported or noticed.

Attention means the investigator’s ability to pursue the subject under study. The phenomenon under study is studied for a span of time to check out on the validity of sensory report. Success of this stage is largely determined by the investigator’s ability to pursue the subject under study.

Perception is qualitatively different than the first two stages. It comprises of the interpretation of the sensory report. It is a discretionary stage where facts are ‘recognized’ understood in a given meaning to be appreciated scientifically.

Observation as a scientific tool of data collection therefore, is not a very simple or easy process. In fact, it is extremely demanding. To use fruitfully, the researcher has to be thoroughly conversant with the problem under study, he has to be trained as well as experienced in field of social research.

10.4 DIFFICULTIES IN THE PROCESS OF OBSERVATION:-

Herbert Spencer (1820-1903), the English sociologist has mentioned the principle difficulties in the process of observation in his book 'study of sociology' Spencer commented, that many social phenomenon are not directly perceptible. Many are geographically dispersed. Often researcher involved has put in special efforts to establish facts by putting together many details which are naturally spread out in space & time [E.g. Communal unrest, Discrimination against women] It is a challenging task.

Spencer has also given a due mention to the barriers to correct observation in his book, because of the vary nature of this technique of data collection, it has several inbuilt shortcoming which the researcher has to consciously overcome in achieve fruitful results.

10.5 PROBLEMS INVOLVED ARE –

1) Inadequacies of sense organs –

Generally, we tend to regard our sense organs as completely reliable. But in reality our sense organs operate in a highly variable, selective & erratic manner psychological research has proved that what man perceives on a particular occasion depends greatly on his state of mind & body at the given point of time. E.g. – A particular painting may appear to be attractive & good to a person who is in a pleasant mood. The same painting will probably look repelling to the same person in a different kind of mental set up.

2) Observation & Inference :-

Observation & inference are two sides of the same coin. We infer on the basis of what we observe. When observed things are given meaning to within a given frame of reference, in relation to the context one is said to be inferring. Without any frame of reference, in relation to the context one is said to be inferring without any frame to start with, new experiences are isolated, unidentifiable and meaningless. Therefore, the two are very much connected.

Nevertheless to treat the two are very much connected Nevertheless to treat the two are being the same would be a scientific error. The researcher engages in observation has to consciously distinguish between the two.

3) Observer & Observed :-

Social science research involves human observer & human subjects. Both 'Human', Interactions on their relationship cannot be denied. This can prove to be serious hindrance to objective data collection. Therefore, the researcher involved has to be careful & cautions. Special efforts should be mad to curtail the impact of inevitable interactions on the proposed research.

MEASURES TO ENSURE SCIENTIFIC OBSERVATION :

It would be an error to say that impartial observation is impossible. The effectiveness & accuracy of the observing method can be certainly be increased by using certain additional aids:

- 1) Besides the researcher's observation records, other methods of recording the event under observation like vide camera, tape recorder, still camera should be utilized.
- 2) In the book of 'Research methods in Social Relations, Jahoda selltiz Deutsch & Cook hare suggested the use of checklist
 - a) Recording of the phenomena or the events should be made in terms of the detailed descriptions of the participants. E.g. – Age, sex, occupation, other personal details.
 - b) Researcher should note down the environment the setting with in which the event is being observed. It should include various details like e.g.- appropriate norms practiced, types of behavior encouraged etc. This would enable the researcher to attribute correct meaning to the event under observation.
 - c) Purpose or objective for which participants are gathered together should be clearly noted.
 - d) To understand & appreciate the phenomenon under observation fully, the exact nature of social behavior, the type of actions & interactions from person to person should be also noted.
 - e) Besides other details, duration of the event or frequency of certain event should be noted to understand whether it is a regular phenomenon or a rate one.

However, it may not be possible to use the checklist in a circumstance for different reasons, nevertheless special care must be taken to collect lot of information about the phenomenon under observation in order to give correct meaning to it.

- 3) The technique of observation is a difficulties challenging one because of its very nature. The tool of interview involves verbal interaction; the tool of questionnaire consists of written responses whereas observation operates at a more subtle level. Selection & appointment of experienced observer increases the possibility of more accurate observation. Observer's efficiency can be increased by training & special education. Trained & experienced researchers can certainly bring in lot of success in the process of observation.
- 4) Recent trend in social research is to have two or more people observe the same event. Different observers should make their records independently. When two or more observers are doing their job of recording the same problem they have opportunities to compare their findings & check the bids involved.

POTENTIAL OF THE TECHNIQUE OF OBSERVATION :

Observation is an important method of social research. It is very much used by the social researcher because it suits the study of the social phenomena. The techniques occupies a place of importance in social research some of it's merits are:-

- 1) Simplest- method of study :-** The tool of observation is popular because of it's simplicity & accuracy since in this method, researcher himself is active in collecting data, he can pursue generalization with greater. Conviction & can be sure about the results. It is more simple as compared to other methods. This is not to say that it is completely nontechnical. But if compared with other techniques of data collection, observation is less demanding.
- 2)** It is possible to record behavior as it occurs. Many other research techniques depends entirely on people's retrospective or anticipatory ability to report their own behavior. These reports are by & large given when the respondent is some what removed from stress & strains of the then situations. Therefore, the respondent can always put up a front or rationalize his behavior later.
- 3)** Sever aspects of human behavior are taken as part & parcel of a given individual's personality. Such items of behaviour therefore escape a conscious detection & resist translation into words. Techniques of interview & questionnaire do not cover these subtle aspects.

4) Observation as a technique is in dependent of people's willingness to report. Respondents sometimes have not time or are unwilling to be interviewed or tested. The tool of observation, comparatively speaking is less demanding of active cooperation on the part of the subjects & therefore can be widely used.

5) There are certain categories of respondents like animals, Infants, mentally disturbed people, etc. Which cannot be studied with the help of interview or questionnaire. Respondents who are not capable of given a verbal or written version of their experiences are best studied with the help of the technique of observation.

10.6 TYPES OF OBSERVATION:-

The investigator, whatever be the purpose of his study, should answer four broad questions before seeing out to observe:-

- a) What should be observed ?
- b) How the observation should be recorded.
- c) How to ensure accuracy of observation.
- d) What kind of relationship should be obtained between the observers & observed.

Depending on these answers, the investigator should choose upon the type of observation he would like to go for broadly speaking, observations are of following types:-

- a) Participant observation
- b) Non – participant observation.
- c) Controlled observation.
- d) Uncontrolled observation.

A) PARTICIPANT OBSERVATION:-

In this method, the observer himself participates in the activities of the group which he is studying. Because of the participation of the observer this is known as participant observation. It is not necessary for the observer to identify himself with the group or actively take part in all the acts. But he has to be physically present while the members of the group perform their activities. Generally, participant observation is kind of uncontrolled observation, in which the researcher may or may not reveal his identity.

This method allows observation of the individual's behavior in the most natural condition secondly, the researcher has access to a body of information which would not have been easily obtained by observer as an outsider. Researcher has the privilege of being part of the group. He gets to share the feelings, emotions & behavior of the group. He gets to share the feelings, emotions &

behavior of the group members (subjects) & thus records it more accurately. He is able to see not only the actions or behavior of the people but is also able to know why & under what give situation subjects act or behave in a given manner. Because the context within which things occur is dearer indeed observation of this type is much more meaningful. Participant observation also allows the researcher to check the truth of statements made by the members of the group.

Participant observation though is an effective method of data collection, it has its own limitations with greater degree of participation, the observer is likely to develop close relationship with other members of the group. This can kill investigator's ability in the group to the extent that he may forget observe certain relevant aspects of human behavior. Affiliation with the group can also make the researcher bias or partial towards a particular subgroup therefore hampering scientific accuracy.

In a participant observation, researcher is forced to occupy a particular position. This limits the scope of the observer to study the phenomenon fully moreover, if the researcher comes to occupy and strategic position in a group, he generally end up bringing about changes in group dynamics therefore bullying the purpose of data collection.

Greatest difficulty in participant observation method is in recording the observed facts. If he records at the spot, he kills the neutrality of the situation. If he records later on, he may forget many things. If he is working in disguise, he has to be very careful about his own activities.

Several sociologists & anthropologists have used this method to collect data. Merton's study of hobos, Serif's study of the psychology of social norms, Land's two surveys of middle town, John Dullard's studies in the southern states, Warner's & Hunt's study of Yankee city are some famous examples.

b) NON- PARTICIPANT OBSERVATION:-

This method is characterized by a relative lack of the participation by the observer in the life of the group that he is observing. The researcher stands at a distance & observes the behavior of the group members often the observed persons are aware of the investigation going on. It is often used in small group research situation

A pure non-participant observation is difficult. There are no standard set of relationships or role patterns for the non member whose is always prevent but never participating.

In a non-participant observation observer maintains a purely impartial status. He is only a silent observer & thus is in a position to record each & every detail with bias. He can maintained a detached view & keep himself a loot from petty quarrels among the group. Similarly there is no fear of researcher influencing the behavior patens of the subjects in this method. Scope of this method is relatively wider because the observer is not expected to occupy any particular positioning the bier achy in order to observer phenomena like in a participant observation. He therefore gets to observe the whole group at a given point of time.

Nevertheless, this type of observation also has its share of limitations. Being a non-participant observer the researcher involved observes only those activities that are visible or apparen. Since he has no opportunity to interact with the subjects he may fail to appreciate the significance of a particular event fully or psychology of the individual involved. Because of the lack of complete context, in correct or even biased inter predation may occur.

People generally feel more suspicious of a person who stands at a distance as a supervisor than a person who intermingles with them as an associate. The whole group may either feel uncomfortable or too conscious to behave in a normal manner when under observation. In this method, researcher may collect all sort of data & all visible facts, thinking it is important. The potential to discern between important & unimportant or relevant & irrelevant is not present on the part of a researcher because of his restricted role as the observer. On the whole, a non-participant type of observation is quite popular in social science.

Roe this Berger & Dickson functioned on passive members of work groups within an industrial plant for their study on 'Management & the works' Warner & Lunt suggested using this method. E.g. – sacred & secular rituals, factories, retail ships, etc.

Nevertheless, it is important to note that in social sciences there is no pure participant or pure non-participant observation. Because both participant observation & non-participant observation suffer from limitations. Good & Hatt opt for a third approach, namely quasi participant observation. This is used in certain situations. According to this approach, the observer takes part in many activities of the group so as to avoid the awkwardness of complete non-participation, while taking on the role of observer or interviewer for others. This pattern was followed by be play in the working class families & by Lynds in their study of Middletown.

c) CONTROLLED OBSERVATION:-

When the process of observation occurs under guided conditions, it is called controlled observations. The main purpose of these types of observation is to check any bias due to faulty perception, in accurate data & influence of outside factors on a particular incident.

Control exercised in this type of observation is of two types:-

- a) Control over the phenomena.
- b) Control over the observation

a) Control over the phenomena is exercised by putting the phenomenon to laboratory type of test. Generally third type of test is very difficult in case of social phenomena but attempts have been made in this direction such experiment have been particularly tried in case of the study of behavior of children & infants. Subjects are kept in a room where various kinds of stimuli are provided & reaction of subjects to there stimuli is observed. Famous experiment of this type is the Hawthorne experiment that was conducted to study a correlation between work conditions & productivity levels of workers.

b) Control over the observation is exercised when it is impossible to obtain control over the phenomenon. The main purpose is to control & guide researcher's perception about the experiment in order to do away with faulty approach or bias.

Following kinds of control devise are generally used for this type of observation.

- 1) Detailed observation plan.
- 2) Use of schedules.
- 3) Use of mechanical appliances.
- 4) Use of socio metric scales.
- 5) Use of hypothesis.
- 6) Team observations.
- 7) Use of control groups.

Though this tool of controlled observation is quite scientifically planned & therefore yields objective result if administered correctly it's scope is limited. Not all phenomena's render them selves to controlled observation. Several ethical considerations also are important in this context. According to some experts, it is incurred to manipulate human behavior solely for research purpose.

d) UNCONTROLLED OBSERVATION :-

When observation takes place in natural surroundings & activities are performed in their usual course without any influence or guidance from any external force it is known as uncontrolled observation. Thus in this case, the observer visits the place of occurrence of phenomenon in order to observe he does not take part in any of the activities.

Most of the social phenomena are observed & studied in this fashion. Scope of this method is certainly wider. Most of the social situations cannot be put through a laboratory type of study. Moreover, the best results regarding social & cultural settings. E.g. Study of folklores, customs, slum conditions, etc.

Some social researchers have criticised the method of uncontrolled observation. Many feel that uncontrolled observation is very unreliable. Researchers can generalize on the basis of stray incidents without verifying them. Various observers may observe the same thing differently & draw different conclusions.

To conclude, observation is one of the important methods of data collection. Its utility cannot be undetermined due to any of the other methods of data collection.

10.7 LIMITATIONS OF OBSERVATION :-

- 1) As mentioned earlier, observation has to be carefully recorded by the researcher. It is often impossible to anticipate the occurrence of an event precisely enough to be able to be present to observe it. Moreover, the observer has to be mentally prepared interfering with the observational task.
- 2) The technique of observation cannot be utilized in certain cases because of the duration of events, E.g. – life histories, evolution of an institution, etc. Therefore the efficacy of this technique is limited.
- 3) Certain personal events do not lend themselves to the technique of observation. Private behavior, sexual behavior, family conflicts cannot be studied with the help of the technique of observation.
- 4) All researchers can't be good observers. Being human, an observer cannot be completely objective in a situation. Observation is a difficult technique. The researcher, to be a good observer should be thoroughly conversant with the problem.

under investigation should be properly trained & should be able to detach himself from the situation in order to record it scientifically.

- 5) All the events are not observable. In several cases facts are naturally in places & time facts have to be put together in order to make things/events meaning full. It is not possible to do it effectively with the help of the technique of observation.

10.8 SUMMARY:-

The technique of observation stands for a systematic viewing coupled with the consideration of the seen phenomenon. This technique includes a stages of sensation attention & perception in it there are four types of observation in scientific research :

Participant observation where the researcher actively participates in the functioning of the group under study, non-participant observation; where the researcher acts like a silent observer, controlled observation; where the researcher tries to control either the phenomenon or the method of observation & uncontrolled observation where the researcher merely observation the functioning the group without playing any significant role in it observation is considered to be one of the best methods of data collection.

10.9 CHECK YOUR PROGRESS :-

- 1) Define & explain the term 'observation'. Discuss the important problems involved in the process of observation.
- 2) Comment on the concept of Quasi participant observation with reference to the merits & limitations of participants & non-participant observation.
- 3) "Observation is the best tool of data collection" discuss the gives statement with reference to merits & limitations of observation.
- 4) Write a detailed note on "Controlled & uncontrolled observation' high lighting it'. Meaning & potential .

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10.11 QUESTION :-

- 1) What do you mean by observation ?
- 2) Explain ethnography.
- 3) Discuss participant observation.
- 4) Analyze non-participant observation.



CASE STUDY METHOD

Unit Structure:

- 11.0 Objectives
- 11.1 Introduction
- 11.2 Definition of case study
- 11.3 Characteristics of a case study
- 11.4 Case study technique
- 11.5 Assumptions
- 11.6 Sources of data for case study
- 11.7 Significance of case study
- 11.8 Limitations
- 11.9 Summary
- 11.10 Check your program
- 11.11 Reference
- 11.12 Questions

11.0 OBJECTIVES

- To acquaint student with method of investigation and importance of Case study in research paper
- To familiarize students with the purpose to understand the life cycle or an important part of the life cycle of the unit

11.1 INTRODUCTION:

In social science research, the case study method is Widely adopted one in carrying our research in the field. The credit for introducing case study goes to Fredrick replay. The English social philosopher, her bet Spencer, was among the first to adopt case study method in comparative studies of different cultures, The comparative studies of different culture, the problem of juvenile delin quency was complex to understand simply on the basis of

available statistical data. It was Healey, who supported the case study method which afforded a deeper understanding of the juvenile delinquency phenomena. Later, sociologists, psychologists, anthropologists, technologists and educationists interested in the study of primitive as well as modern cultures by case study method. H. Gisbrians have had restored. To this method while portraying historical character of a particular historical period and describing the developments today, many a novelist and dramatist have used some resemblance of the case study method for presenting a word picture of character.

11.2 DEFINITION OF CASE STUDY METHOD

P. V. Young defines case study as “a comprehensive study of a social unit, be it a person, a group of person, a institution, or an community is called a case study”, According to Goode and Hatt,” it is an approach which views any social unit as a whole. It is a way of organizing social data so as to preserve the unitary character of the social object being studied.” In the word of Charles Horfon Coolye, “Case study depends our perception and gives us a clear insight into life It gets at behaviour directly and not by an indirect approach.” By the above definition, it is clear that the case study method is qualitative, inclusive, intensive, insight stimulating and comprehensive approach. The field study is comparatively limited but has more of depth in it. It aims at studying everything rather than something about everything as in case of statistical method. In other words, it is study of Micro problem at macro level.

The approach to a case study research may not be based on hypothesis or on any well established conclusions but the study itself may help in formulating a well founded hypothesis for further investigation. This approach to research is , therefore, an open and objective investigation of a particular unit with a view to develop a hypothesis in character so the researcher has complete freedom in selecting problem that be considered as describe and fruit bearing. And it is used not necessary for proving or disproving a hypothesis. Thus, the case study methods work as a micro scope in understanding the complex behaviour of social problem

11.3 CHARACTERISTICS OF A CASE STUDY :-

- 1) The case study method aims at deep and detailed investigation of a unit.
- 2) It covers a sufficient wide cycle of time.
- 3) It is continuity in nature.
- 4) It is qualitative in character and it may equally be quantitative.

- 5) The number of unit to be studied is small.
- 6) It is flexible with which the researcher has independence in selecting the problem.
- 7) The data is to be scientifically synthesized which should be as much prognostic as diagnostic.

11.4 CASE STUDY TECHNIQUE : -

The case study is often termed as method, sometimes as technique and at others an approach to social reality. It is in fact, a technique which considers all potential aspects of situation intensively investigating it. The technique of gathering and processing data are related to three phases, viz

- 1) Choice of case
- 2) Recording of data
- 3) Data interpretation

The choice of case consists of two elements, first selection of 'representative unit'. Representativeness of the case is important with a view to studying as a specimen in a culture rather than as a definite entity, for eg- the factors which are influencing the successful functioning of the commercial bank, it is needless to say that a representative group of the sample- Second, identifying the situation thought case unit has an outlook, the problem must be selected carefully and well defined the situation of the case unit being studied.

Organizing the social data in such a way to preserve the unitary character of the social aim which is the essential feature in recording of data. In practical sense, the wholeness of case can be preserved as Goode and Hatt started, in four headings namely,

- 1) Breadth of data,
- 2) Level of data,
- 3) formation of index / indices,
- 4) Interaction in a time dimension

The breadth of data refer to the fact of data collection, level of data concerns to many facts of life of the unit, and that is available, index relates the various traits that are actually used in characterizing the unit and time dimension emphasis upon the process and time, the time provided may be short or long.

The interpretation of data is as equally and challenging as the selection of the case and gathering information about the case. The

researcher must closely guard against the subjective interpretation of the facts of a case being studied.

11.5 ASSUMPTIONS :-

In selection of a problem for research under case study method one should keep in mind. The following assumptions. They are -

- 1) The unit is indivisible and cannot be studied in piece meal and in programmatic.
- 2) A Particular unit has its own uniqueness' but it is not different from other unit in all respects. In other words, it is representative of a group and can be studied as a type rather a pure individual. This means underlying unit. This underlying unit makes it possible to apply the inferences, for the unit / units to the group as a whole. It is because of this assumption, the case study method can proliffully applied and possible to predict and control of social phenomenon.
- 3) Social phenomena is a complex indeed , no- technique that can bring in uniformity and consequently ensure the complex totality ie, human life This complex of totality being amnable by case study developing in sights into cultural conflicts and problem oil of cillox exchange
- 4) The real motives behind the action is being influenced by time. So that worker has to study the problem in its historical perspective.
- 5) Case study depends upon the efficiency of the ' recall ' of others as to what has happened earlier

11.6 SOURCES OF DATA FOR CASE STUDY :-

Following are the main sources of data for case study research.

- 1) The personal documents, viz. dairies, autobiographies, memories, letter, etc of an individual which contain the description of remarkable events of the life of an individual as well as his reactions towards them. Although they sufficiently subjective in nature but are important for social research. In the words of P.N. Young "personal documents represent continuity of experience which helps to illuminate the individual personality . Social relations and Philosophy of life often expressed in objective reality or subjective appreciation.

- 2) Life history is another course for case study at reveals the respondent life with the significance of social movements.

11.7 SIGNIFICANCE OF CASE STUDY :-

- 1) Case study helps in formulating valid hypothesis A thorough study and careful analysis can derive various generalizations which may be developed into useful hypothesis. Infact, study of relevant literature and case study are the two potent sources of hypothesis.
- 2) It helps in framing questionnaire or schedule Through case study, it can be known the prolites of the unit of individual with which a better and suitable questionnaire or schedule can be framed in order to get rich response.
- 3) It aids in sampling, by studying the individual units thoroughly it can PST them in definite type or class. Hence, it helps in perfect stulification of this sample.
- 4) It locate deviant cases. The deviant case are those units that behave against the proposed hypothesis .The tendency is to ignore them but for scientific analysis they are important.
- 5) Case study method is a process rather than an incident. The problem under study forms a process rather than one incident EG- Courtship process , clique formation , etc.
- 6) Case study method enlarge the range of personal experience of the researcher In statistical method, generally ,a narrow range of topic is selected and the researcher's knowledge is limited to the particular aspect only. In case of case study, the whole of range of subjective life is studied and the range of knowledge is naturally enlarged . with this personal gain, he gets an intimate knowledge of many aspects of the units.
- 7) Since the case study covers the entire life of the unit, it is inclusive and intensive in nature. Under this, there is possibility of studding the various aspects of a problem,
- 8) The significance of the case study is recorded this nature of recording the data within the life of an individual and later on, within the life of the class of individuals. This means the researcher comes into contact with different classes of people , a thief , a pick-pocket and a like.

11.8 LIMITATIONS : -

The data collected in case study method is incapable of verification and the generalizations down from it leads in unsystematic procedure. Secondly, due to inaccurate observations and faulty inference, selection of a case may not be typical of the group. In other words, the case study is susceptible to post hoc failure in memory, unconscious omission or repression of unpleasant facts which describes what is more imaginary than real . Thirdly, the researcher thus to find some common sense explanations to a particular phenomena. This is so happened as he is so over confident to his intimate knowledge of the unit. This brings to presume even his common sense or intuitive explanations are most scientific ,such explanation being in capable of verification which are hardly reliable, four thing the case study method is qualitative in nature It deals with only the psychologist aspects of a human being s. Quantitative of the results may be difficult. In the case study method They are :-

- 1) The subject of study must be 'representative' as a specimen in a series of similar problem.
- 2) The life-history material should be organized and properly conceptualized.
- 3) The technique of elaboration of organic materials into social behaviour must be properly specified.
- 4) The groups or institutions which are responsible for transmitting a culture should be recognized.
- 5) A continues related experience from childhood should be stressed if the study is related to an individual.

11.9 SUMMARY : -

Important qualitative Information which may not be given any statistical treatment but may be pressured and interrupted in a disruptive way be survey and case study method. The surely agency should conduct the surely in a completely objective fashion without pre-determined finding case study method problem cases or abnormal situations for purposes diagnosis and remedy. It study normal situations to serve as the basis of preventing difficulties.

11.10 CHECK YOUR PROGRESS :-

1. Explain in you own words a case study method.
2. Define case study.

3. Discuss Characteristics of case study.
4. What are the significance of case study method ?

11.11 REFERENCE :-

- 1) Saravnavel P Research Methodology, Kitab Mahal, 1987.
- 2) Sharma B.A.V , Ravindra Prasad , D, Satyanarayana . P- Research Methodology, in social sciences, sterling Publishers, 1984.

11.12 QUESTION :-

1. Explain case study and its advantages and disadvantage



CONTENT ANALYSIS

Unit Structure

- 12.0 Objectives
- 12.1 Introduction
- 12.2 Meaning of content analysis
- 12.3 Research problem in content analysis
- 12.4 Applications
- 12.5 Summary
- 12.6 Check your Programs
- 12.7 References
- 12.8 Question

12.0 OBJECTIVES

- To acquaint students about the method of data collection on the basis of content analysis.
- To analyse the importance of archival records research.

12.1 INTRODUCTION

Content analysis is a research technique for making inferences by objectively and systematically identifying specified characteristics of content of document. This is a method of collection and analysis used to gather data from archival records, documents, newspapers, diaries, letters, minutes of meetings, and they like the content of the written material serves as a basis of inference. The analysis is made objectively and systematically. Objectivity refers to making analysis on the basis of explicit roles which enable different researchers to obtain the same result from the same documents. Systematic analysis refers to making inclusion or exclusion of content according to consistently applied criteria of selection. Only materials relevant to research hypothesis are examined.

12.2 MEANING CONTENT ANALYSIS

Content analysis as a method of studying communications was developed in the United States as a branch of social psychology known as communication research.

Content analysis can be applied to available materials as letters, diaries, newspaper articles and editorials etc and to materials like stories or essays especially produced for a particular research problem.

12.3 RESEARCH PROBLEM

Procedure –

Significant content analysis begins with some systematic problem which requires specific data from content analysis the researcher must conceptualizing the variables that are relevant to his problem.

The procedure of content analysis involves certain steps.

The first step is to define the Universe that is to be analyzed e.g. The editorials of newspaper on the subject matter of the problem (Say Sati) under study the publication of an author the issue of a newspaper for a given period. If the volume of materials to be examined is too large a representative sample of documents may be selected for analysis.

The second step is to specify the content characteristic to be measured on the basis of the characteristic the universe is divided into two categories.

Before discussing the general procedure for categorization it is necessary to specify the major unit of analysis of recording unit is the smallest element of content in which the appearance of a reference is counted the content unit is a larger body of the content that may be examined in characteristic a recording unit for example the recording unit may be a single term but in order to note whether the term is treated favorably and unfavorably one has to consider the entire sentence in which the term appears the sentence in the context unit.

Recording Units:-

Five major recording units are frequently used in content analysis they are word (terms) themes, character paragraph and items the word is the smallest unit the words are counted and a list of frequencies of selected words is prepared for example lawsell in a study on propaganda detection reports that the Moscow news frequently used twenty-seven key political (bourgeois, class struggle, red army, the people revolution etc)

The theme is a preposition about something. It is usually in the form of sentence clause or passage themes are not most frequently in the study of propaganda, attitudes, images and values.

The character is an Individual in a literary production. This is used as a unit in analyzing stories for studying the units of characters appearing in them.

The paragraph as a unit of analysis is rarely used because of difficulties in classifying various things discuss in it.

The item is the whole document. It may be an entire article a book or a speech.

The third step in content analysis is code of orization is an important part of the content analysis. Because it reflect the purpose of the study and spells out of the variables of the hypothesis to be tested. Even totally recording units are classified and coded into categories for example projective stories written by children in response to a picture may be categorized in to creative and non creative and non creative. Categories most related to the objective and be exhaustive and mutually exclusive. Exhaustiveness ensure that every recording unit relevant to the study can be classified mutual exclusivity means that no recording unit can be included is more than one category. The indicators or criteria for classifying recording units into respective categories should be explicitly specified. This enables replication which is an essential requirement of objectivity.

The last step is content analysis is to quantify the material in any appropriate from one form of quantification is ranking judges can be asked to rank the objects according to specified criterion the next form of quantification is rating scale. This ia generally employed in quantifying attitudes and values for sample the cheque of creativity may be rated as very high average, law very law.

12.4 APPLICATIONS :-

Content analysis is used for various purposes such as

- (a) To analyze the attributes, antecedents or effects;
- (b) To infer personality traits of speakers from logical and cognitive characteristic of their verbal communication
- (c) To infer aspect of content of likes a tores.
- (d) To understand the role of mass media in molding public opinion on occasion like general election
- (e) The study newspaper stand toward current issue like sati, terrorism in Punjab, India's peace keeping force role in srilanka etc.

- (f) To determine the philosophy of saints like Sri Ramkrishna. Swami Vivekananda of Sri Aurobindo and of great national leaders like Mahatma Gandhi, Gopal Krishna Gokhale or Jawaharlal Nehru.
- (g) To determine themes and values of novels and short stories.
- (h) To determine social literatures.
- (i) to measures behavior variables like need values, attitudes, authoritarianism, creativity and so enough and analysis of both available materials of projective kind.
- (j) to study the propaganda techniques adopted by propaganda its to influence the public.
- (k) to identify the literacy style, concepts or belief of a writer e.g. Mahatma Gandhi concept of trusti.

P (1) to explain the possible casual factor related to some out come or action or event e.g. The influence of editorial upon the action of the participant on an economic legislation and so on

12.5 SUMMARY

Content analysis of available materials should not be used indiscriminately. If a researcher can gather data directly through interviewing or projective techniques so much be the better if there is no such possibility then available can be used.

12.6 CHECK YOUR PROGRESS

- 1) Explain the meaning content analysis.
- 2) What are the problems faced by researcher in content analysis while doing research.

12.7 REFERENCES :-

- 1) Aritson J.A Hand book for interviewer (Gout, social survey No. m 136) London H.N.S.O 1967.
- 2) Berelson Bernard, content analysis in communication Research Gleonce III free press 1942.
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12.8 QUESTIONS

- 1) Write short note on content analysis.
- 2) Discuss content analysis and problems in detail.



SAMPLING (MEASURING AND CHARACTERISTIC)

Unit structures :

- 13.0 Objectives
- 13.1 Introduction & Meaning
- 13.2 Terms and concepts used in sampling
- 13.3 Objectives of sampling
- 13.4 Characteristics of a good sampling
- 13.5 Advantages of sampling
- 13.6 Disadvantages of sampling
- 13.7 Summary
- 13.8 Check your progress
- 13.9 References
- 13.10 Questions

13.0 OBJECTIVES

- to intrude the students about an important problem concerning the practical formulation of social research
- to familiarize students with knowledge to draw conclusions about the universe

13.1 INTRODUCTION & MEANING

It is possible to make some kind of general statement by observing only a few items or element is sample drawn therefore is actual practice we do not go on repeating the study for the same set of items on an indefinite number sample is drawn from it. Is actual practice we do not go on repeating the study for the same set of items on an indefinite number, sample is drawn from it,

A sample, as the name implies, is a smaller representation of a large rohole. In other words, a section of the population selected from the latter in such a way that they are representative of the universe called a sample. A single member of a population is referred to as population

element when some of the elements are selected with the intention of finding out something about the population from which they are taken, that group of elements is referred as a sample & the process of selection is called sampling simply speaking, the method of selecting for a study a portion of the universe with a view to draw conclusion about the universe is known as sampling, sampling may be defined as “the selection of part of an aggregate or totality on the basis of which a judgement or inference about the aggregate or totality is made.”

13.2 TERMS & CONCEPTS USED IN SAMPLING & SAMPLE DESIGN:-

Selection is procedural not judgemental samples are drawn from lists, called source list or sampling frames, which supposedly are populate enumeration of all units in the population being sampled complete enumeration of large population is invariably inaccurate sampling frames are the basis in fact for sampling in theory.

“A sample design is the theoretical basis & the practical means which we infer the characteristics of some population by generalizing from the characteristics of selectively few of the units comprising the population.

There are creation other terms that are characteristics of all sampling discussion & with which the reader should be familiar. These terms are listed & defined below.

POPULATION OR UNIVERSE :-

Population, or Universe, is the aggregate of all units possessing certain specified characteristics on which the samples seeks to draw inferences, for e.g. families with incomes within a given range.

FRAME :-

The frame describes the population in terms of sampling units. It may often be a geographical area, such as a list of city blocks or countries. Sometimes, it may even be the subscription list for a magazine. In essence, a frame lists or maps elements of the universe.

CENSUS :-

“Census” denotes a total enumeration of individuals elements, or units in a defined population.

SAMPLE :-

A sample is composed of some fraction or part of the total number of elements or units in defined population sampling, therefore is a method of selection some fraction of population.

DESIGN :-

The design describes the method by which the sample is chosen.

RANDOM :-

A mathematical term “random” means that every element in the total population has an equal chance or probability of being chosen for the sample & that each of these elements is independent of the other.

UNITS :-

Any “ population “ or “Universe” should contain some specification in terms of content units, extent & time for e g, a farmer’s household in a district in Punjab in 1975”, these is unit designation in household & time designation of the population Here extent designation is indicated, i.e. at the level of the district

ATTRIBUTE :-

It is a characteristics possessive trail of an element of a population. For e, g if in a class of 35 students 15 had dark hair, then we could say that 15 students possess the given attribute. Qualification then lies in counting how many possess this attribute & how many do not.

VARIABLE :-

In a class of 35 students we are to find age, height, income, etc, if we can say that actual variable characteristics were possessed by the sample. It then may be “actual magnitude of some variable characteristics for each sample member his age, height, & income, then qualification involves measuring the magnitude of the characteristics in each case. A variable can always be transformed into an attribute by a broad grouping, the variable age” taking values, say from 21 upwards can be turned into an attribute.

STATISTIC :-

Statistics refers to the value of a variable (or attribute) calculated from a sample taken out of a universe or population. The characteristics of a sample are called a statistics.

PARAMETER:-

Parameter is the value of a variable (or attribute) calculated from the population which is being studied. The characteristics of population are referred to as parameters.

ESTIMATING :-

One major aspect of the inferential data analysis; is the estimation of population parameters by using the descriptive statistic from a sample of population. Estimation is generalization of a statistical description of a sample to the appropriate population.

BIAS :-

The tendency to have an error in one direction is a bias.

SAMPLE ERROR :-

“Sample error “refers to error characteristics of the standard design & indicates how closely the measurement obtained from the sample is to the parameter

PRECISION:-

Precision of a sample is designed by the computation of the standard error. In other words, if repeated samples were drawn from the same universe, the consistency among the separate samples is a measure of precision.

ACCURACY :-

Ordinarily accuracy is considered distinct from precision. Precision is a measurable quantity derived from the characteristics of the sample design. Accuracy refers to unavoidable errors in measurement or estimation, probably not measurable or known.

STRATIFICATION :-

Stratification deals with the segmentation of a sample into a no of strata, such as income level, size of family unit or, in some special cases, ownership of certain household appliances.

The terms ‘population’ & ‘Universe’ are often used synonymously in social science research the universe conceptually is the total no of all units for the which the population is an operational definition. In other words, the universe is what the sample is supposed to represent, and the population is what the sample actually present after the universe as well as all farmers in rural villages, we have to adjust the definition to account for farmers who are not counted properly. at the time of interviewing or who are otherwise unavailable because they miss appointments, or are too busy working in the fields.

13.3 OBJECTIVE OF SAMPLING :-

- 1) The chief objective of sampling is to get the desired information about the universe with a prescribed reliability at the minimum cost or with the maximum reliability at the given cost. The information about the population yield by the sample is probable rather than certain in nature
- 2) The precision of estimate & the degree of reliability of estimate depend upon the sampling method adopted and the procedure of estimation

13.4 BASES AND CHARACTERISTICS OF GOOD SAMPLING :-

The choice of a sample as representative of the whole group is based upon the following assumptions.

1) **Underlying homogeneity amidst complexity :-**

Although educational phenomena's appear to be very complex in nature, so that no two students are like, a keener study has disclosed that beneath this. Fundamentally speaking, the students are similar in many respects light upon the whole groups. Thus, the units or samples selected have likeness or similarity with other units to make the sampling more scientific.

2) **Possibility of representative selection :-**

It has been shown that if a certain no of units are selected from a universe on purely random basis, every unit will have chance of being included & the sample so selected will contain all types of units, so that it may be represent live of the whole group. Each unit has an equal probability of being included in the sample. The sample data can adequately represent the census

3) **Absolute accuracy not essential :-**

The researchers must work with idea that the study which he is conducting does not require absolute & cent percent accuracy. In large scale studies, we have to depend upon averages & estimates which are considered as fairly significant in an inquiry. It is not the absolute accuracy that is needed but relative or significant accuracy. The results of sampling studies than out to be sufficiently accurate to permit valid generalization

The sampling method was used in social sciences research as early as in 1754 by A.L. Bowleg. Since then the method is increasingly being utilized. This technique has been now made many a studies possible

- 1) When the population is very large, it can be satisfactorily covered through sampling.
- 2) It saves a lot of time, energy & money
- 3) Especially, when the units of an area are homogeneous, sampling techniques is really useful.
- 4) When the data are unlimited, the use of this method is really useful.
- 5) When cent percent accuracy is not required the use of this technique becomes inevitable.
- 6) When the no of individuals to the studied is manageable, intensive study become possible.

CHARACTERISTICS OF A GOOD SAMPLE :-

- 1) A good sample is one which, within restrictions imposed by its size, will reproduce the characteristics of the population with the greatest possible accuracy
- 2) It should be free from error due to bias or due to deliberate selection of the unit of the sample.
- 3) It should be free from random sampling error It should not be selected by a procedure where there. Is a connection between the method of selection & the characteristics under consideration.
- 4) There should not be any substitution of originally selected unit by some other more convenient in any way.
- 5) It should not suffer from income plate coverage of the units selected for study ie, if should not ignore the failures in the sample in responding to the study
- 6) Relatively small samples properly selected may be much more reliable than large samples properly selected. But at the same time it is very essential that the sample is adequate in size so that it can become really reliable.
- 7) In the samples, only such units should be included, which as far as possible, are independent.
- 8) While constructing a sample, it is important that measurable or known probability sample techniques are used. This will substantially reduce the likely discrepancies.

13.5 ADVANTAGES OF SAMPLING :-

Cochran has enlisted four advantages of sampling :-

- 1) **REDUCED COST** :- If the data are collected for the entire population, cost will be very high. It is economical of cost when the data are collected from sample which is only a fraction of the population.
- 2) **GREATER SPEED** :- The use of sampling is economical of time also sampling is less time consuming than the census technique. Tabulation, analysis, etc also take much less time in the case of sample than in the case of a population.
- 3) **GREATER SCOPE** :- completed enumeration of all units of the population are not only most often impracticable, but they require highly trained personal & sophisticated equipment sample. Signifies things and personnel with a little training can collect and handle the data. There is great scope & flexibility of studies when a sample is used.
- 4) **GREATER ACCURACY** :- Sampling ensures completeness & a high degree of accuracy due to limited area of operation. In dealing with a sample the volume of work is reduced. Therefore, careful execution of field work is possible, The processing of the data is also done more

accurately, which in then produces better results. A part from these, there are a few more advantages also.

5) **ORGANISATION OF CONVENIENCE** :-Sampling involves very few organizational problems. Due to small numbers, it does not requires vast facilities. It is economical in respect of resources. The spaces & equipment required for this study are very small.

6) **INTENSIVE & EXHAUSTIVE DATA**:- As the no is limited, therefore it is possible to collect intensive & exhaustive data.

7) **SUITABLE IN LIMITED RESOURCES** :- In every society, there are more problems & less resources, particularly when the people are poor & problems uncountable. This is the method which enables the research to work even with limited resources.

8) **BETTER SUPPORT** :- Usually it is difficult for the researcher to establish support with the support between the researcher & the respondents. As the population of the study increases, the problem of supporter also increases But in a manageable sample, it is possible for the researcher to establish this meaningful support.

9) In a small sample, it becomes possible to scrutinize the data collected.

13.6 DISADVANTAGES OF SAMPLING :-

1) **CHANCES OF BIAS** :- The most common argument against the sampling method is the fact that it may involvers biased selection & thereby Itad us to draw erroneous conclusions. A bias in the sample may be caused either by faulty method of selection of individuals for the sample or the nature of phenomena itself.

2) **DIFFICULTIES IN SELECTING A TRULY REPRESENTATIVE SAMPLE** :-The results of a sample are accurate & usable only when the sample is representative of the whole group selection of a truly representative sample is very difficult particularly when the phenomena under study are of a complex nature. A no of reasons stand in the way of selecting good samples.

3) **NEED FOR SPECLAUSED KNOWLEDGE** :- The sampling method cannot be used by everybody. It requires a specialized knowledge. In sampling technique, statistical analysis & absence. For such knowledge, the researches may commit serious mistakes.

4) **CHANGEABILITY OF UNITS** :- It the units of the population are not homogenous, the sampling technique will be unscientific Although the no of cases is small, it is not always easy to stick to the selected cases especially in social sciences research. The cares of the sample may be widely. Dispersed some of them may refuse to co-operate with the

researches, & some other may be inaccessible. Because of their difficulties, all the cases may not be taken up. Sometimes the selected cases. May have to be replaced by other cases. All this introduces a change in the stipulated subjects to be studied .

5) IMPOSSIBILITY OF SAMPLING :- Sometimes the universe is too small, or too heterogeneous, so that it is not possible to draw a representative sample. In such cases, census study is the only alternative. In the studies, where a very high standard of accuracy is expected, the sampling method may be unsuitable. Even if the sample is drawn most carefully, there are always some chances of error.

13.7 SUMMARY :-

A sampling for a study is devised largely taking into view the level of accuracy & confidence in the findings of the study. Research projects differ in regard to the levels of the aspiration for accuracy & confidence in their findings (based on study of a sample). A sampling which warrants the insurance that the chances are great enough that the selected sample is sufficiently representative of the population to justify our resuming the risk of taking it as a basis for estimating the characteristics (of research concern) in the population, may be called representative sampling plan.

Sampling demands exercise of great care & caution, otherwise the results obtained may be incorrect or misleading. When the characteristics to be measured occur only rarely in the population, a very large sample is required to yield cases that will give statistically reliable information about it. Often, small samples hamper analysis of data. Since there are not enough cases for break-down tables & sub-classifications.

13.8 CHECK YOUR PROGRESS :-

- 1) Explain the meaning, characteristics & uses of sampling? (Importance of sampling).
- 2) What is sampling & what are the different types of sampling?

13.9 REFERENCES :-

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13.10 QUESTIONS:-

- 1) What do you mean by sampling?
- 2) Discuss objectives of sampling?
- 3) What are the characteristics of good sample?
- 4) Highlight Disadvantages of sampling
- 5) Analyze advantages of sampling



PROBABILITY SAMPLING

Unit structure

- 14.0 Objective
- 14.1 Introduction
- 14.2 Sampling methods
- 14.3 Probability sampling
- 14.4 Non-Probability sampling
- 14.5 Design of probability sampling
- 14.6 Probability sampling methods
- 14.7 Summary
- 14.8 Check your progress
- 14.9 Reference
- 14.10 Questions.

14.0 OBJECTIVES :-

- To make the students understand the concept of probability sampling which is empirical involving, systematic investigation with repeated trial.
- To acquaint the students with the observation of frequency series which helps to draw sampling.

14.1 INTRODUCTION

Estimate can be established through mathematical calculation NON PROBABILITY SAMPLING is that sampling procedure which does not afford every basis of estimating the probability.

14.2 SAMPLING METHODS :-

Sampling methods may be classified into two generic types :

- 1) Probability or Random sampling
- 2) Non-probability or Non-random sampling.

14.3 PROBABILITY SAMPLING :-

It is based on the theory of probability. It is also known as random sampling. It provides a non zero chance of selection for each element of the population. It's chief characteristics are :-

- i) Every member of the population has an equal chance of being included in the sample.
- ii) The probability of selection of a sample given size from a given population is also same. For e.g. If one select a sample of size 50 from a population of size of size 500, every unit out of 500 can enter into a sample with equal probability $50/500 = 1/10$. Similar, one can formulate several different samples of size 50 out of 500 members of the populations. The probability of selecting any one group of 50 is also identical for all such groups.
- iii) Probability sampling gives a representative sample and hence the findings of the sample can be generalised to draw conclusion, about the population.
- iv) It is possible to estimate sampling errors in case of probability sampling. Hence, one can state the results, with a desired level of confidence in probability terms. For e.g. one can say that sample results are acceptable with a confidence level. Say, 0.95 probability.

Probability sampling should be used when a researches wants to generalise his finding and hence desires a greater degree of accuracy in estimating population values. However, cost and time required for probability sampling may be large.

14.4 NON PROBABILITY SAMPLING :-

It is not based on the theory of probability. However simplicity convenience and low cost are the chief merits of this type of sampling. In such cases, non-random sampling methods can be used to study the required populations.

It's demerits are :-

- 1) It cannot ensure an equal chance or probability of selection to every unit of the population.
- 2) The probability of selection of each on it is unknown.
- 3) A non-probability sample may not be a representative one.
- 4) It is, therefore, not possible to estimate population parameters (values) from the results obtained from the sample.

- 5) Sampling errors cannot be estimated with any known probability. The results obtained contain sampling bias.

However nonrandom sampling is used when –

- 1) The population list is not available or incomplete.
- 2) The researcher does not aim at finding generalisations regarding population parameters. He is only interested in studying the nature of a phenomenon.
- 3) The cost of the probability sampling is too large and the researcher does not expect corresponding adequate benefits out of his study,
- 4) There is a given time for completing the study. The probability sampling may be more time-consuming & does not permit completion of work within the given time constraint.

14.5 DESIGNS OF PROBABILITY SAMPLING :

D) Following is the list of various designs of probability sampling :-

a) Simple Designs :-

- 1) Simple Random sampling (SRS)
- 2) Stratified Random sampling
- 3) Systematic, Random Sampling

b) Complex Designs :-

- 4) Cluster sampling
- 5) Area sampling
- 6) Multi-stage sampling
- 7) Random sampling with probability proportional to size
- 8) Multi-phase sampling.
- 9) Inter-penetrating sampling.

II. Non probability sampling designs are :-

- 1) Convenience Accidental sampling
- 2) Purpose sampling.
- 3) Quota sampling

4) Snowball sampling

THE PROCESS OF RANDOM SELECTION :-**1. Lottery Method :-**

Let us consider a population of size 'N' from which we want to draw a sample of size 'n'. In order to draw a random sample, no the units of the population from 1 to N, write them on paper gone on each paper, fold these papers and place them in a bowl. Mix these papers as well and use lottery method, i.e. draw 'n' papers in succession (one after the other), note down the nos. on these papers. The units in the population, which bear these numbers, constitute our sample. To this process of selection, when a no. is drawn from a b owl, it is not put back i.e., replaced. Hence, the method is called SRS without replacement. If the no. drawn are replaced, it is called SRS with replacement to either case, every unit of the population is selected in the sample with same probability 'n'.

2. Use of Random Number Tables :-

However social scientists do not actually obtain SRS by lottery method, instead they are use random no tables for selection. These tables are readily available. The nos. in these tables are randomly distributed. One can open any page & read nos. row-wise, column-wise or even diagonally. Note down the first 'n' nos. These nos. indicates the units in the populations which form your sample. For. e.g. we have a population of 200 units. Number these units from 1 to 200. Now, if we want to select a sample of 25 units, read the first 25 nos. from any page of random no. tables. If a no. is more than 200 omit it. If a no. is repeated, they omit that also. Thus, the first 25 nos. you note down constitutes your sample. It is a less number some and equally valid technique of securing a random sample.

3. Use of Computer :-

If the population is very large and if computer facilities are available, a computer can be used for drawing random sample. The computer can be programmed to print out a series of as many random nos. as a research wants to have.

Random sampling is the basis of most of the complicated sampling methods. Unfortunately when dealing with social science dates, ensuring randomness in selection is difficult. There are two general technical problems to securing randomness in a sample. One of them is related to definition of universe, the other is the mechanical manipulation of that universe in the selection process. It is not enough to define universe theoretically, it is also necessary to have a concrete description of it. For e.g. in a survey of physically handicapped persons, the team should be defined & illustrated clearly.

The various methods of sampling techniques or different sampling designs can be grouped under two broad head, random sampling & non-random sampling. Random sampling is also referred to as probability sampling since if the sampling process is random, the law of probability can be applied. It is to be remembered that the term random sample is not used to describe the data in the sample but the process employed to select the sample. Randomness is thus a property of the sampling procedure.

The most important difference between random and non-random sampling is that where as the pattern of sampling variability can be ascertained in case of random sampling, in non-random sampling, there is no way of knowing the pattern of variability in the process.

Probability Sampling Method (Random)	Non-probability sampling Method (Non-random)
a) Simple Random Sampling (unrestricted random sampling)	i) Accidental Sampling ii) Quote sampling iii) Purposive sampling iv) Convenience Sampling
b) Restricted Random sampling i) Stratified sampling ii) Cluster and Area sampling	

Bloomers & Lindquist have said – “In general sampling schemes may be classified according to two types –

- 1) Those in which sample elements are automatically selected by some scheme under which particular sample of a given size from a specified population has some known as probability of being selected; and
- 2) Those in which the sample elements are arbitrarily selected by the sample because in his judgement the elements thus chosen will most effectively represent the population.

Distinction between Probability & Non probability sampling :-

Hence according them, there are two chief methods of sampling.

- 1) The probability sampling and
- 2) The Judgment sampling

The former is largely the method in educational and psychological research because it is most amenable to the development of any theory regarding the magnitudes of sampling areas which may be expected in a given situation. In the former randomness is the fundamental element of control such designs permit the specification of the precision that is obtained; and the no. of cases necessary to provide the required precision.

Non probability designs, on the other hand, device their contact from the judgement of the investigator. For e.g. a pollster may be instructed to interview 100 persons passing a certain streets cornea, to contact by phone so many store keepers, so many housewives or so many clerks. In non-probability sampling the causes are selected on such bases as availability and interviewer judgement. Frequently, randomness is erroneously, assumed to follow from the stratification of the population into relevant sub-populations. The advantages of non-probability designs lies largely in the area of convinces, which along with the extra sample size sometimes possible for the same cost is felt to compensate for the relative risk of possible bias. Commercial polls, for instance frequently claim with same degree of empirical justification that the increase in the precision of probability sampling over non-probability sampling is too small to warrant the extra cost of a random sampling design. The fact that the actual selection is done by experience field workers is obviously responsible for their relative success frequently, on the other hand, such samples are over weighted with the co-operative, the available and so on. They depend too exclusively on uncontrolled factors and especially on the investigators insight and there is no statistical procedure permitting the determination of the margins of sampling errors.

At time, it may be possible to combine probability and non-probability sampling. This is of course, a complicated procedure which calls for a somewhat greater understanding of statistical procedures than the average student is likely to possess. It must be also remembered that complicated sampling, designs are very frequently costly and the greater precision may be obtained for a given cost by simply taking a larger sample of a standard variety,

Randomness :-

The concept of randomness has been basic to scientific observation and research. It is based upon the assumption that, while individual events cannot be predicted with accuracy, aggregate events can. The hungry the mob, the greater the apparent anarchy. It is the supreme law of unreason. Whenever a large sample of chaotic elements are taken in hand and meashalled in the order of their magnitude, an unsuspected and most beautiful team of regularity proves to have been later all along.

Randomisation has two important application in research :

- 1) Selecting groups of individuals for observations that are representative of the population about which the researcher wishes to generalize.
- 2) Equating experimental and control groups in an experienced. Assuming individuals by random assignment is the best method of providing of their equivalents.

Simple, unrestricted random sampling is the simplest (probability) sampling design, calling for nothing more than selecting the required no.

of cases of random from the specified population. It is important to note that a random sample is not necessarily an identical representation of the population. Characteristics of successive random samples drawn from the same population may differ to some degree, but it is possible to estimate their variation from the population characteristics and from each other. The variation known as sampling error, does not suggested that a mistake has been made in the process, but that with randomization, certain predictable chance variations are observed. Randomization is the most fundamental concept which underlies most of the advanced sampling designs.

14.6 PROBABILIT SAMPLING METHODS :-

1) The Simple Random Sampling :-

Simple random sampling means that every member of the sample is selected from the total population in such a manner that all members of the population have essentially the same probability of being selected. This is the most popular, basic method of sampling. It is considered the most trust worthy method of securing representative of the whole population. But it is neither arbitrary nor careless or haphazard. Random method of selection provides an unbiased cross section of the population.

Ideally this would require each population member to be assigned a numbers, then the sample would be selected from a table of random no. or some other random selection for e.g. if we wished to draw a sample of 50 individuals from a population of 600 students, we could place the 600 names in a container and blind folded, draw one name of time until the sample of 50 was selected. Still another say to select every third, fifth or tenth person until the sample is completed. This approach is also known as sampling from sequential list or sampling is also known as sampling from sequential list or sampling by fisher and tater, Tippet or Kendall and Balington – Smith – After assigning consecutive no. in any direction (horizontally, vertically or diagonally) when a number is read that corresponds with that written on a unit card, that unit is chosen for the sample of the desired size is obtained. In small instances, the selection of the sample may be a multistage process, that is some form of randomization may be performed in several of stages of the selection, until the final desired groupings are obtained.

The advantages of random sampling :-

- 1) It required only a minimum knowledge of the population in advance.
- 2) It is free of errors in classification.
- 3) It is appropriate for data analysis which includes uses of inferential statistics.
- 4) It is more represent alive of the population.

- 5) It is free from bias and prejudice.
- 6) The method is simple to use.
- 7) It is easy to assess the sampling error in this method.

Disadvantages of random sampling :-

- 1) It carries large errors for the same sample size than are found in stratified sampling.
- 2) If the units or items are widely dispersed the selection of sample becomes impossible.
- 3) If the units or items are heterogeneous in nature or of different size and nature, random sample method would not be applicable.
- 4) Lack of use of available knowledge concerning the population and lack of knowledge concerning the size of the sample units prior to their selection are some other disadvantages.
- 5) It is occasionally very difficult to have a completely cataloged universe.
- 6) Cases selected may be too widely dispersed or even impossible to contact and thus adherence to the whole sample may not be possible.
- 7) There are instances where the investigator does not want a representative sample. In some studies, such as exploratory survey which the object is to gain insight into the problem the investigator may choose as his sample only informed persons who can provide him with the maximum degree of insight into his problem.

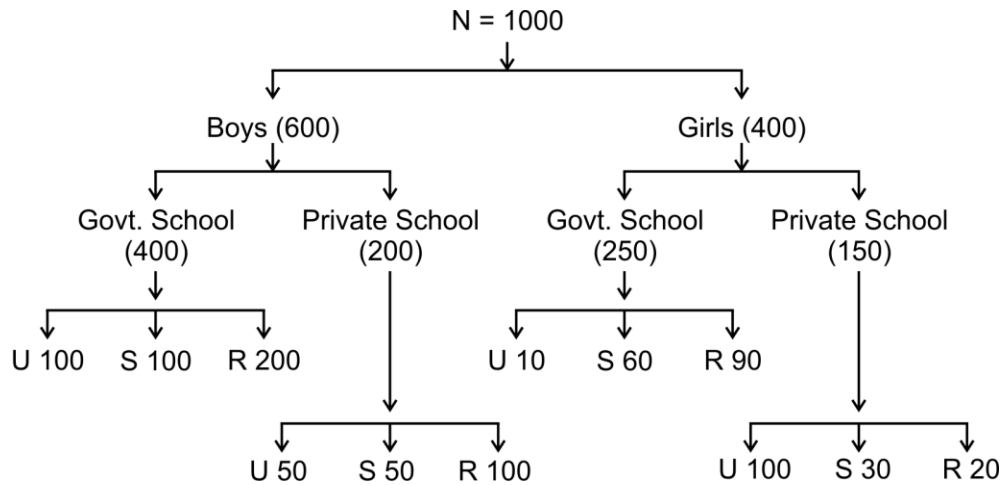
2. Stratified Sampling :-

Stratified random sampling is a refinement of simple random sampling since in addition to randomness; stratification introduces a secondary element of control as a means of increasing precision and representativeness. A stratified random sample is, in effect a weighted combination of random subsamples. If by chance there is an under proportion of one type of unit in it, it is advisable to use stratified random sampling. The population is divided into smaller homogeneous groups or strata by some characteristics and from each of these smaller homogeneous groups draw at random a predetermined no. of units. Proportional sampling enables one to achieve even greater representativeness in form each stratum in proportion to its actual size in the total population. For e.g. for drawing a representative sample from this community in respect of various occupations of the people, we shall have to find out the proportion of each occupation at group. If the proportions were 15% professional workers, 10% Managers, 20% skilled workers & 55% unskilled workers, the sample should include approximately the same proportions in order to be representative. This method is also called

combination of both random sampling & purposive selection. In the selection of strata or group, we employ purposive method, but in selecting actual units from each stratum random method is used .

The usual stratification factors are sex, age, socio-economic status educational back ground, residence, (rural or urban), occupation, political – party affiliation, religion & race. In the standardization of tests and public opinions polls, the method of stratified sampling is necessary.

The following table provides an illustration of selecting a stratified sample for a total of 1000 cases.



Process of stratifying :- Following point may be considered while constructing strata because the success of stratified sampling largely depends on the formation of strata.

- 1) First of all different variables involved in the study of the problems may be noted variables should be selected in a way that they are related to the study then the universe has to be divided into strata in the light of these variables.
- 2) The size of each stratum in the universe should be large enough to provide selection of units on random basis.
- 3) Stratification should be so constructed that there should be maximum homogeneity in the different units of strata & the units in one stratum should be similar to each other. But they should differ significantly from stratum to stratum
- 4) The strata should be clear cut & free from overlapping.
- 5) It is desirable that the no of units selected from each stratum are in the same ratio as the total no. of units in the stratum bear to the units in the whole universe. Thus, if the percentage of education in a contain community is 40, the same percentage of units will be selected from amongst the educated.

KINDS OF STRATIFIED SAMPLE :-**1) Proportional stratified sampling**

The number of units to be drawn from each stratum in the same proportion as they stand in the universe.

2) Disproportionate stratified sampling :-

An equal number of cases are taken from each stratum regardless of the size of strata in proportion to universe.

3) Stratified weighted sampling :-

It aims at removing the defects of disproportionate sample. An equal no. of units are selected from each stratum & averages are taken from each stratum but they are given weights in proportion to the size of stratum in the whole universe.

ADVANTAGES OF STRATIFIED SAMPLING :-

- 1) In random sample although every unit has an equal chance of being selected, sometimes important units are left out by chance But under stratified sampling, no significant group can remain unrepresented.
- 2) If a stratum is perfectly homogeneous selection of even a few cases from it would save the purpose.
- 3) Replacement of a unit can be done conveniently if the originally selected case is inaccessible. If a person refuses to co-operate with the survey, he can be easily substituted by another unit from the same stratum.
- 4) It is possible to select such a sample through stratification that most of the units are geographically, localised. A purely random sample fails to provide such a control and the cases randomly selected may be very widely dispersed. Concentration of units economises time and cost of survey.

DISADVANTAGES OF STRATIFIED SAMPLING :-

- 1) Bias may be caused in the sample through improper stratification owing to overlapping in the strata or disproportionate selection.
- 2) When the sizes of different strata are unequal, attainment of correct proportion becomes difficult.
- 3) Lack of accurate information on proportion of population in each category and faulty classification may be listed as some other disadvantages.

- 4) The task of stratified sampling is itself not so easy placing variables in the proper and right strata is not as easy task. It depends on the understanding and knowledge of the investigation.

CLUSTER SAMPLING :-

Generally, a sample is selected in units of one. This need not be so, especially in the field of education where it is frequently as easy to contact a whole class as it is to contact a single individual. Cluster sampling is the design in which the unit of sampling is the design in which the unit of sampling consists of multiple cases e.g. a family, a classroom a school or even a city or a school system. Rather than listing all elementary school. Children in a given city and randomly selecting 15% of these students for the sample, a researcher lists all the elementary schools in the city, selects at random 15% of the cluster of units, and uses all of the children in the selected schools at the sample. It is a variation of the simple random sample, particularly appropriate when the population to be studied is infinite where a list of the members of population does not exist, or when the geographic distribution of the individuals is widely scattered. It is also known as area sampling, as the selection of individual subjects is made on the basis of place of residence or employment. Some authors consider it synonymous with multistage sampling in which the cases to be studied are picked up at random at different stages. For e.g. if the idea is to study the problems of middle class working couples in a stage, the first stage will be to pick up a few districts in the state. The next stage will be to pick up at random a few rural and urban areas for the study. The third stage will come when from each area; a few families belonging to middle class will be picked up. The last stage will be that of selecting working couples out of these families. Thus the stage will be :-

State → Districts → Middle → Working Couples
 Urban → Class → in these
 Areas families families

This method is usually applied when the area to be covered is very wide and it is not possible to study the whole population at one stage. It is agreed, however, that a sample obtained by taking a relatively large no. of small cluster is preferable to a sample of equal size obtained on the basis of small no. of large clusters.

Thus, the cluster sampling is independent of the other kinds and classification of sampling designs, and one might sample in clusters according to a simple random sampling design a stratified random sampling design or any other sampling design.

Thus, cluster sampling is a type of sampling in which cluster of units are selected in the sample instead of elementary units is not available further with cluster sampling field weak cost is comparatively low.

However, except under some particular conditions, sampling with cluster is less efficient than sampling with element.

A sampling procedure in which the sampling unit is a cluster of elements and after selecting samples of cluster information is collected on each element in the samples cluster is called cluster sampling. For e.g. instead of selecting a sample of an individual in Tirupati from the list of all individual in Tirupati town we may select a sample of households (families) & then collect necessary information from each member of the sample households. In this case, the sampling cluster is household. In an all India survey, instead of selecting a sample of individual from entire country, we may select a sample of villages (urban blocks in towns and cities) and the conduct census in the sample villages or blocks. Here the sampling cluster is village or equivalent urban block similarly for selecting a sample of students in university hostels, we may select a sample of hostel group and collect information one each inmate of the sample rooms. In this case, the sample cluster used is the hostel room.

The sample of clusters can be selected by using anyone of the basic sampling designs. For e.g. we may select a simple random sample of clusters or a systematic sample of clusters or simple random samples of clusters from each stratum of a stratified population of clusters.

MERITS OF CLUSTER SAMPLING :-

- 1) It is economical because it is much easier and less expensive to observe clusters of units in a few schools than randomly selected, students scattered in many schools throughout the state.
- 2) It is particularly attractive from the standpoint of permitting the easy accumulation of large sample.
- 3) It is advantageous in that the loss of precision per individual case is more than compensated for by the possibility of taking larger samples for the same cost.
- 4) It is useful because it may combine the advantages of both random as well as stratified sampling.
- 5) Another advantages of this procedure is the amount of information which may be obtained concerning one or more areas

DEMETIS OF CLUSTER SAMPLING :-

- 1) It may produce a larger sampling error for each cluster may be composed of units that are line one another, which reduces the representativeness of the sample.

- 2) It is likely to introduce an element of sample bias because of the unequal size of some of the subsets selected.
- 3) It may not be possible to apply its findings to another area.
- 4) An overlapping effects taken place so that the effective no. of cases from the stand point of increasing the precision of the sample is somewhat less than the actual no. of cases involved.

AREA SAMPLING METHOD :-

This is an important form of cluster consisting of specific geographical area like a district, talukas, villages or blocks in a city are randomly drawn. As the geographical area are selected as sampling units, in such cases that sampling is called area sampling.

It is not a separate method of sampling but forms a part of cluster sampling.

In a country like India, where a state is divided into districts, districts into Talukas, and Talukas into from and village area sampling is done on the basis of this administrative unit in multistage. In multistage sampling method, sampling is carried out into two or more stages. The population is regarded as being composed of a no. of first stage sampling units. Each of them is made up of nos. of second stage unit and so forth i.e. at each stage a sampling unit is a cluster of the sampling unit is a cluster of the sampling units of the subsequent stage.

First, sample of the first stage sampling units is drawn, then from each of the selected first stage sampling unit, sample of the second stage sampling units is drawn. The procedure continues down the final sampling units a population elements. Appropriate random sampling method is adopted at each stage.

Multi stage sampling is appropriate where the population is scattered over a wider geographical area and not frame or list is available for sampling. It is also useful when a survey has to made within a limited time and cost budget.

Some of the advantages are it results in concentration of field work in compact small areas and consequently in a saving of time, labour and money. It is also more convenient, efficient and flexible than single stage sampling. It fulfills the necessity of having a sampling frame covering the entire population.

The major disadvantages of the multi-stage sampling is that the procedure of estimating sampling error and cost advantages complicate. Thus, it is difficult for non-statisticians to follow this estimation procedure.

14.7 SUMMARY :-

Probability sampling is the only approach that makes possible the formulation of determinable representative sampling plans. That is, the investigator, if he used probability, sampling can estimate the size of a sample (or size of various components of complex samples) that he will need if he wants to have a given degree of confidence that his simple finding will not differ by more than a specified amount from the finding or result that a study of total population would yield.

In non-probability sampling, there is no assurance that every element has some specifiable chance of being included in the sample. It is clear that for the non-probability type samples there is no way of estimating how much confidence may place in the sample returns as to their being within a specified margin of error.

14.8 CHECK YOUR PROGRESS :-

- 1) Explain cluster sampling.
- 2) Discuss stratified sampling.
- 3) What do you mean by simple random sample?
- 4) Explain in detail probability sampling and different methods in that sampling in it or Explain in detail probability sampling and write any three methods or two methods of sampling ?

14.9 REFERENCES :-

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14.10 QUESTIONS :-

- 1) Discuss any two methods of probability Sampling.
- 2) Explain Random and Stratified Sampling.



NON PROBABILITY SAMPLING

Unit structure

- 15.0 Objectives
- 15.1 Introduction & Meaning
- 15.2 Classification of non – probability sampling
- 15.3 Sampling and non – sampling errors
- 15.4 Summary
- 15.5 Check your progress
- 15.6 References
- 15.7 Question

15.0 OBJECTIVES:-

- To make the students aware about the forms of non-probability sampling, usefulness & error in it.

15.1 INTRODUCTION & MEANING :-

Non–probability sampling is not based on the theory of probability. This sampling does not provide a chance of selection to each population element. The only merit of this type of sampling are simplicity, convenience & low cost.

15.2 CLASSIFICATION OF NON – PROBABILITY SAMPLING

1) ACCIDENTAL SAMPLING :-

In Accidental sampling, the researcher simply reaches out & taken cases that fall to land continuing the process till such time as the sample researcher a designated size. The researcher, for e.g. may take the first 150 persons he meets on any one of the pedestrian paths of a street who are willing to be interviewed or to provide the find of information that he is seeking. In such a sample, there is no other way of estimating, the bias (difference between the average sample value & true population value)

except by doing a parallel study with a probability sample or undertaking a complete census. This type of sampling, besides being economical & convenient, can also afford a basis for stimulating insights & hypothesis, where too much accuracy is not needed or where pre-occupation is with tentative ideas to hypothesis-formulation (as in exploratory studies) an accidental sample is quite useful.

Thus, in this a researcher selects any case he comes across. For e.g., if due to wealth to study the behavior of police, the researcher stands outside the police station & asks the opinion of those who come out of the police station about police behaviour.

This method is adopted to survey quickly public opinion. In this, it is not possible to know whether the sample is representative or not.

2) JUDGEMENT OR PURPOSIVE SAMPLING :-

A judgement sample is one which is selected according to some one's personal judgement in the choice and includes only those items of the universe in the sample which he considers are most typical of the convenience. While choosing the sample, only the average items are considered & extreme items are omitted & election of the sample adjusted in accordance with the object of the enquiry, so that no significant item may be ignored.

This method is suitable :-

- 1) When only a small no. of sampling units is in the universe &
- 2) In solving everyday business problems & making public policy decisions i.e. to the urgent problems

Thus it is one of the non-probability methods of sampling. Probability samples are designed to be representative. Judgement sampling involves the selection of a group from the population on the basis of available information thought to be representative of the total population or the selection of a group by institution on the basis of a criterion deemed to be self-evident. If for any reason in the researcher's judgement, a particular subgroup or stratum is satisfactorily representative its selection illustrates the principle of judgement sampling, pilot studies could be based on such samples. They furnish the sample of what are known as the cases or typical cases.

The chief advantages are the elimination of cost & time in preparing the sample & the ability of the researcher to include certain features of stratification in the sample. Disadvantages include uncontrolled variability & bias in the estimates, strong assumptions, based upon through knowledge of the population, & elimination of the use of inferential parametric statistical tools for purpose of generalisation by & complete reliance on intuition & hunch is risky.

3) QUOTA SAMPLING :-

A quota sample is one in which the interviewer is instructed to collect information from an assigned no of or quota of individual in each of several groups, the groups being specified as to age, sex, income or other characteristics much like the strata in stratified sampling. Subject of these controls, however the individual selected in each group are left to the interviewee choice rather than being decided by probability method Quota sampling usually proceed in three stages :-

- 1) The population is classified in terms of properties known or assumed to be patient to characteristics being studied;
- 2) The preparation of the population falling into each group or class is determined on the basis of known assumed or estimated composition of the population &,
- 3) Each observer or interviewer is assigned a quota of respondents.

Quota sampling is very popular in market surveys & public opinion polls because it is cheaper per elementary sample than random sampling. It occasionally provides satisfactory results if the interviewers are carefully trained & if they follow their instructions closely.

Quota sampling is a type of stratified judgement sampling. As it uses the benefits of stratification & as it is very simple to use this sampling method, it is quite often used in practice by many agencies when sampling results are very quickly needed with small budgets.

We have seen in stratified random sampling that form a stratified population sample of prefixed size are taken from each stratum using probability sampling techniques in contrast, in quota sampling sample of prefixed size are taken from each stratum of a stratified population using judgement sampling techniques. Each enumerator of the survey is allotted a quota of units to be selected from each stratum & in quota sampling the enumerator fills his quota in each stratum by taking advantages of any information that enables him to cover his quota quickly & cheaply. He selects representative & quickly accessible unit according to his personal judgement in each stratum with prior information such as that rich people seldom live in slum & poor people are rarely found in posh localities

ADVANTAGES OF QUOTA SAMPLING TECHNIQUE ARE :

- 1) Quota sampling derive the benefits of stratification without the high field costs that might be incurred in attempt to select units at a random.
- 2) Not much technical knowledge of sampling theory is necessary to use this method of sampling.
- 3) Varying amounts of latitude can be permitted to the enumerators to select the sample quickly & cheaply.
- 4) In this technique, the personal advance knowledge & contact the enumerator has with the sampling units can be fully exploited.

5) The estimates can be obtained very quickly & cheaply.

DISADVANTAGES OF QUOTA SAMPLING TECHNIQUE ARE :-

- 1) Theory of sampling cannot be applied to quota sampling method as there do not contain any elements of probability in the selection of the sample.
- 2) Information about the precision of estimates through quota sampling methods cannot be obtained.
- 3) The reliability of the estimate is not known & hence confidence limits cannot be set for the parameters.
- 4) As such, it is dangerous to use quota samplings methods without sufficient experience in such surveys.

Suppose, it is desired to conduct a socioeconomic survey on certain group of people. Then each investigator is allowed free to choose their respondents provided this quota shall contain so many of low income & so many of each profession like employees, businessman, agriculturists etc. Each investigator can complete his field work quickly with less travelling & halting allowances & further without going through technical process of selecting random samples.

In public opinion polls in assessing political attitude to various parties & in gauging the reaction of people to a government's policy decision, quota sampling methods are very useful to get results quickly.

15.3 SAMPLING & NON – SAMPLING ERRORS :-

Since a sample survey implies the study of small population of the total universe and drawing inferences about the population, there would naturally be ascertain amount of in accuracy or errors. Such errors are known as sampling errors or sampling fluctuations. If a census is taken, sampling errors could be expected to disappear.

1) Sampling errors :-

The errors which arise due to use of sampling surveys are known as the sampling errors. Even when a sample is random one, it may not be exactly representative of the population from which it is chosen. This is because samples are seldom, if ever, perfect miniature of the populations. However, these errors can be controlled. Sampling errors are of two types – Biased & unbiased.

a) BIASED ERRORS :-

Are those which arise as a result to any bias error prejudice of the person in selecting a particular sampling method may purposive sampling method may be adopted in place of a simple random sampling method. As a result of such errors, or cumulative errors or non-compensating errors. As bias or prejudice forms a constant component of error that does not decrease in a large population as the no. in the sample increases i.e. such errors are likely to increase with as increase in the size of the sample.

b) UNBIASED ERRORS :-

Arises due to chance differences, between the members of the populations included in the sample, those not included. It is known as random sampling errors the random sampling error decreased on an average as size of the sample increases. Such error is, therefore, also known as non cumulative or compensating error.

Bias may arise due to :-

- 1) Faulty process of selection.
- 2) Faulty work during the collection of information, &
- 3) Faulty method of analysis

Faulty selection of sample may give rise to bias in a no. of ways, such as :-

- a) Purpose sampling,
- b) Selection of sample in a haphazard way,
- c) Substitution of selected item in the sample by another,
- d) Incomplete investigation or response etc, during the process of collecting the actual information in a survey (whether sample or census, certain inaccuracies may creep in. These may arise due to improper formulation of decision, problem wrongly defining the population, specifying wrong decision, securing an inadequate frame, poorly designed questionnaire, an ill trained, interviewer, failure of a respondents memory, unorganized collection procedure, faulty editing or cooling of response. Faulty methods of analysis may also introduce bias. Such bias can be avoided by adopting the proper methods of analysis.

Among the many suggestions that could help in reducing biases and improving sampling designs are –

- 1) Manageable and specific problem selection,
- 2) Intensive study, verification and reporting of methodological biases;
- 3) Systematic documentation of related research.
- 4) Greater investment in enumeration;
- 5) Effective protesting.

- 6) Use of complementary research methods and
- 7) Replication.

Non- response and substitutions are the rules of the game in large scale field surveys. As for the first problems, a good survey strategist.

- 1) Trains interviewers thoroughly in preparation for work, evaluates their performance infield and provides in services guidance.
- 2) Does intensive protesting of sampling and interviewing techniques as well as of questionnaire items and field logistics.
- 3) Matches interviewers and respondents linguistically and demographically into the extent possible.
- 4) Schedules interviewing attempts at the time of day and day of week convenience of the intended respondents.
- 5) Times interviewing to accommodate seasonal and climate conditions.
- 6) Maintains by area and
- 7) Makes rules for interviewing call backs (re-interviewing attempts) in an effort to reduce non-response role. There is no theory for substitution and strictly speaking random. Sample cannot be substituted. In practice, however, substitutions are usually obtained by;
 - a) Matching if possible, missing population units with available units of presumably similar characteristics;
 - b) Systematic or alternate random selection of geographically proximal units;
 - c) Random selection of replacements from a separate back up sample of the same population, etc.

The type of error can occur in any survey, whether it be a complete enumeration or sampling. Non-sampling errors include biases and mistakes. Some of the factors responsible for the non-sampling errors are enumerated here. Vague definition of population; vague questionnaire, vague conception regarding the information desired inappropriate statistical unit, inaccurate /inappropriate method of interview observations or measurement; errors in data processing operations such as welding, punching, verification, tabulation etc. errors committed during presentation and printing of tabulated results.

Non-sampling errors tend to increase with the sample size and required to be controlled and reduced to a minimum.

15.4 SUMMARY :-

In accidental sampling, the researcher simply reaches out and picks up the cases that call to hand continuing the process till such time as the

sample acquires a desired size. In such a sample there is, of course, no other ways of estimating the bias (difference between the average sample value and the true population value) except by doing a parallel study with a probability sample or by under taking a complete census. If one uses an accidental sample, one can only hope and pray that he is not being too grossly misled by his sample findings which constitution the basis of estimating the state of the population.

The basic objective of quota sampling is the selection of a sample that is a replica of the population with respect to which one would wish to generalize. Quota sampling, by a larger, after the insurance that diverse elements in the population will be included in the sample and that these elements will be taken account of in proportions in which they obtain in the population.

A common strategy of purpose sampling is to pick cases that are judged to be typical of the population in which one is interested. The selection of elements proceeds under the assumptions that errors of judgement in the selection will that tend to counter balance each other.

Judgment sampling has great utility in exploratory or formulative studies aiming as they do at obtaining insights that would help posing problems or formulating hypothesis for research.

15.5 CHECK YOUR PROGRESS :-

- 1) What do you mean by Quota sample ?
- 2) Discuss accidental sampling,
- 3) Analyse sampling errors.

15.6 REFERENCES :-

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15.7 QUESTIONS :-

- 1) What is non-probability sampling ?
- 2) Explain the detail Accidental, purpose and Quota sampling.



16

GRAPHIC PRESENTATION OF DATA

Unit Structure:

- 16.0 Objectives
- 16.1 Meaning of Diagram
- 16.2 Types of Diagrams
- 16.3 Graphs
- 16.4 Check your progress
- 16.5 References
- 16.6 Questions

16.0 OBJECTIVES

- To acquaint students with Diagrams and its uses.
- To make students familiar with Visual forms of presentation of data.

16.1 MEANING OF DIAGRAM:

In the previous chapter, we have seen methods of classification and tabulation which are used to present the data in a condensed form. A diagram is a visual form of presenting the tabulated data which crease a long lasting impression. The diagrams are presented in attractive ways which impress everyone. The information presented with the help of the diagram is easily understood and remembered by a common man, as compared to the tabulated data which requires a closer reading. Hence, in

newspapers, journals, advertisements, the statistical data is displayed pictorially. Because of their visual impact, diagrams are used in exhibitions, conferences and board-meetings.

Two or more sets of data can be compared with the help of diagrams. Diagrammatic representation of data saves a lot of time because a diagram can be quickly understood and can be easily interpreted. A diagram does not add any new meaning to the data but it exhibits the data more clearly and effectively. More information can be represented with the help of a table than a diagram. Diagrams provide a panoramic view of the entire data, they are more eloquent than mere figures in a tabular form and as such they are better suited for publicity.

16.2 TYPES OF DIAGRAMS:

Some common types of diagrams are:-

- (i) **One dimensional diagrams** – bar diagrams
- (ii) **Two dimensional diagrams** – squares, rectangles and circles
- (iii) **Three dimensional diagrams** – cubes, spheres, cylinders
- (iv) **Pictograms**
- (v) **Cartograms**

In this chapter, we propose to study some important diagrams.

1. Simple bar diagram:

A simple bar diagram is used to represent only one variable at a time e.g. figures representing sales, exports, production, population over a period of time.

It is a one dimensional diagram because the length of the bar represents the value of the given characteristic. The bars may be drawn vertically or horizontally. The width of all bars must be uniform and the distances between two consecutive bars should be same. The scale is considered only on y axis and it is desirable to write the respective figures at the top of each bar to know the precise value.

When a large number of items are to be compared, lines instead of bars may be drawn to accommodate all the items.

The following diagram illustrates the method.

Illustration 1:

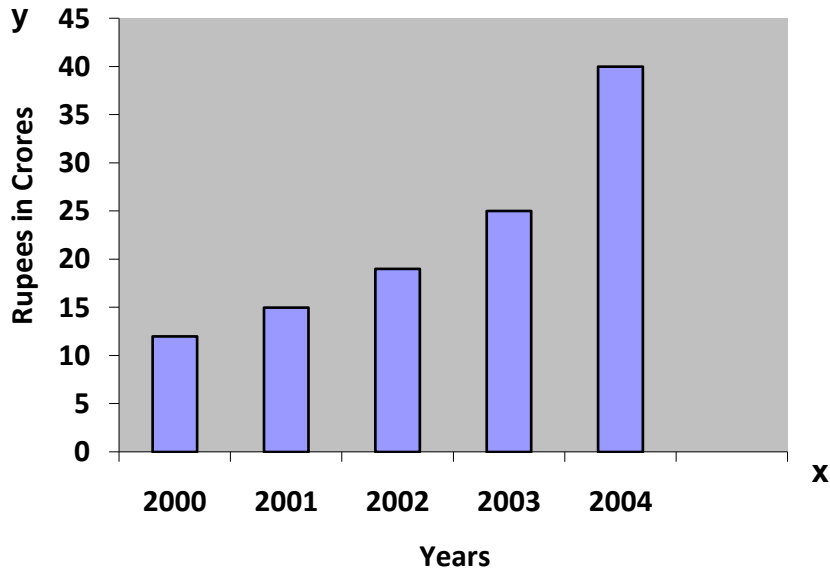
The following data refer to sales (in crores of Rs.) of a company for five years. Represent it with a Simple Bar Diagram.

Year	2000	2001	2002	2003	2004
Sales	12	15	19	25	40

Solution:

By taking years on x axis, sales (in crores of Rs.) on y axis, rectangles of equal width are drawn. The distance between successive rectangles is same. The scale on y axis is 1 cm = Rs. 5 crores.

Simple Bar Diagram



2. Multiple Bar Diagram

When two or more characteristics are to be represented simultaneously, multiple bar diagram is used. For instance, production and prices of commodities can be compared for different years or birth rates and death rates can be compared.

The characteristics are represented by a group of adjacent rectangles of uniform length such that length of the rectangles represent the respective figures. The distance between successive rectangles is constant. To distinguish between the characteristics, they may be coloured or shaded differently or symbols like dots, cross-marks etc. can be used. Using multiple bar diagrams, two or more related variables, which can not be added or where the sum is not very meaningful, are represented. In some cases, when a variable can be divided into different components and changes in the values of the components are more significant and important

than changes in the value of variable, multiple bar diagrams may be used.

Consider the following example.

Illustration 2:

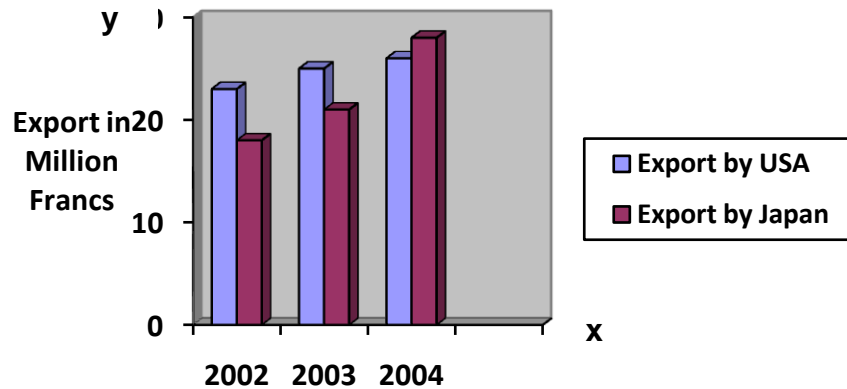
Draw a multiple bar diagram to represent the data relating to exports of cars by U.S.A. and Japan to France, for the years 2002-2004. The exports are expressed in million Francs.

Exports		
Year	U.S.A	Japan
2002	23	18
2003	25	21
2004	26	28

Solution:

The years are expressed on x axis and the exports on y axis. The rectangles are of equal width and the distance between the rectangles is uniform.

Multiple Bar Diagram



3. Subdivided Bar Diagram:

If the data contains subdivisions or components of a total, then Subdivided Bar Diagram can be used to represent these subdivisions. For instance, the number of persons can be divided into males and females or the total expenditure may be subdivided into expenditure on items like Food, Rent, Clothing etc.

A vertical bar representing the grand total is drawn first and it is divided into various parts such that height of every part represents the value of the corresponding component. Different shades, colours or designs can be used to distinguish between parts of the rectangle. The components may be rearranged such that the largest value is shown at the base and the least, at the top of the rectangle and the same order should be maintained for all the bars.

An index should be given representing the arrangement of components within the rectangle. Cumulative totals may be calculated to simplify makings of components.

Illustration 3:

Represent the following data by a subdivided bar diagram. The data represents figures of production of paper in thousand tones for the years 2002, 2003, 2004.

Types	2002	2003	2004
Printing and Writing	35	40	50
Wrapping	18	19	15
Boards	16	15	15
Special Varieties	7	5	5
Total	76	79	85

Solution:

We prepare the columns for cumulative totals to simplify the markings.

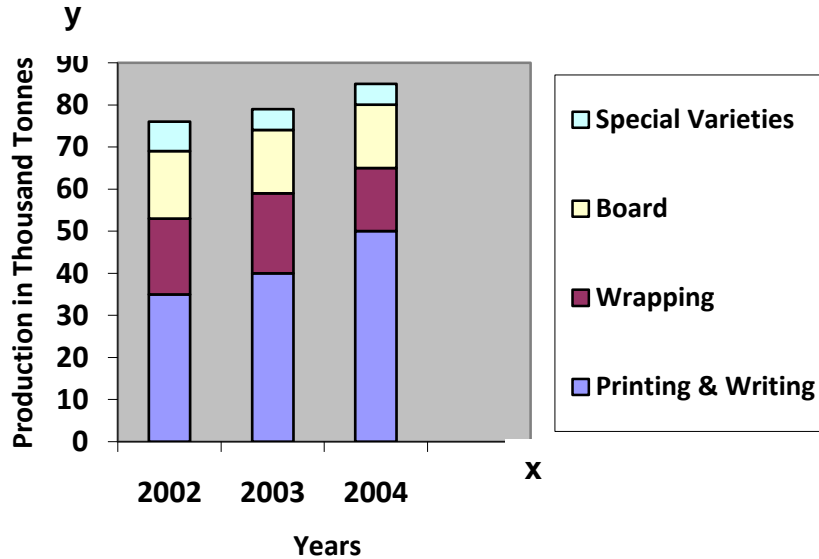
Types	2002		2003		2004	
		Cum.		Cum.		Cum.
Printing and Writing	35	35	40	40	50	50
Wrapping	18	53	19	59	15	65
Boards	16	69	15	74	15	80
Special Varieties	7	76	5	79	5	85
Total	76		79		85	

The second column for every year represents the cumulative total of production. First, three bars of equal width and heights representing total production figures 76, 79 and 85 (thousand tones) are constructed. Then the first bar, for the year 1981, is subdivided at 35, 53 and 69 so that the four parts of the rectangle represent corresponding figures, namely 35, 53 and 69 so that the four parts of the rectangle represent corresponding figures, namely 35, 18, 16 and 7 for the four types. The same method is applied for the remaining bars as well. The parts are filled in with different designs and the index is written at the right hand top corner.

Note that uniform distance is kept between successive bars. On x axis years are considered and on y axis the production figures are considered.

Note the order of the index, it is exactly opposite of the given types.

Subdivided Bar Diagram



4. Percentage Bar Diagram

Sometimes, the subdivisions of a total are expressed as percentages. Then a subdivided bar diagram with the percentages can be drawn. In this type, the total height of every bar is same, corresponding to 100 percent and is subdivided further according to percentages of different components. It helps in comparison of many components.

The following example illustrates the diagram.

Illustration 4:

The budgets of two families are given below. Represent the data by a percentage diagram.

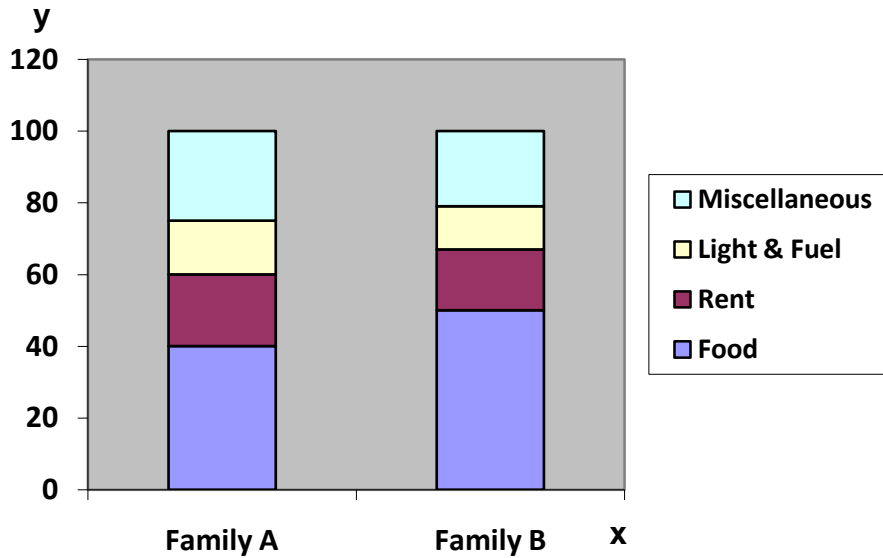
Item of Expenditure	Family A Rs.	Family B Rs.
Food	1600	1200
Rent	800	400
Light & Fuel	600	300
Miscellaneous	1000	500
Total	4000	2400

Solution:

The actual amounts are converted into percentages and cumulative percentages are obtained to simplify the markings.

Item	Family A			Family B		
	Rs.	Percent	Cum. Percent	Rs.	Percent	Cum. Percent
Food	1600	40	40	1200	50	50
Rent	800	20	60	400	17	67
Light & Fuel	600	15	75	300	12	79
Miscellaneous	1000	25	100	500	21	100
Total	4000	100	--	2400	100	--

Percentage Bar Diagram



5. Pie Diagram:

When number of subdivisions is more, a **Pie diagram** can be used instead of Subdivided Bar Diagram to have better visual impact. In general, if number of components is five or more, a Pie Diagram is preferred.

For more than one Pie Diagrams (to be drawn simultaneously for comparison). Circles are drawn with the radius proportional to square root of the total. Then the areas of circles represent the totals. The figures for components are converted into angles and then the circle is divided into different sectors using the angles. The area of each sector represents the figure for the corresponding component. The sectors are coloured or shaded differently so as to distinguish between the components.

The angles are calculated using the formula,

$$\text{Angle in Degree} = \frac{\text{Individual Value} \times 360^{\circ}}{\text{Total}}$$

The following example illustrates the Pie Diagram.

Illustration 5:

Draw a Pie Diagram to represent the following data giving profits of different partners in a firm.

Partner	Profit in Rs.
A	2200
B	2000
C	1800
D	1600
E	1400
Total	9000

Solution:

The profits of the partners are to be converted into angles by using the formula

$$\text{Angle} = \frac{\text{Individual Profit} \times 360}{\text{Total}}$$

For instance, for Partner A,

$$\text{Angle} = \frac{2200 \times 360}{9000} = 88$$

For Partner B,

$$\text{Angle} = \frac{2000 \times 360}{9000} = 80$$

Similarly the figures of profits for other partners are converted into angles which are represented below.

Partner	Profit in Rs.	Angle in Degrees
A	2200	88
B	2000	80
C	1800	72
D	1600	64
E	1400	56
Total	9000	360

Here a circle is drawn with radius proportional to $\sqrt{9000.0}$. Then by measuring angles of $80^{\circ}, 72^{\circ}, 64^{\circ}$ and 56° , the circle is divided into 5 sectors, the areas of these sectors represent the corresponding figures.

Pie Diagram

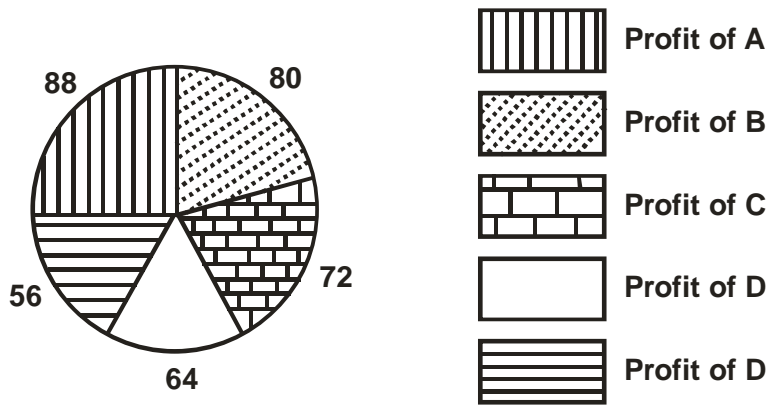


Illustration 6:

(1) Answer the following by studying the following diagram:

(a) What is the percentage rise in imports?

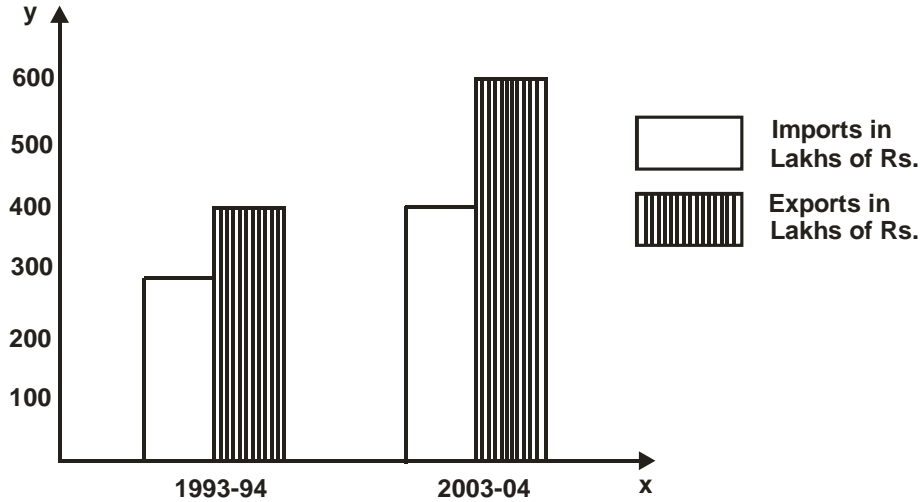
The actual rise = 100 lakhs for 300 lakhs
 \therefore The percentage = $\frac{100 \times 100}{300} = 33.33\%$

(b) What is the percentage rise in exports?

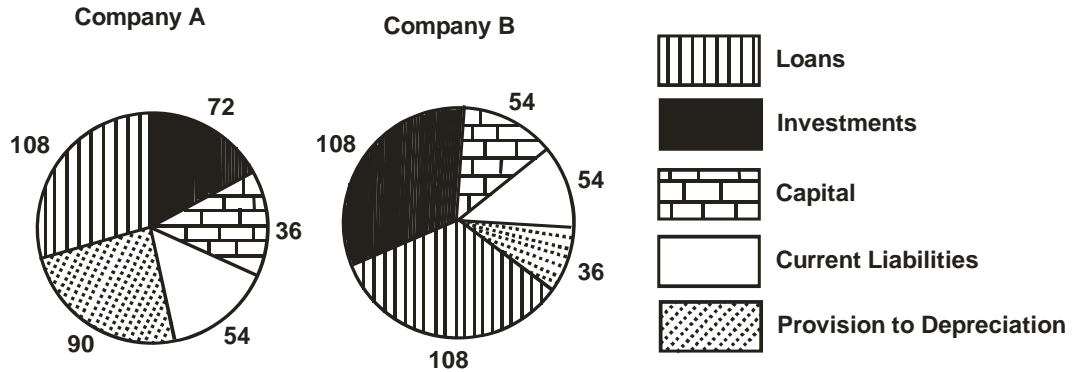
The actual rise = 200 lakhs on 400 lakhs
 \therefore The percentage = $\frac{200 \times 100}{400} = 50\%$

(c) Which two figures are identical?

The export in 1993-94 and the import in 2003-2004 are identical viz. Rs. 400 lakhs.



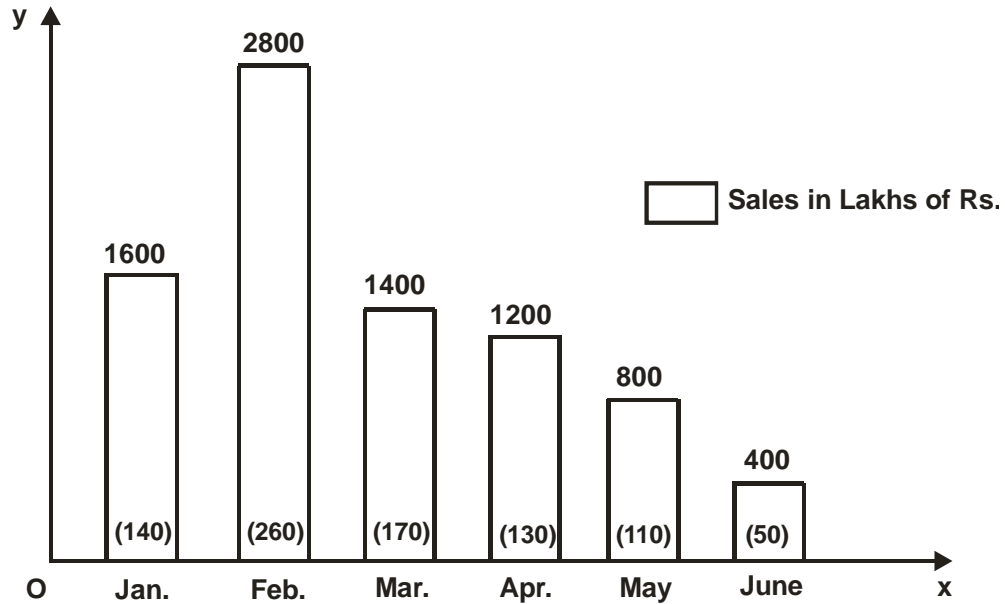
(2) Study the following Pie Diagrams representing Liabilities for Company A and B, and answer the following:



- Which company has more provision for depreciation? (Company A)
- Which types of liabilities show the same percentage?
Investments and Loans in company B (108^0 each)
- Which company has more total liabilities? (Company A).
- Which two liabilities together form 50% of the total liabilities and in which company?

Investment and Loans together form 50% of the total liabilities in Company A.

Sales of New Equity Shares in Market in 2004



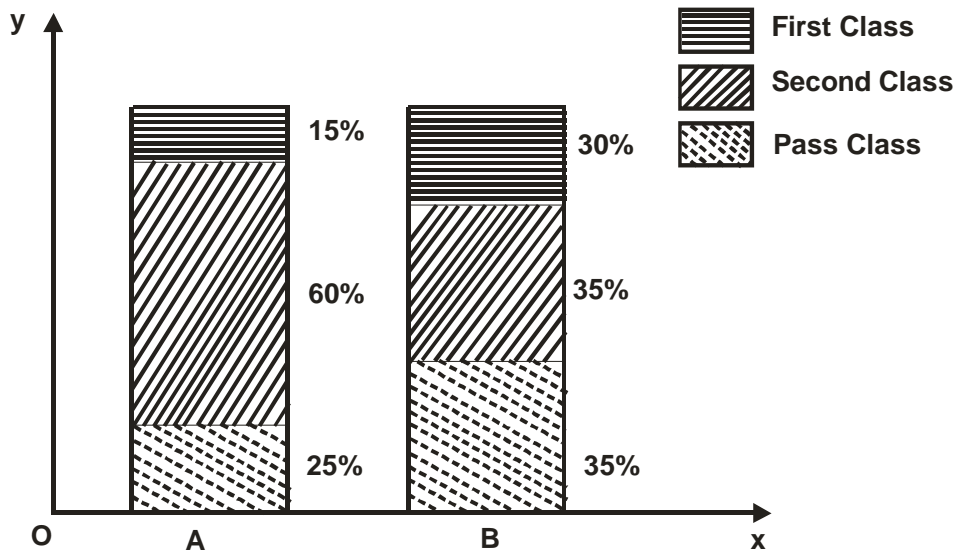
(3) Study the following diagram and answer the questions:

Note: The figures in brackets at the bottom indicate number of companies whose shares were sold.

- In which month the sales reached a maximum? (February)
- In which months the ratio of sales to the number of companies was the highest and least?

In Jan. 2004 and May 2004 the ratio was the highest and least, respectively.

(4) The following diagram gives the break-up of number of students who passed H.S.C. Examination in 2004 from two colleges A and B.



It must be remembered that diagrams are supplementary to the tabulated data, they can not substitute the tables. The diagrams provide general idea but details can be obtained from tables only. It should be noted that they supply approximate information and for accurate and exact figures, the tables must be referred. No further mathematical treatment can be given to diagrams. If data contains large figures with small differences, then the diagrams fail to indicate these small changes. In spite of these limitations, they are popularly used in presentation of statistical data.

16.3 GRAPHS

Though, graphs may be used to represent any statistical data in a condensed form, usually they are used to represent frequency distributions and time-series. The graphs are drawn on graph papers and they display a relationship between the variables represented on x and y axis. Graphs are helpful in analysis of the data. e.g., mode, median, quartiles, deciles etc. can be approximately obtained from the graphs.

Now, let us study the types which are used to represent a frequency distribution. They are

- (i) Histogram, (ii) Frequency Polygon, (iii) Frequency Curve, (iv) Cumulative Frequency Curves

(i) Histogram:

It is a graphical presentation of frequencies and the corresponding class intervals. The class intervals are taken on x axis and the respective frequencies are considered on y axis.

Adjacent rectangles are constructed by considering the width of the class interval as base and the frequency as the height. The area of the Histogram represents the distribution of total frequency over the class intervals.

The Histogram can not be constructed in case of open and class intervals. If class intervals are not of uniform length then suitable adjustments in the frequencies are to be made.

The difference between a Histogram and a Bar Diagram is that the latter is a one dimensional diagram in which the heights of the bars represent the corresponding figures and in Histogram, the height and the base, both are significant.

Consider the following example.

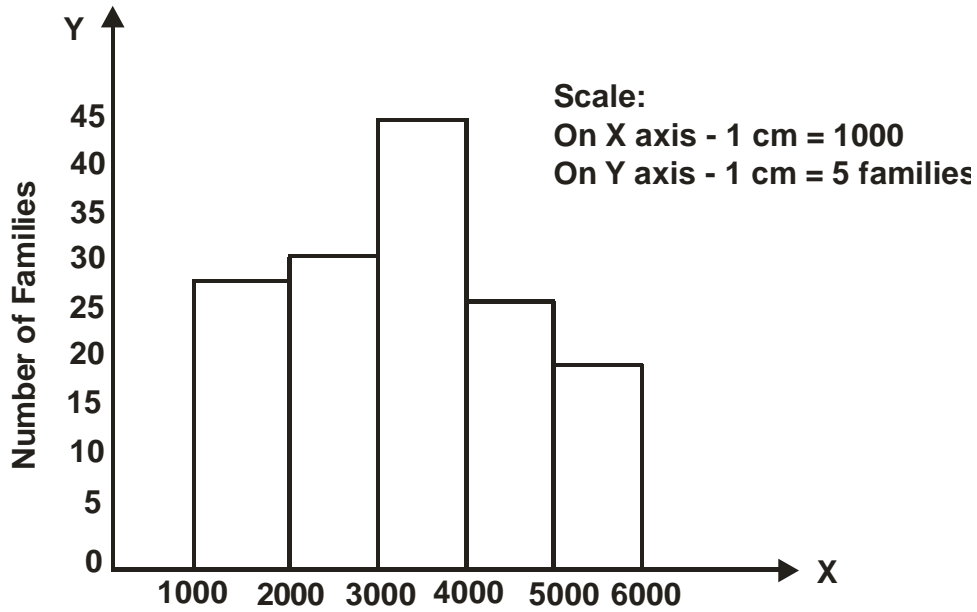
Illustration 7 :

Draw A Histogram to represent the following data:

Income in Rs.	Number of Families
1000-2000	27
2000-3000	30
3000-4000	45
4000-5000	25
5000-6000	18

Solution:

Here the class intervals (income in Rs.) are considered on x axis and the frequencies representing the number of families are considered on y axis.



For **unequal class intervals**, **frequency densities** instead of frequencies are considered on y axis and are calculated as follows:

$$\text{Frequency Density} = \frac{\text{Frequency}}{\text{Length of the Class Interval}}$$

Illustration 8:

Draw a Histogram for the following data representing age in years for 76 employees of a firm.

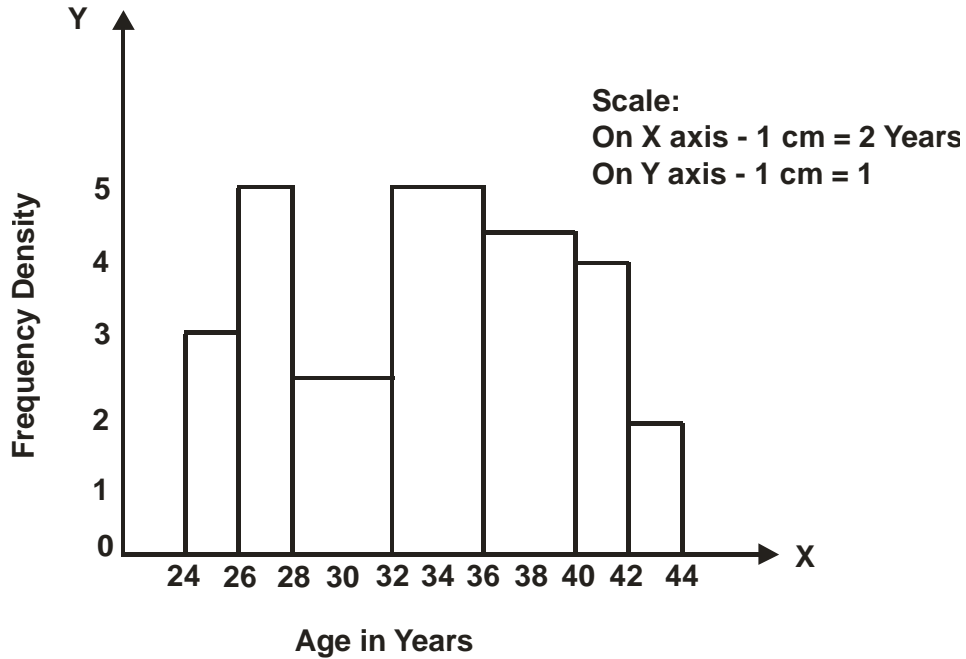
Age in years	24-26	26-28	28-32	32-36	36-40	40-42	42-44
No. of employees	6	10	10	20	18	8	4

Solution:

As the class intervals are of unequal width frequency densities are calculated as follows:

Age in years Class-interval	No. of Employees Frequency	Freq. Density = $\frac{\text{Frequency}}{\text{Length of the Class}}$
24-26	6	$\frac{6}{2} = 3.0$

26-28	10	$\frac{10}{2} = 5.0$
28-32	10	$\frac{10}{4} = 2.5$
32-36	20	$\frac{20}{4} = 5.0$
36-40	18	$\frac{18}{4} = 4.5$
40-42	8	$\frac{8}{2} = 4.0$
42-44	4	$\frac{4}{2} = 2.0$



(ii) Frequency Polygon:

Here class marks i.e. mid points of the class intervals are considered on x axis and frequencies are considered on y axis. The points are plotted on a graph paper with reference to the class marks as x co-ordinates and the corresponding frequencies as y co-ordinates. The points are then joined by straight line segments. To complete the polygon, hypothetical class intervals with zero frequencies are considered one before the first class interval and one more after the last class interval.

Consider the following illustration.

Illustration 9:

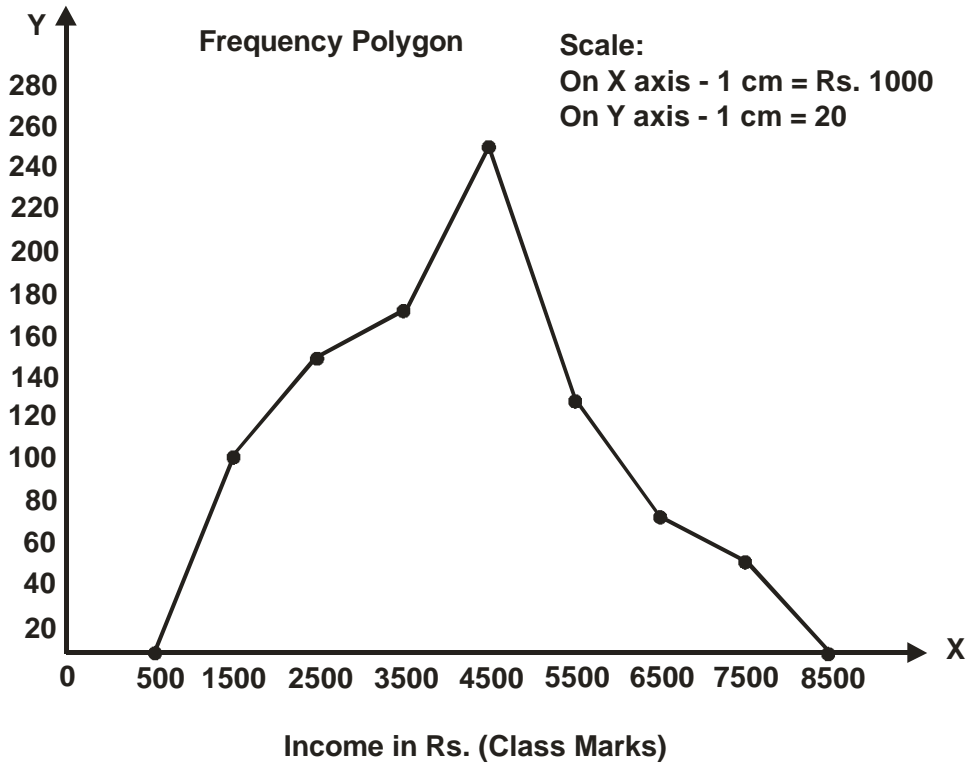
The following is the distribution of monthly salaries of 925 employees of a company. Represent the data by a Frequency Polygon.

Income in Rs.	No. of Employees
1000-2000	100
2000-3000	150
3000-4000	175
4000-5000	250
5000-6000	125
6000-7000	75
7000-8000	50
Total	925

Solution:

The class marks of the class intervals are 1500, 2500, 3500, 4500, 5500, 6500 and 7500 with the frequencies 100, 150, 175, 250, 125, 75, and 50 respectively.

The corresponding points are plotted on a graph paper and they are connected by straight line segments. To complete the polygon two hypothetical intervals with zero frequencies are considered such that one precedes the first class interval and has the class marks Rs. 500, and the other follows the last class interval with class mark of Rs. 8500. The corresponding points, namely (500,0) and (8500,0) are plotted on x axis and then by joining them with the remaining figure, the polygon is completed.



(iii) Frequency Curve:

The method of plotting the points is same as that for Frequency Polygon. The only difference is that the points are joined by a smooth, free hand curve and not by straight line segments.

The curve may be drawn in such a way that it passes through as many plotted points as possible. If there are more class-intervals a Frequency Curve is preferred to a Frequency Polygon.

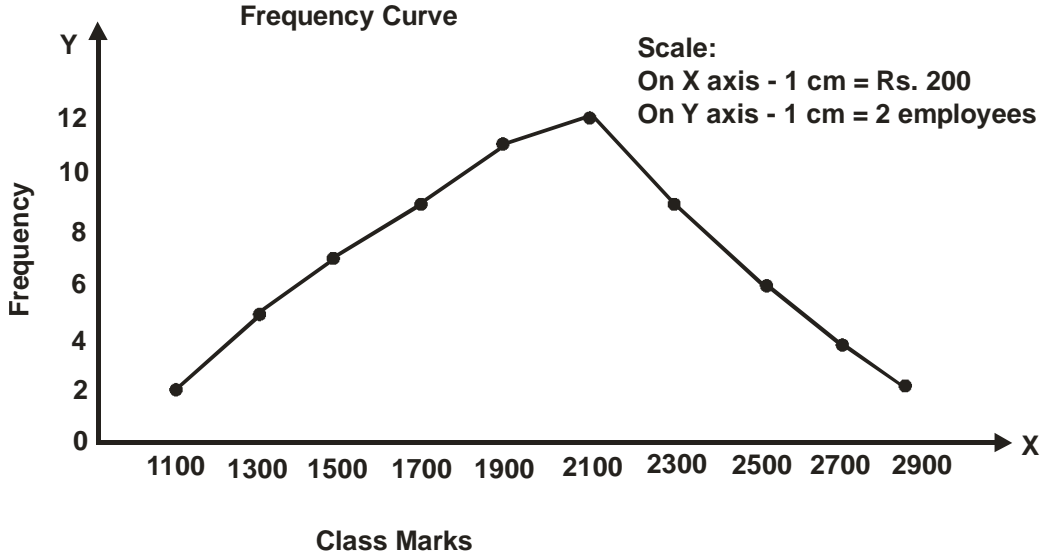
Illustration 10:

Draw a Frequency Curve for the following data:

Income in Rs.	No. of Employees
1000-1200	2
1200-1400	5
1400-1600	7
1600-1800	9
1800-2000	11
2000-2200	12
2200-2400	9
2400-2600	6
2600-2800	4
2800-3000	3

Solution:

The frequencies are considered on y axis and the class marks 1100, 1300 ---2900 are considered on x axis. The corresponding points are plotted and then a smooth free hand curve is drawn.



The first three graphs namely **Histogram**, **Frequency Curve** and **Frequency Polygon** are used to represent a **Frequency Distribution**. The next one viz. **Cumulative Frequency Curves**, as the name suggests, presents **cumulative frequencies**.

(iv) Cumulative frequency curves or Ogives:

There are two types of these curves:

(a) **Cumulative Frequency Curve-Less than Type: (Ogive – less than)** The values assumed by the variable (for discrete variables) or the upper class limits (for continuous variables) are considered on x axis and the corresponding cumulative frequencies (less than) are taken on y axis. The points are plotted and a smooth free hand curve is drawn.

(b) **Cumulative Frequency Curve-More than type: (Ogive – more than)** By taking, the values of the variable (discrete variable) or the lower class limits on x axis and by considering the respective 'more than' cumulative frequencies on y axis, the points are plotted. Then a free hand curve is drawn.

Illustration 11:

Draw a cumulative frequency curve 'less than' for the following data:

Monthly Income	No. of Families
----------------	-----------------

in Rs.	
1500-1700	70
1700-1900	100
1900-2100	120
2100-2300	150
2300-2500	100
2500-2700	60

Solution:

To plot the points we prepare a table of upper class limits and the corresponding less than cumulative frequencies as follows:

Income in Rs. Less than	Cumulative Frequency Less than
1700	70
1900	$70 + 100 = 170$
2100	$170 + 120 = 290$
2300	$290 + 150 = 440$
2500	$440 + 100 = 540$
2700	$540 + 60 = 600$

Now the points corresponding to upper class limits on x axis and the cumulative frequencies on y axis are plotted e.g. (1700, 70), (1900, 170)... upto (2700, 600) and then the curve is drawn. The curve is extended upto the x axis by considering one more upper class limit, namely 1500 with cum. Freq. zero. i.e. (1500, 0).

Cumulative Frequency Curve (Less than)

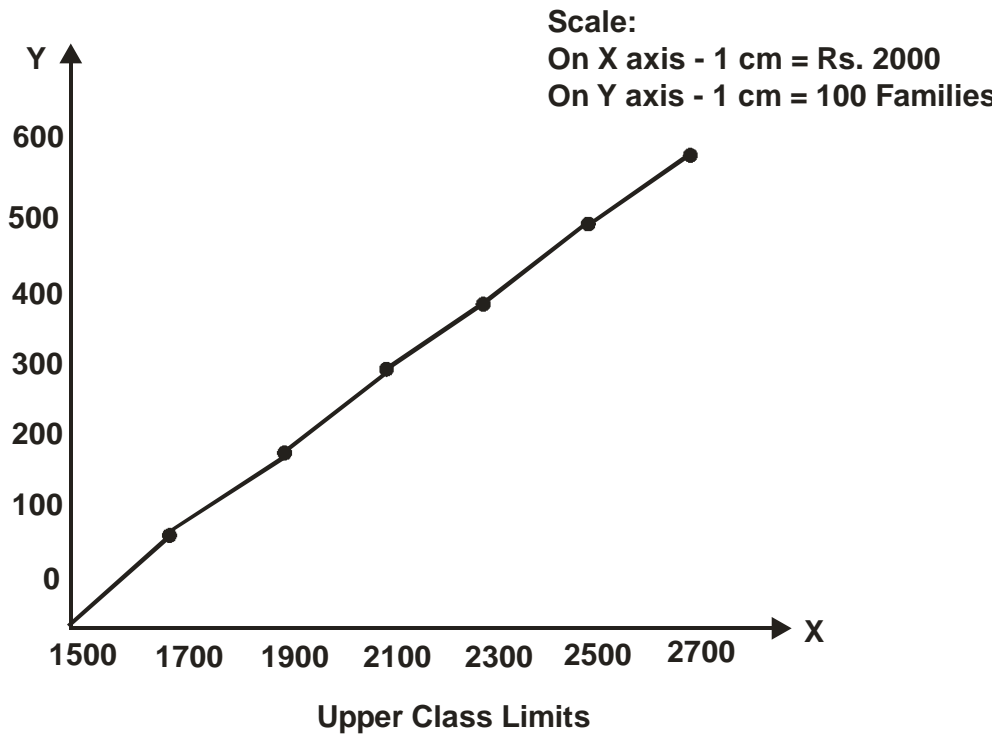


Illustration 12:

Draw a Greater than Cumulative Frequency Curve for the following data:

Age in Years Less than	No. of Persons
10	15
20	30
30	53
40	75
50	100
60	110
70	115
80	125

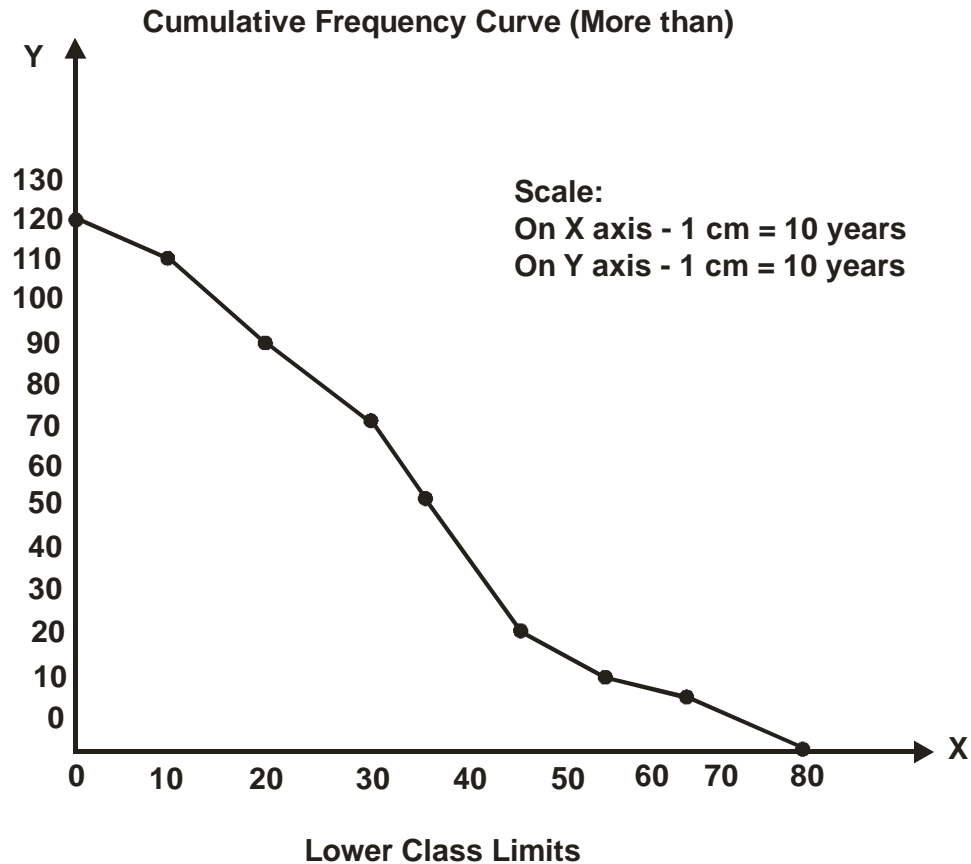
Solution:

The given data, first of all, is to be converted into an ordinary frequency distribution and then the 'greater than' cumulative frequencies are calculated, because the given frequencies are Cum. Frequencies 'less than' type.

Age in Years	No. of Persons	No. of Persons
--------------	----------------	----------------

	f	Cu. Freq. Greater than type
0-10	15	125
10-20	$30 - 15 = 15$	$125 - 15 = 110$
20-30	$53 - 30 = 23$	$110 - 15 = 95$
30-40	$75 - 53 = 22$	$95 - 23 = 72$
40-50	$100 - 75 = 25$	$72 - 22 = 50$
50-60	$110 - 100 = 10$	$50 - 25 = 25$
60-70	$115 - 110 = 5$	$25 - 10 = 15$
70-80	$125 - 115 = 10$	$15 - 5 = 10$
Total	125	

By considering the co-ordinates (0, 125), (10, 110), (20, 95), (30, 72), (40, 50), (50, 25), (60, 15) and (70, 10) the points are plotted. One more additional point (80, 0) is also considered and then a smooth curve is drawn.



The cumulative frequency curves can be used to obtain x co-ordinate when y co-ordinate is given and also to find y co-ordinates when x co-ordinate is known. We will discuss it when we will study the measures of central tendency.

16.4 CHECK YOUR PROGRESS:

- 1) What do you mean by diagrams?
- 2) Draw Bar diagram and Histogram.
- 3) Draw Pie-chart.

16.5 REFERENCES :

- 1) Borwankar P.V. – Research Methodology Seth Publisher 1995.

16.6 QUESTIONS :

- 1) Give a Graphic presentation on frequency Polygon & Ogive.
- 2) Give a graphic presentation of Histogram and Pie-chart.



17

MEASURES OF CENTRAL TENDENCY

Unit Structure:

- 17.0 Objectives
- 17.1 Introduction & Meaning
- 17.2 Types of Average
- 17.3 Summary
- 17.4 Check your progress
- 17.5 References
- 17.6 Questions

17.0 OBJECTIVES

- To acquaint students with statistical terms.
- To familiarize students with Mean, Median & Mode for presenting data.

17.1 INTRODUCTION & MEANING

One of the objectives of the analysis of data is to get one single value which can describe characteristics of the entire mass of the data, which can be considered as representative of the entire distribution. A value satisfying this criterion is a **central value** or an **“average”**.

In practice, the word **“average”** is used with different meanings. For instance, an average student, average height of boys, average Hindi film, average actor, average income, etc. In some cases, we use the term **“average”** to denote a mediocre type e.g. average student, average actor, average film, etc. In some other cases by the expression “average” we mean “typical” or “usual” e.g. average Indian, average housewife etc. In statistical terms the average refers to a value of obtained by a specific process like average height or average income.

In Statistics, the average is representative or typical value of the data. It usually lies somewhere near the centre of the group and that is why the averages are termed as measures of Central Tendency or Central Value. It depicts the main characteristics of the data. Large volumes of data cannot be easily understood or remembered. So a single value, summarizing prominent features of the data is needed.

If two or more sets of data are to be compared, it is not possible to compare each and every item. So, we require one figure, representing the entire data in condensed form. For example, average salaries of employees of two companies of same type can be compared. Suppose these are Rs. 2,500 and Rs. 2,150. The employees of the second company can demand a raise in salary based on these results, or suppose, average marks at the terminal examination of students of two divisions of F.Y.B.Com. are 65.2 and 45.8 respectively. Then, some arrangement of special coaching can be made for students of second division. Thus, averages can facilitate inter-comparison of different characteristics.

While drawing conclusions, care has to be taken to study the number of forces affecting the data. For instance, in the previous example of students of two divisions, the divisions might have been formed according to marks at H.S.C. examination and the first

division may have students with higher percentage, which explains the average marks of 65.2 at terminal examination. Another point to be noted is the same type of measure must be used to compare two or more sets of data.

Requisites of a Good Average:

1. It should be easy to understand and easy to calculate.
2. It should be based on all observations.
3. It should be capable of further algebraic treatment.
4. It should not be affected by extreme values.
5. It should not be affected much by sampling fluctuations.

17.2 TYPES OF AVERAGES

The averages can be classified into two groups – **mathematical averages and positional averages.**

The **mathematical averages** are based on all observations and they are calculated using mathematical formulae. The averages are:

- (i) Arithmetic Mean
- (ii) Geometric Mean
- (iii) Harmonic Mean

However, we will study only the first two averages.

The **Positional averages** are based on only some of the observations and are located at a specific place in the sets. They are also called “**measures of location**”. They are:

- (i) Median
- (ii) Mode

Let us study these measures in detail.

Arithmetic Mean:

The most popular measure of central tendency is Arithmetic mean. It is the arithmetic mean, which is referred to by a common man as an “average”.

In simple terms, the mean is computed by dividing sum of all observations by the number of observations.

For ungrouped data (where frequency distribution is not formed)

If there are n observations in the set and these represent different values $x_1, x_2, x_3, \dots, x_n$ of the variate x , then the arithmetic mean, denoted by \bar{x} , is calculated as follows.

$$\bar{x} = \frac{\text{Sum of the Observations}}{\text{Number of the Observations}}$$

$$= \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

If we denoted the sum $x_1 + x_2 + x_3 + \dots + x_n$ as $\sum x$,

$$\bar{x} = \frac{\sum x}{n}$$

Note: We may choose any constant as the value of C .

Daily Wages in Rs. (Class-Interval)	Number of Workers f	Class Marks x	u	fu
50 – 55	10	52.5	0	0
55 – 60	22	57.5	1	22
60 – 65	30	62.5	2	60
65 – 70	20	67.5	3	60
70 – 80	12	75.0	4.5	54
80 – 100	6	90.0	7.5	45
Total	100			241

Now, $N = \sum f = 100$, $\sum fu = 241.0$, $A = 52.5$ and $C = 5$

The formula is

$$\bar{x} = A + C \times \left[\frac{\sum fu}{N} \right]$$

$$= 52.5 + 5 \times \left[\frac{241.0}{100} \right]$$

$$= 52.5 + 12.05 = 64.55 = \text{Rs. } 64.55$$

So, the average daily wages are Rs. 64.55

Merits of Arithmetic Mean:

- (i) It is easy to understand and easy to calculate.

- (ii) It is rigidly defined, so that a unique answer is obtained.
- (iii) It is based on all the observations, which can be seen from the formula $\bar{x} = \frac{\sum x}{n}$
- (iv) Further mathematical treatment is possible in case of arithmetic mean. For instance, mean for the combined group can be calculated knowing means of individual groups.
- (v) If number of items and their average are known, the sum of the values of these items can be directly obtained.
- (vi) As sum of the deviations of the values from the arithmetic mean is zero, it balances the values on either side of it. So, it is better representative than any other average.
- (vii) It is less affected by sampling fluctuations and so it has a sampling stability.

Demerits of Arithmetic Mean:

- (i) As its computation requires all values, if some values are not known, it can not be calculated.
- (ii) It is a value which may not be present in the data. That is, there may not be even one item whose value coincides with value of the arithmetic mean.
- (iii) Sometimes, it may give absurd results like the average number of students per class is 50.4.
- (iv) It is affected by extreme values, i.e. those, which are either too large or too small.

e.g. the mean of 50, 75, 65, 57, 48 is 59.

If we consider the last observation as 480 instead of 48, i.e. the mean of 50, 75, 65, 57 and 480 is 145.5.
- (v) In case of open end class intervals, the arithmetic mean can not be computed, unless some assumption about size of class intervals is made.

MEDIAN:

Median is an important measure of **location**. When the raw or ungrouped data are arranged in ascending or descending order, the **middle observation** or the arithmetic mean of two middle observations is the **median**. The median can be obtained without any formula as follows.

(i) For Ungrouped Data:

If x_1, x_2, \dots, x_n are n observations, arranged in order, then median is defined as Median = $\left(\frac{n+1}{2}\right)$ th observation if n is an odd number = arithmetic mean of $\left(\frac{n}{2}\right)$ th observation and $\left(\frac{n}{2} + 1\right)$ th observation if n is even.

Illustration 1:

Find median for the following set of observations 53, 42, 30, 55, 75, 50, 32, 39, 62.

Solution:

First arrange the values in ascending order as 30, 32, 39, 42, 50, 53, 55, 62, 75.
Now, $n = \text{no. of observations} = 9$

So, the middle observation is the fifth observation. Hence, median = 50.

Illustration 2:

Find median for the following data containing ten observations. 93, 32, 47, 55, 78, 65, 95, 100, 86, 70.

Solution:

First arrange the data in descending order as 100, 95, 93, 86, 78, 70, 65, 55, 47, 32. Now as the number of observations is ten, an even number, there is no single middle observation. But the pair (78, 70) can be considered as the middle pair.

So, median = average (arithmetic mean) of the pair = $\frac{78 + 70}{2} = 74$

Hence, median is 74.

(ii) For Grouped Data:

Consider the case of discrete variate.
Median is defined as the value of the variable, for which cumulative frequency exceeds $\frac{N}{2}$ where N represents the total number of observations.

Illustration 3:

Find median for the following data representing the ages in years of children.

Age in Years	3	4	5	6	7	8	9	10
No. of Children	14	20	40	54	40	18	7	7

Solution:

We prepare the table of cumulative frequencies “less than” type.

Age x	No. of Children f	Cumulative Frequency (less than) Cf
3	14	14
4	20	34
5	40	74
6	54	128
7	40	168
8	18	186
9	7	193
10	7	200
Total	200	

$$\text{Here, } N = \sum f = 200 \therefore \frac{N}{2} = \frac{200}{2} = 100$$

By comparing 100, with the cumulative frequencies, we get 128 as the first cumulative frequency exceeding 100 i.e. $\frac{N}{2}$. The value of x, corresponding to the cumulative frequency 128 is 6, which gives the median value.

So, the median is 6.

Continuous Variate Case:

Now, consider the case when the variate is continuous expressed with the help of class intervals.

Firstly, the median class is located as the one for which the cumulative frequency exceeds $\frac{N}{2}$.

The following procedure is followed.

Let l_1 = lower class limit of the median class

l_2 = upper class limit of the median class

f = frequency of the median class

cf = cumulative frequency of the premedian class

Now, median is calculated using the formula,

$$\text{Median} = l_1 + \frac{l_2 - l_1 \left[\frac{N}{2} - cf \right]}{f}$$

Now consider the following example.

Illustration 4:

Calculate the median for the following data:

Monthly Income in Rs.	No. of Families
1500 – 1700	70
1700 – 1900	100
1900 – 2100	120
2100 – 2300	150
2300 – 2500	100
2500 - 2700	60

Solution:

We prepare the table of cumulative frequencies to locate the median class.

Monthly Income in Rs.	No. of Families	Cumulative Frequency
1500 – 1700	70	70
1700 – 1900	100	170
1900 – 2100	120	290
2100 – 2300	150	440
2300 – 2500	100	540
2500 – 2700	60	600
Total	600	

Now, $N = \sum f = 600$, an even number $\frac{N}{2} = 300$

By comparing $\frac{N}{2}$, that is, 300, with the cumulative frequencies, find the first cumulative frequency exceeding 300. It is 440, so the corresponding class interval 2100 – 2300 is the median class.

Here, $l_1 =$ lower class limit = 2100

$l_2 =$ upper class limit = 2300

$f =$ frequency = 150

$cf =$ cumulative frequency of the previous class = 290

Substituting these values in the formula,

$$\text{Median} = l_1 + \frac{l_2 - l_1 \left[\frac{N}{2} - cf \right]}{f}$$

$$\begin{aligned}
 &= 2100 + \frac{2300 - 2100}{150} \frac{300 - 290}{150} \\
 &= 2100 + \frac{200}{150} \frac{10}{150} = 2100 + \frac{2000}{150} \\
 &= 2100 + 13.3333 = 2113.3333
 \end{aligned}$$

So, the median income is Rs. 2113.33

Illustration 5:

Find the median for the following data:

Class Interval	5-9	10-14	15-19	20-24	25-29	30-34	35-39
Frequency	8	18	27	21	10	8	7

Solution:

First we take the class intervals exclusive type, by adding $\frac{10-9}{2} = 0.5$ to the upper class limits and subtracting 0.5 from the lower class limits. So, the new classes with class boundaries are 4.5 – 9.5, 9.5 – 14.5 and so on. The following table is prepared to find cumulative frequencies and the median class.

New Class Interval	Frequency	Cumulative Frequency
4.5 – 9.5	8	8
9.5 – 14.5	18	26
14.5 – 19.5	27	53
19.5 – 24.5	21	74
24.5 – 29.5	10	84
29.5 – 34.5	8	92
34.5 – 39.5	7	99
Total	99	

Now, $N=99$ and $\frac{N}{2} = \frac{99}{2} = 49.5$

After comparing 49.5 with the cumulative frequencies, as 53 exceeds 49.5, the median class is 14.5 – 19.5.
 $l_1 = 14.5, l_2 = 19.5, f = 27, cf = 26$

Using the formula,

$$\begin{aligned} \text{Median} &= l_1 + \frac{l_2 - l_1 \left[\frac{N}{2} - cf \right]}{f} \\ &= 14.5 + \frac{19.5 - 14.5 \quad 49.5 - 26}{27} \\ &= 14.5 + \frac{5 \quad 23.5}{27} = 14.5 + \frac{117.5}{27} \\ &= 14.5 + 4.35 = 18.85 \end{aligned}$$

Hence, median is 18.85

Merits of Median:

- (i) It is easily understood and the calculations are also simple. In some cases, it can be obtained by mere inspection.
- (ii) It is not affected by extreme values.
- (iii) It is a value which exists in the data in many cases.
- (iv) For attributes, median can be calculated.
- (v) If some extreme values are not known and the total number of observations is known, median can be obtained.
- (vi) When the distribution of the data is not symmetrical, median is an appropriate average.
- (vii) Median can be located graphically with the help of ogives.
- (viii) The sum of the absolute deviations of the values from the median is minimum.

Demerits of Median:

- (i) It is not based on all observations so it may not be a good representative of the data in some situations.
- (ii) It is affected by sampling fluctuations.
- (iii) The median is not capable of further mathematical treatment.
- (iv) Its calculation requires prior arrangement of the data in ascending or descending order.
- (v) For continuous variate case, the formula is obtained on the assumption of uniform distribution of frequencies over the class intervals. This assumption may not be true.

MODE:

The **mode** is defined as the value of a variable which occurs most frequently. It is a value which is repeated maximum number of times or with highest frequency. So, mode is considered as the most typical average. Graphically, it is the value on x-axis corresponding to the peak of the frequency curve.

If the data are ungrouped, mode can be obtained from inspection as the value with the maximum frequency. If we want to calculate the most common height for a group of students or the most common size of ready made shirts we have to consider the mode as the average. In market surveys, to know consumers' Preference, mode is considered as the most suitable average.

For ungrouped data, for small sets mode can be found by inspection. But for grouped data, mode is calculated with the help of interpolation formula. If a distribution has two or more values of maximum frequency, then the distribution is known as bimodal, trimodal or multimodal.

Ungrouped Data:

Mode is determined by observing the given set of values and then locating the one which is repeated maximum number of times.

Illustration: 7

Following are the marks of 15 students in a certain test. Find the modal marks.

18, 22, 25, 42, 39, 35, 25, 33, 34, 25, 29, 37, 35, 25 and 40

Solution:

As the marks 25 are repeated maximum number of times, that is 4 times out of 15 observation. The modal marks are 25.

Now consider,

Grouped Data – Discrete Variate Case

Here mode can be obtained as the value of the variable with the maximum frequency.

Illustration 8:

Find the mode for the following data, representing size of ready made pants.

Size of pants in cms	60	65	70	75	80	85	90
No. of Pants	11	15	25	40	20	15	10

Solution:

Here the variable x is the size in cms and the frequency f is the number of pants. As the size 75 cms has the maximum frequency of 40, it is the modal size.

So, the modal size of pants is 75 cms.

Let us consider,

Grouped Data – Continuous Variate Case

If the distribution has only a single maximum frequency, the mode can be calculated as follows:

First of all, modal class is located as the class interval with the maximum frequency.

Let l_1 = lower class limit of the modal class

l_2 = upper class limit of the modal class

f_1 = frequency of the modal class

f_0 = frequency of the pre-modal class

f_2 = frequency of the post-modal class

Then mode is given by

$$\text{Mode} = l_1 + \frac{l_2 - l_1}{f_1 - f_0 + f_1 - f_2} \cdot (f_1 - f_0)$$

But $f_1 - f_0 + f_1 - f_2 = 2f_1 - f_0 - f_2$

So mode can also be calculated as,

$$\text{Mode} = l_1 + \frac{l_2 - l_1}{2f_1 - f_0 - f_2} \cdot (f_1 - f_0)$$

Illustration 9:

Find the mode for the following data:

Income in Rs.	200-400	400-600	600-800	800-1000	1000-1200
No. of Persons	16	34	60	37	13

Solution:

Here the variable is the income in Rs. and the frequency is the no. of persons. The maximum frequency is 60, so that the modal class is 600-800, corresponding to the maximum frequency 60.

l_1 = lower class limit of the modal class = 600

l_2 = upper class limit of the modal class = 800

f_1 = frequency of the modal class = 60

f_0 = frequency of the pre-modal class = 34

f_2 = frequency of the post-modal class = 37

$$\begin{aligned} \text{Mode} &= l_1 + \frac{l_2 - l_1}{2f_1 - f_0 - f_2} \cdot (f_1 - f_0) \\ &= 600 + \frac{800 - 600}{120 - 34 - 37} \cdot (60 - 34) \\ &= 600 + \frac{200}{49} \cdot 26 \\ &= 600 + 106.1225 = 706.1224 \approx \text{Rs. } 706.12 \end{aligned}$$

So the modal income is Rs. 706.12

Merits of Mode:

- (i) It is easy to understand and easy to calculate.
- (ii) By definition, it is the most typical or representative value.
- (iii) Mode is not affected by values which are too large or too small.
- (iv) It is an appropriate average in qualitative data.
- (v) It can be obtained graphically from a histogram.
- (vi) It can be calculated in open end class intervals or in those cases where the neighbourhood of point of concentration is known.

Demerits

- (i) It is not rigidly defined. A distribution may be bimodal and multimodal.
- (ii) It is not based on all observations.
- (iii) It is affected by sampling fluctuations.
- (iv) It is not capable of further mathematical treatment.

17.3 SUMMARY

The definitions of arithmetic, mean, geometric mean, median and mode are different in the sense that, means are mathematical averages and the other two are positional averages.

The arithmetic mean and geometric mean are based on all observations while median and mode are not. This fact can be a disadvantage to mean, because if only one item is not known, then mean can not be obtained.

As calculations of means require all observations, they are affected by extreme values. But median and mode are not affected by extreme values.

All the measures, except geometric mean, are easy to understand and easy to calculate. Median and mode can be found by inspection, in ungrouped data. But for grouped data, all these measures require some calculations.

In case of open end class intervals, arithmetic mean and geometric mean can not be calculated, but median and mode can be computed for open end classes as well. The arithmetic mean and geometric mean are capable of further algebraic treatment, but no such treatment is possible in case of median and mode. Usually, as arithmetic mean satisfies most of the requisites of a good average, it is most widely used.

17.4 CHECK YOUR PROGRESS

- 1) Explain Mean.
- 2) Discuss Median.
- 3) Highlight Mode and its demerits.

17.5 REFERENCES

- 1) Borwankar P.V. – Research Methodology Seth Publisher 1995.

17.6 QUESTIONS

- 1) Discuss measures of central tendency
- 2) Give the merits and demerits of median and mode.



MEASURES OF DISPERSION

Unit Structure:

- 18.0 Objectives
- 18.1 Introduction & Meaning
- 18.2 Range
- 18.3 Quartiles
- 18.4 Mean Deviation
- 18.5 Standard Deviation
- 18.6 Check your progress
- 18.7 References
- 18.8 Questions

18.0 OBJECTIVES

- To introduce students with quantitative method of data collection.
- To enable students to apply statistical terms in social research.

18.1 INTRODUCTION AND MEANING

We have studied various measures of central tendency such as mean, median, mode in the previous chapter. But they are not adequate to describe the distribution. For instance, consider the following sets of observations:

Set A: 35, 37, 34, 38 and 46 with mean 38

Set B: 10, 90, 45, 12 and 33 with mean 38

Set C: 38, 38, 38, 38, and 38 with mean 38

All the sets have the same mean 38, but if the values in the sets are observed carefully, it can be seen that in set C, the average 38 completely represents the distribution; in set A, only one value is represented by the average and in set B, average 38 represents none of the values. Also, the variation of the items is nil in set C and is maximum in set B.

Thus, it is quite clear that in addition to averages, some additional information about the variation of items is required, to know the extent to which the values vary from one another and from central value.

A measure of spread of scatter of the data is called a measure of variation or dispersion.

The measures of dispersion can give us idea about reliability of the averages. When the dispersion is less, the average is more reliable so that it is a better estimate of the population average, and if, the dispersion is more, the average is not a good representative of the data.

The measures of dispersion determine the extent of variation in the data, by which, some steps can be taken to control the variability. For instance, in factories quality control techniques can be applied to control the variation.

The measures of dispersion can be used to compare two or more distributions. The one with less dispersion is more consistent or homogeneous and the one with more dispersion is less consistent.

The study of dispersion leads to further advanced techniques in analysis such as Statistical Quality Control, Cost Control, Inventory Control, etc.

Requisites of a Good Measure of Dispersion:

- (i) It should be easy to understand and easy to calculate.
- (ii) It should be rigidly defined.
- (iii) It should be based on all the observations.
- (iv) It should be capable of further algebraic treatment.
- (v) It should not be affected much by extreme values.
- (vi) It should have sampling stability.

There are two types of measures of dispersion.

- (a) Absolute Measures giving actual extent of scatter of the data and
- (b) Relative Measures expressed as pure numbers, independent of the unit of measurement.

Corresponding, to each absolute measure of dispersion, a relative measure can be defined which can be used to compare two or more distributions. Now, let us study these measures.

18.2 RANGE

It is defined as the difference between the maximum and minimum values. It is an absolute measure.

$$\text{Range} = \text{Maximum} - \text{Minimum}$$

If we consider the set A,B,C, mentioned earlier.

$$\text{Range for Set A} = 46 - 34 = 12$$

$$\text{Range for Set B} = 90 - 10 = 80$$

$$\text{Range for Set C} = 38 - 38 = 0$$

So, for the sets A,B,C, even though the means are the same, the ranges are quite different.

Illustration 1:

The following are the prices in Rs. of different brands of television sets. Find the range of prices.

Rs. 17850, 16990, 17500, 19850, 16650, 19300

Solution:

$$\begin{aligned} \text{Here, Range} &= \text{Maximum Price} - \text{Minimum Price} \\ &= 19850 - 16650 = 3200 \end{aligned}$$

So, the range of prices is Rs. 3200.

2) Coefficient of Range :

It is a relative measure of dispersion and is defined as,

$$\text{Coefficient of Range} = \frac{\text{Maximum} - \text{Minimum}}{\text{Maximum} + \text{Minimum}}$$

Thus, it is a ratio of the difference and the sum of maximum and minimum values. Being a ratio, it is independent of the unit in which the original variable is measured.

Illustration 2:

Find the coefficient of range for the following data relating to prices of shares of "ABC" company during a week.

Rs. 25.75, 23.10, 23.50, 29.25, 24.50

Solution:

The maximum price = Rs. 29.25

The minimum price = Rs. 23.10

$$\begin{aligned} \text{Coefficient of Range} &= \frac{\text{Maximum} - \text{Minimum}}{\text{Maximum} + \text{Minimum}} \\ &= \frac{29.25 - 23.10}{29.25 + 23.10} = \frac{6.15}{52.35} \\ &= 0.1175 \end{aligned}$$

The range and coefficient of range are used to measure the variation in prices of commodities, shares, temperatures, rainfall, etc. over a time period. The range is used to measure variations which are highly sensitive like gold and silver prices. In day-to-day life, question like “How many answer papers are assessed in a week? Or How many marks are expected in a particular paper? Or How much profit does a shopkeeper make per day? Are always answered in the form between, two extreme value.

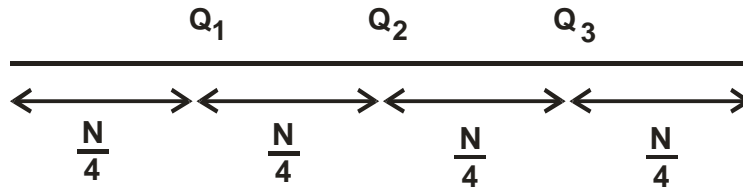
But statistically it is represented by single number which is interval between maximum all minimum value called as range.

Merits of Range:

- (i) It is easy to understand and easy to compute.
- (ii) It is rigidly defined.
- (iii) For small sample size, range is a good measure.
- (iv) It is affected by extreme values and its value changes from sample to sample.

18.3 QUARTILES

Quartiles are not measures of central tendency but they represent three values dividing the entire distribution of data into four equal parts. As the calculations are similar to that for median, we consider Quartiles along with median. The quartiles are called first quartile Q_1 , second quartile Q_2 and the third quartile Q_3 . Quartiles occupy specific positions in the distribution of data. if we arrange all N observations in order, then the quartiles Q_1, Q_2 and Q_3 are three points such that they divide the distribution into four equal parts, each consisting of $\frac{N}{4}$ observations.



The figure shows four parts, containing $\frac{N}{4}$ observations and three values Q_1, Q_2 and Q_3 .

The number of observations less than Q_1 is $\frac{N}{4}$

The number of observations less than Q_2 is $\frac{N}{2}$

The number of observations less than Q_3 is $\frac{3N}{4}$

For continuous distribution, using interpolation formula:

(i) Consider the First Quartile Q_1

The first quartile class is located as the one for which cumulative frequency exceeds $\frac{N}{4}$. After locating the class interval,

l_1 = lower class limit of the first quartile class,

l_2 = upper class limit of the first quartile class,

f = frequency of the first quartile class,

cf = cumulative frequency of the class preceding the first quartile class, and Q_1 is calculated using the formula

$$Q_1 = l_1 + \frac{l_2 - l_1 \left[\frac{N}{4} - cf \right]}{f}$$

(ii) The Second Quartile Q_2 coincides with the median.

$$Q_2 = l_1 + \frac{l_2 - l_1 \left[\frac{N}{2} - cf \right]}{f}$$

(iii) Consider the Third Quartile Q_3

The required class interval is obtained by comparing the cumulative frequency with $\frac{3N}{4}$ and then finding the class for which cumulative frequency exceeds $\frac{3N}{4}$.

l_1 = lower class limit of the third quartile class,

l_2 = upper class limit of the third quartile class,

f = frequency of the third quartile class,

cf = cumulative frequency of the class preceding the third quartile class.

Q_3 is calculated as

$$Q_3 = l_1 + \frac{l_2 - l_1 \left[\frac{3N}{4} - cf \right]}{f}$$

Note: There are 25% of the total observation which lie below Q_1 . 50% of the observation are below Q_2 and 75% are below Q_3 . So, there are 50% observations in between Q_1 and Q_2 , and so Q_1 and Q_3 are the limits within which middle 50% of the observations lie.

Illustration 6:

Find the three quartiles for the following data:

Daily Wages in Rs.	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55
No. of Workers	12	28	36	50	25	18	16	10	5

Solution:

We prepare the table for cumulative frequencies.

Daily Wages in Rs.	No. of Workers f	Cumulative Frequency less than
10-15	12	12
15-20	28	40
20-25	36	76
25-30	50	126
30-35	25	151
35-40	18	169
40-45	16	185
45-50	10	195
50-55	5	200
Total	200 = N	

For Q_1 , consider $\frac{N}{4} = \frac{200}{4} = 50$

From the table as 76 is greater than 50, the required class interval is 20-25.

Now, $l_1 = 20, l_2 = 25, f = 36, cf = 40$

$$Q_1 = l_1 + \frac{l_2 - l_1 \left[\frac{N}{4} - cf \right]}{f}$$

$$= 20 + \frac{25 - 20 \quad 50 - 40}{36}$$

$$= 20 + \frac{5 \quad 10}{36}$$

$$= 20 + 1.3889 = 21.39$$

So, the first quartile is Rs. 21.39.

Now, for Q_2 , consider $\frac{N}{2} = \frac{200}{2} = 100$

By comparing 100, with the cumulative frequencies, as 126 exceeds 100, the required class is 25-30.

Now, $l_1 = 25, l_2 = 30, f = 50, cf = 76$

$$Q_2 = l_1 + \frac{l_2 - l_1 \left[\frac{N}{2} - cf \right]}{f}$$

$$= 25 + \frac{30 - 25 \quad 100 - 76}{50}$$

$$= 25 + \frac{5 \quad 24}{50} = 25 + \frac{120}{50}$$

$$= 27.4$$

So, the second quartile is Rs. 27.4.

Now, for Q_3 , consider $\frac{3N}{4} = \frac{3 \times 200}{4} = 150$

By comparing 150, with the cumulative frequencies, as 151 exceeds 150, the required class is 30-35.

Now, $l_1 = 30, l_2 = 35, f = 25, cf = 126$

$$\begin{aligned}
 Q_3 &= l_1 + \frac{l_2 - l_1 \left[\frac{3N}{4} - cf \right]}{f} \\
 &= 30 + \frac{35 - 30 \quad 150 - 126}{25} \\
 &= 30 + \frac{5 \quad 24}{25} = 30 + \frac{120}{25} \\
 &= 30 + 4.8 = 34.8
 \end{aligned}$$

So, the third quartile is Rs. 34.8.

Limitation:

- (i) It can not be calculated for open end classes.
- (ii) It does not take into account the deviations of individuals items from a measure of central tendency.
- (iii) It is not based on all the observations.

3) Semi-inter-quartile-range or quartile deviation:

It is defined as follows:

$$\text{Semi - inter - quartile Range} = \frac{Q_3 - Q_1}{2}$$

The semi-inter-quartile range considers only the middle 50% of the observations and it ignores the first and the last quarter. It is an absolute measure. The quartile deviation also measures the average amount by which the two quartiles Q_1 and Q_3 differ from median.

4) Coefficient of quartile deviation:

It is a relative measure and is defined as

$$\text{Coefficient of Q.D.} = \frac{Q_3 - Q_1}{Q_3 + Q_1}$$

As, it is a ratio, it is a pure number, so that it can be used to compare two or more distributions.

Illustration 3:

Find the quartile deviation for the following data of pocket allowances (Rs.) of 15 student. Also find the coefficient of quartile deviation.

Set A (Rs.): 34, 45, 53, 42, 39, 35, 40, 51, 57, 52, 47, 62, 55, 50, 63

Solution:

Arrange the sets in ascending order of magnitude as

Set A: 34, 35, 39, 40, 42, 45, 47, 50, 51, 52, 53, 55, 57, 62, 63

Here, n = the total no. of observation = 15

$$Q_1 \text{ is } \left(\frac{n+1}{4} \right)^{\text{th}} \text{ observation} = 4^{\text{th}} \text{ observation}$$

$$\therefore Q_1 = \text{Rs. } 40$$

$$Q_3 \text{ is } 3 \left(\frac{n+1}{4} \right)^{\text{th}} \text{ observation} = 12^{\text{th}} \text{ observation}$$

$$\therefore Q_3 = \text{Rs. } 55$$

$$\text{Quartile Deviation} = \frac{Q_3 - Q_1}{2} = \frac{55 - 40}{2} = 7.5$$

$$\begin{aligned} \text{Coefficient of Quartile Deviation} &= \frac{Q_3 - Q_1}{Q_3 + Q_1} = \frac{55 - 40}{55 + 40} \\ &= \frac{15}{95} = 0.1579 \end{aligned}$$

Now consider the quartile deviation for grouped data.

Illustration 4:

Calculate quartile deviation for the following distribution of ages of 800 persons. Also find the coefficient of quartile deviation.

Age in Years	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60
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No. of Persons	50	70	100	180	150	120	70	60
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Solution:

As it is a continuous distribution, first prepare the following table to obtain cumulative frequencies and to locate the required class intervals.

Age in Years	No. of Persons	Cumulative Frequency (Less than)
20-25	50	50
25-30	70	120
30-35	100	220
35-40	180	400
40-45	150	550
45-50	120	670
50-55	70	740
55-60	60	800
Total	800	

Here, $N = \sum f = 800$

a) For Q_1 , consider $\frac{N}{4} = 200$. As 220 is the first cumulative frequency greater than 200, the required class for Q_1 is 30-35.

Now $l_1 = 30, l_2 = 35, f = 100, cf =$ cumulative freq. of previous class = 120.

$$\begin{aligned}
 Q_1 &= l_1 + \frac{l_2 - l_1 \left[\frac{N}{4} - cf \right]}{f} \\
 &= 30 + \frac{35 - 30 \quad 200 - 120}{100} \\
 &= 30 + \frac{50 \quad 80}{100} = 30 + \frac{400}{100} \\
 &= 34 \text{ yrs.}
 \end{aligned}$$

b) For Q_3 , consider $\frac{3N}{4} = 600$. As 670, is the first cumulative frequency exceeding 600, the required class interval for Q_3 is 45-50.

Now, $l_1 = 45, l_2 = 50, f = 120, cf = 550$

$$\begin{aligned}
 Q_3 &= l_1 + \frac{l_2 - l_1 \left[\frac{3N}{4} - cf \right]}{f} \\
 &= 45 + \frac{(50 - 45)(600 - 550)}{120} \\
 &= 45 + \frac{5 \cdot 50}{120} = 45 + \frac{250}{120} \\
 &= 45 + 2.08 = 47.08 \text{ years}
 \end{aligned}$$

$$\begin{aligned}
 \text{Quartile Deviation} &= \frac{Q_3 - Q_1}{2} \\
 &= \frac{47.08 - 34}{2} = \frac{13.08}{2} \\
 &= 6.54 \text{ years}
 \end{aligned}$$

$$\begin{aligned}
 \text{Coefficient of Quartile Deviation} &= \frac{Q_3 - Q_1}{Q_3 + Q_1} \\
 &= \frac{47.08 - 34}{47.08 + 34} = \frac{13.08}{81.08} \\
 &= 0.1613
 \end{aligned}$$

So, the quartile deviation is 6.54 years and coefficient of quartile deviation is 0.1613.

Merits of Quartile Deviation:

- (i) It is simple to understand and easy to calculate.
- (ii) As it is based on middle 50% of the observations, it is not affected by extreme values. So, it is useful in erratic data.
- (iii) It can be calculated for open end classes.
- (iv) The quartile deviation can be obtained for qualitative data which can not be measured but can be ranked.

Limitations:

- (i) It is not based on all observations.
- (ii) It is not capable of further mathematical treatment.

- (iii) It is affected by sampling fluctuations.
- (iv) It does not consider the observations in the first and last quarter.

However, it gives a rough idea about the scatter of the data and it is a better average than range.

18.4 MEAN DEVIATION

The range or quartile deviation do not take into account, the deviations from the central value. The mean deviation considers these differences in absolute values and averages these differences.

Thus, mean deviation, in which is an absolute measure is defined as the arithmetic mean of absolute values of deviations of all the observations taken from the mean, median or mode. Mean deviation from median is minimum.

For Ungrouped Data

$$a) \text{ M.D. from mean} = \frac{\sum |x - \bar{x}|}{n}$$

$$b) \text{ M.D. from median} = \frac{\sum |x - \text{Median}|}{n}$$

$$c) \text{ M.D. from mode} = \frac{\sum |x - \text{Mode}|}{n}$$

Where n represents total number of observations.

For Grouped Data, $N = \sum f$

$$a) \text{ M.D. from mean} = \frac{\sum f |x - \bar{x}|}{N}$$

$$b) \text{ M.D. from median} = \frac{\sum f |x - \text{Median}|}{N}$$

$$c) \text{ M.D. from mode} = \frac{\sum f |x - \text{Mode}|}{N}$$

2) Coefficient of Mean Deviation:

It is a ratio of the mean deviation and the measure from which the deviations are considered.

Being a relative measure of dispersion, it is a pure number, independent of the unit of measurement of the variable. Hence, it can be used to compare two or more sets of data. It is defined as follows:

$$a) \quad \text{Coefficient of M.D. from mean} = \frac{\text{M.D. from Mean}}{\text{Mean}}$$

$$b) \quad \text{Coefficient of M.D. from median} = \frac{\text{M.D. from Median}}{\text{Median}}$$

$$c) \quad \text{Coefficient of M.D. from mode} = \frac{\text{M.D. from Mode}}{\text{Mode}}$$

Illustration 1:

Find the mean deviation from mode and the corresponding coefficient of mean deviation for the following data:

Income in Rs.	800-1000	1000-1200	1200-1400	1400-1600	1600-1800
No. of Persons	16	34	60	37	13

Solution:

First calculate mode as follows:

Here the modal class is 1200-1400 as the corresponding frequency 60 is the maximum frequency.

Now, $l_1 = 1200, l_2 = 1400, f_1 = 60, f_2 = 37, f_0 = 34$

$$\begin{aligned} \text{Mode} &= l_1 + \frac{l_2 - l_1}{2} \frac{f_1 - f_0}{f_1 - f_0 - f_2} \\ &= 1200 + \frac{1400 - 1200}{2} \frac{60 - 34}{60 - 34 - 37} \\ &= 1200 + \frac{200}{2} \frac{26}{-11} = 1200 + \frac{5200}{-49} \\ &= 1200 + 106.12 = 1306.12 \end{aligned}$$

So that modal income is Rs. 1306.12

Now, prepare the following table to calculate $\sum f|x - \text{Mode}|$.

Income in Rs.	No. of Persons	X	$ x - \text{Mode} $	$f x - \text{Mode} $
800 – 1000	16	900	406.12	6497.92
1000 – 1200	34	1100	206.12	7008.08
1200 – 1400	60	1300	6.12	367.20
1400 – 1600	37	1500	193.88	7173.56
1600 – 1800	13	1700	393.88	5120.44
Total	160			26167.20

No, $\sum f|x - \text{Mode}| = 26167.2, N = 160$

$$\text{M.D. from mode} = \frac{\sum |x - \text{Mode}|}{n} = \frac{26167.2}{160} = \text{Rs. } 163.545$$

$$\begin{aligned} \text{Coefficient of M.D. from mode} &= \frac{\text{M.D. from Mode}}{\text{Mode}} = \frac{163.545}{1306.12} \\ &= 0.1252 \end{aligned}$$

Merits of Mean Deviation

- i) It is rigidly defined.
- ii) It is easy to understand.
- iii) It is based on all the observations.
- iv) Its value is minimum when calculated from median.
- v) It is less affected by extreme values.
- vi) As it takes into account deviations from averages it is more scientific than range or quartile deviation.

Limitations:

- i) It requires more calculations for continuous variables.
- ii) It ignores the negative signs for deviations and only absolute values are considered.

18.5 STANDARD DEVIATION

It is defined as the positive square root of the arithmetic means of the squares of the deviations of the observations from the arithmetic mean. It is denoted by σ (sigma). It is an absolute measure.

(a) For ungrouped Data

If x_1, x_2, \dots, x_n are n observations then $\bar{x} = \frac{\sum x}{n}$

$$\text{and } \sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

The alternative formula

$$\sigma = \sqrt{\frac{\sum x^2}{n} - \bar{x}^2}$$

(b) For Grouped Data

If x_1, x_2, \dots, x_n are n distinct values of a variable with frequencies f_1, f_2, \dots, f_n then

$$\bar{x} = \frac{\sum fx}{N}, \text{ where } N = \sum f \text{ and } \sigma = \sqrt{\frac{\sum f (x - \bar{x})^2}{N}}$$

The alternative formula is

$$\sigma = \sqrt{\frac{\sum fx^2}{N} - \bar{x}^2}$$

For continuous variate, x_1, x_2, \dots, x_n are the class marks.

Note: There are two possibilities for value of \bar{x} . They are (i) \bar{x} is integer and (ii) \bar{x} is not an integer. Any one of the two formulae can be used in any case. But usually, the first formula is used when \bar{x} is an integer and the alternative formula is used when \bar{x} is not an integer, to simplify the calculations. Now consider some examples.

Illustration 1:

Find standard deviation for the following data:

Class Interval	0-10	10-20	20-30	30-40	40-50
Frequency	11	15	25	12	7

Solution:

The variable is a continuous variable so x represents the class marks of the class intervals i.e. x values are 5, 15, 25, 35 and 45.

Prepare the following table for the product term fx, fx^2 to obtain mean and S.D.

Class Interval	Frequency	Class-mark	fx	fx^2
0-10	11	5	55	275
10-20	15	15	225	3375
20-30	25	25	625	15625
30-40	12	35	420	14700
40-50	7	45	315	14175
Total	70		1640	48150

$$N = \sum f = 70$$

$$\sum fx = 1640$$

$$\bar{x} = \frac{\sum fx}{N} = \frac{1640}{70} = 23.4286$$

As it is not an integer, we use the following formula for standard deviation σ .

$$\sigma = \sqrt{\frac{\sum fx^2}{N} - \bar{x}^2}$$

$$\text{Now, } \sum fx^2 = 48150, \bar{x} = 23.4286, N = 70$$

Substituting these values, in the formula

$$\sigma = \sqrt{\frac{\sum fx^2}{N} - \bar{x}^2}$$

$$= \sqrt{\frac{48150}{70} - 23.4286^2}$$

$$= \sqrt{687.8571 - 548.8993} = \sqrt{138.9578}$$

$$= 11.7880$$

So, the standard deviation is 11.788.

Illustration 2:

Find standard deviation for the distribution of weights of 90 children.

Weight in kgs.	20-25	25-30	30-35	35-40	40-45
No. of Children	11	15	24	26	14

Solution:

We prepare the following table to calculate the product terms fx and fx^2 .

Weight in kgs	No. of Children	x	fx	fx^2
20-25	11	22.5	247.5	5568.75
25-30	15	27.5	412.5	11343.75
30-35	2	32.5	780.0	25350.00
35-40	26	37.5	975.0	36562.50
40-45	14	42.5	595.0	25287.50
Total	90			104112.50

$$\therefore \sum fx = 3010 \text{ and } N = 90, \sum fx^2 = 104112.5$$

$$\bar{x} = \frac{\sum fx}{N} = \frac{3010}{90} = 33.4444$$

The standard deviation is given by

$$\begin{aligned} \sigma &= \sqrt{\frac{\sum fx^2}{N} - \bar{x}^2} \\ &= \sqrt{\frac{104112.5}{90} - 33.4444^2} \\ &= \sqrt{1156.8055 - 1118.5278} = \sqrt{38.2777} \\ &= 6.1869 \end{aligned}$$

Hence, the standard deviation is 6.1869.

It can be observed that if the class marks are expressed as fractions or if the class intervals are more, the calculations become lengthy and tedious.

Merits and demerits of standard Deviation

Merits of standard Deviation.

- 1) It is rigidly defined.
- 2) It is based on all the observations.

- 3) It is not affected much by sampling fluctuations.
- 4) It is amicable to further mathematical treatment.

Demerits:

- 1) It is not easy to understand and easy to calculate
- 2) As it consider the sum of the squares of deviations of items from the mean. The items away from mean gets more weight age than those near the mean. Thus, standard deviation gives more weight age to extreme value.

18.6 CHECK YOUR PROGRESS

- 1) What do you mean by Range?
- 2) What is Mean Deviation?
- 3) Explain Quartile deviation.

18.7 REFERENCES

- 1) Borwankar P.V. – Research Methodology Seth Publisher 1995.

18.8 QUESTION

- 1) What is standard deviation? What are it merits and demerits?
- 2) What is mean deviation? Discuss its as merits and demerits.



MEASURES OF DISPERSION

Unit Structure:

- 18.0 Objectives
- 18.1 Introduction & Meaning
- 18.2 Range
- 18.3 Quartiles
- 18.4 Mean Deviation
- 18.5 Standard Deviation
- 18.6 Check your progress
- 18.7 References
- 18.8 Questions

18.0 OBJECTIVES

- To introduce students with quantitative method of data collection.
- To enable students to apply statistical terms in social research.

18.1 INTRODUCTION AND MEANING

We have studied various measures of central tendency such as mean, median, mode in the previous chapter. But they are not adequate to describe the distribution. For instance, consider the following sets of observations:

Set A: 35, 37, 34, 38 and 46 with mean 38

Set B: 10, 90, 45, 12 and 33 with mean 38

Set C: 38, 38, 38, 38, and 38 with mean 38

All the sets have the same mean 38, but if the values in the sets are observed carefully, it can be seen that in set C, the average 38 completely represents the distribution; in set A, only one value is represented by the average and in set B, average 38 represents none of the values. Also, the variation of the items is nil in set C and is maximum in set B.

Thus, it is quite clear that in addition to averages, some additional information about the variation of items is required, to know the extent to which the values vary from one another and from central value.

A measure of spread of scatter of the data is called a measure of variation or dispersion.

The measures of dispersion can give us idea about reliability of the averages. When the dispersion is less, the average is more reliable so that it is a better estimate of the population average, and if, the dispersion is more, the average is not a good representative of the data.

The measures of dispersion determine the extent of variation in the data, by which, some steps can be taken to control the variability. For instance, in factories quality control techniques can be applied to control the variation.

The measures of dispersion can be used to compare two or more distributions. The one with less dispersion is more consistent or homogeneous and the one with more dispersion is less consistent.

The study of dispersion leads to further advanced techniques in analysis such as Statistical Quality Control, Cost Control, Inventory Control, etc.

Requisites of a Good Measure of Dispersion:

- (i) It should be easy to understand and easy to calculate.
- (ii) It should be rigidly defined.
- (iii) It should be based on all the observations.
- (iv) It should be capable of further algebraic treatment.
- (v) It should not be affected much by extreme values.
- (vi) It should have sampling stability.

There are two types of measures of dispersion.

- (a) Absolute Measures giving actual extent of scatter of the data and
- (b) Relative Measures expressed as pure numbers, independent of the unit of measurement.

Corresponding, to each absolute measure of dispersion, a relative measure can be defined which can be used to compare two or more distributions. Now, let us study these measures.

18.2 RANGE

It is defined as the difference between the maximum and minimum values. It is an absolute measure.

$$\text{Range} = \text{Maximum} - \text{Minimum}$$

If we consider the set A,B,C, mentioned earlier.

$$\text{Range for Set A} = 46 - 34 = 12$$

$$\text{Range for Set B} = 90 - 10 = 80$$

$$\text{Range for Set C} = 38 - 38 = 0$$

So, for the sets A,B,C, even though the means are the same, the ranges are quite different.

Illustration 1:

The following are the prices in Rs. of different brands of television sets. Find the range of prices.

Rs. 17850, 16990, 17500, 19850, 16650, 19300

Solution:

$$\begin{aligned} \text{Here, Range} &= \text{Maximum Price} - \text{Minimum Price} \\ &= 19850 - 16650 = 3200 \end{aligned}$$

So, the range of prices is Rs. 3200.

2) Coefficient of Range :

It is a relative measure of dispersion and is defined as,

$$\text{Coefficient of Range} = \frac{\text{Maximum} - \text{Minimum}}{\text{Maximum} + \text{Minimum}}$$

Thus, it is a ratio of the difference and the sum of maximum and minimum values. Being a ratio, it is independent of the unit in which the original variable is measured.

Illustration 2:

Find the coefficient of range for the following data relating to prices of shares of "ABC" company during a week.

Rs. 25.75, 23.10, 23.50, 29.25, 24.50

Solution:

The maximum price = Rs. 29.25

The minimum price = Rs. 23.10

$$\begin{aligned} \text{Coefficient of Range} &= \frac{\text{Maximum} - \text{Minimum}}{\text{Maximum} + \text{Minimum}} \\ &= \frac{29.25 - 23.10}{29.25 + 23.10} = \frac{6.15}{52.35} \\ &= 0.1175 \end{aligned}$$

The range and coefficient of range are used to measure the variation in prices of commodities, shares, temperatures, rainfall, etc. over a time period. The range is used to measure variations which are highly sensitive like gold and silver prices. In day-to-day life, question like “How many answer papers are assessed in a week? Or How many marks are expected in a particular paper? Or How much profit does a shopkeeper make per day? Are always answered in the form between, two extreme value.

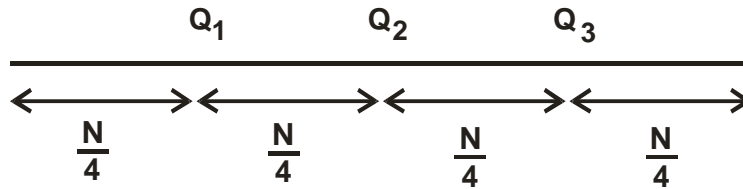
But statistically it is represented by single number which is interval between maximum all minimum value called as range.

Merits of Range:

- (i) It is easy to understand and easy to compute.
- (ii) It is rigidly defined.
- (iii) For small sample size, range is a good measure.
- (iv) It is affected by extreme values and its value changes from sample to sample.

18.3 QUARTILES

Quartiles are not measures of central tendency but they represent three values dividing the entire distribution of data into four equal parts. As the calculations are similar to that for median, we consider Quartiles along with median. The quartiles are called first quartile Q_1 , second quartile Q_2 and the third quartile Q_3 . Quartiles occupy specific positions in the distribution of data. if we arrange all N observations in order, then the quartiles Q_1, Q_2 and Q_3 are three points such that they divide the distribution into four equal parts, each consisting of $\frac{N}{4}$ observations.



The figure shows four parts, containing $\frac{N}{4}$ observations and three values Q_1, Q_2 and Q_3 .

The number of observations less than Q_1 is $\frac{N}{4}$

The number of observations less than Q_2 is $\frac{N}{2}$

The number of observations less than Q_3 is $\frac{3N}{4}$

For continuous distribution, using interpolation formula:

(i) Consider the First Quartile Q_1

The first quartile class is located as the one for which cumulative frequency exceeds $\frac{N}{4}$. After locating the class interval,

l_1 = lower class limit of the first quartile class,

l_2 = upper class limit of the first quartile class,

f = frequency of the first quartile class,

cf = cumulative frequency of the class preceding the first quartile class, and Q_1 is calculated using the formula

$$Q_1 = l_1 + \frac{l_2 - l_1 \left[\frac{N}{4} - cf \right]}{f}$$

(ii) The Second Quartile Q_2 coincides with the median.

$$Q_2 = l_1 + \frac{l_2 - l_1 \left[\frac{N}{2} - cf \right]}{f}$$

(iii) Consider the Third Quartile Q_3

The required class interval is obtained by comparing the cumulative frequency with $\frac{3N}{4}$ and then finding the class for which cumulative frequency exceeds $\frac{3N}{4}$.

l_1 = lower class limit of the third quartile class,

l_2 = upper class limit of the third quartile class,

f = frequency of the third quartile class,

cf = cumulative frequency of the class preceding the third quartile class.

Q_3 is calculated as

$$Q_3 = l_1 + \frac{l_2 - l_1 \left[\frac{3N}{4} - cf \right]}{f}$$

Note: There are 25% of the total observation which lie below Q_1 . 50% of the observation are below Q_2 and 75% are below Q_3 . So, there are 50% observations in between Q_1 and Q_2 , and so Q_1 and Q_3 are the limits within which middle 50% of the observations lie.

Illustration 6:

Find the three quartiles for the following data:

Daily Wages in Rs.	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55
No. of Workers	12	28	36	50	25	18	16	10	5

Solution:

We prepare the table for cumulative frequencies.

Daily Wages in Rs.	No. of Workers f	Cumulative Frequency less than
10-15	12	12
15-20	28	40
20-25	36	76
25-30	50	126
30-35	25	151
35-40	18	169
40-45	16	185
45-50	10	195
50-55	5	200
Total	200 = N	

For Q_1 , consider $\frac{N}{4} = \frac{200}{4} = 50$

From the table as 76 is greater than 50, the required class interval is 20-25.

Now, $l_1 = 20, l_2 = 25, f = 36, cf = 40$

$$\begin{aligned}
 Q_1 &= l_1 + \frac{l_2 - l_1 \left[\frac{N}{4} - cf \right]}{f} \\
 &= 20 + \frac{25 - 20 \quad 50 - 40}{36} \\
 &= 20 + \frac{5 \quad 10}{36} \\
 &= 20 + 1.3889 = 21.39
 \end{aligned}$$

So, the first quartile is Rs. 21.39.

Now, for Q_2 , consider $\frac{N}{2} = \frac{200}{2} = 100$

By comparing 100, with the cumulative frequencies, as 126 exceeds 100, the required class is 25-30.

Now, $l_1 = 25, l_2 = 30, f = 50, cf = 76$

$$\begin{aligned}
 Q_2 &= l_1 + \frac{l_2 - l_1 \left[\frac{N}{2} - cf \right]}{f} \\
 &= 25 + \frac{30 - 25 \quad 100 - 76}{50} \\
 &= 25 + \frac{5 \quad 24}{50} = 25 + \frac{120}{50} \\
 &= 27.4
 \end{aligned}$$

So, the second quartile is Rs. 27.4.

Now, for Q_3 , consider $\frac{3N}{4} = \frac{3 \times 200}{4} = 150$

By comparing 150, with the cumulative frequencies, as 151 exceeds 150, the required class is 30-35.

Now, $l_1 = 30, l_2 = 35, f = 25, cf = 126$

$$\begin{aligned}
 Q_3 &= l_1 + \frac{l_2 - l_1 \left[\frac{3N}{4} - cf \right]}{f} \\
 &= 30 + \frac{35 - 30 \quad 150 - 126}{25} \\
 &= 30 + \frac{5 \quad 24}{25} = 30 + \frac{120}{25} \\
 &= 30 + 4.8 = 34.8
 \end{aligned}$$

So, the third quartile is Rs. 34.8.

Limitation:

- (i) It can not be calculated for open end classes.
- (ii) It does not take into account the deviations of individuals items from a measure of central tendency.
- (iii) It is not based on all the observations.

3) Semi-inter-quartile-range or quartile deviation:

It is defined as follows:

$$\text{Semi - inter - quartile Range} = \frac{Q_3 - Q_1}{2}$$

The semi-inter-quartile range considers only the middle 50% of the observations and it ignores the first and the last quarter. It is an absolute measure. The quartile deviation also measures the average amount by which the two quartiles Q_1 and Q_3 differ from median.

4) Coefficient of quartile deviation:

It is a relative measure and is defined as

$$\text{Coefficient of Q.D.} = \frac{Q_3 - Q_1}{Q_3 + Q_1}$$

As, it is a ratio, it is a pure number, so that it can be used to compare two or more distributions.

Illustration 3:

Find the quartile deviation for the following data of pocket allowances (Rs.) of 15 student. Also find the coefficient of quartile deviation.

Set A (Rs.): 34, 45, 53, 42, 39, 35, 40, 51, 57, 52, 47, 62, 55, 50, 63

Solution:

Arrange the sets in ascending order of magnitude as

Set A: 34, 35, 39, 40, 42, 45, 47, 50, 51, 52, 53, 55, 57, 62, 63

Here, n = the total no. of observation = 15

$$Q_1 \text{ is } \left(\frac{n+1}{4} \right)^{\text{th}} \text{ observation} = 4^{\text{th}} \text{ observation}$$

$$\therefore Q_1 = \text{Rs. } 40$$

$$Q_3 \text{ is } 3 \left(\frac{n+1}{4} \right)^{\text{th}} \text{ observation} = 12^{\text{th}} \text{ observation}$$

$$\therefore Q_3 = \text{Rs. } 55$$

$$\text{Quartile Deviation} = \frac{Q_3 - Q_1}{2} = \frac{55 - 40}{2} = 7.5$$

$$\begin{aligned} \text{Coefficient of Quartile Deviation} &= \frac{Q_3 - Q_1}{Q_3 + Q_1} = \frac{55 - 40}{55 + 40} \\ &= \frac{15}{95} = 0.1579 \end{aligned}$$

Now consider the quartile deviation for grouped data.

Illustration 4:

Calculate quartile deviation for the following distribution of ages of 800 persons. Also find the coefficient of quartile deviation.

Age in Years	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60
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No. of Persons	50	70	100	180	150	120	70	60
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Solution:

As it is a continuous distribution, first prepare the following table to obtain cumulative frequencies and to locate the required class intervals.

Age in Years	No. of Persons	Cumulative Frequency (Less than)
20-25	50	50
25-30	70	120
30-35	100	220
35-40	180	400
40-45	150	550
45-50	120	670
50-55	70	740
55-60	60	800
Total	800	

Here, $N = \sum f = 800$

a) For Q_1 , consider $\frac{N}{4} = 200$. As 220 is the first cumulative frequency greater than 200, the required class for Q_1 is 30-35.

Now $l_1 = 30, l_2 = 35, f = 100, cf =$ cumulative freq. of previous class = 120.

$$\begin{aligned}
 Q_1 &= l_1 + \frac{l_2 - l_1 \left[\frac{N}{4} - cf \right]}{f} \\
 &= 30 + \frac{35 - 30 \quad 200 - 120}{100} \\
 &= 30 + \frac{50 \quad 80}{100} = 30 + \frac{400}{100} \\
 &= 34 \text{ yrs.}
 \end{aligned}$$

b) For Q_3 , consider $\frac{3N}{4} = 600$. As 670, is the first cumulative frequency exceeding 600, the required class interval for Q_3 is 45-50.

Now, $l_1 = 45, l_2 = 50, f = 120, cf = 550$

$$Q_3 = l_1 + \frac{l_2 - l_1 \left[\frac{3N}{4} - cf \right]}{f}$$

$$= 45 + \frac{(50 - 45)(600 - 550)}{120}$$

$$= 45 + \frac{5 \cdot 50}{120} = 45 + \frac{250}{120}$$

$$= 45 + 2.08 = 47.08 \text{ years}$$

$$\text{Quartile Deviation} = \frac{Q_3 - Q_1}{2}$$

$$= \frac{47.08 - 34}{2} = \frac{13.08}{2}$$

$$= 6.54 \text{ years}$$

$$\text{Coefficient of Quartile Deviation} = \frac{Q_3 - Q_1}{Q_3 + Q_1}$$

$$= \frac{47.08 - 34}{47.08 + 34} = \frac{13.08}{81.08}$$

$$= 0.1613$$

So, the quartile deviation is 6.54 years and coefficient of quartile deviation is 0.1613.

Merits of Quartile Deviation:

- (i) It is simple to understand and easy to calculate.
- (ii) As it is based on middle 50% of the observations, it is not affected by extreme values. So, it is useful in erratic data.
- (iii) It can be calculated for open end classes.
- (iv) The quartile deviation can be obtained for qualitative data which can not be measured but can be ranked.

Limitations:

- (i) It is not based on all observations.
- (ii) It is not capable of further mathematical treatment.

- (iii) It is affected by sampling fluctuations.
- (iv) It does not consider the observations in the first and last quarter.

However, it gives a rough idea about the scatter of the data and it is a better average than range.

18.4 MEAN DEVIATION

The range or quartile deviation do not take into account, the deviations from the central value. The mean deviation considers these differences in absolute values and averages these differences.

Thus, mean deviation, in which is an absolute measure is defined as the arithmetic mean of absolute values of deviations of all the observations taken from the mean, median or mode. Mean deviation from median is minimum.

For Ungrouped Data

$$a) \text{ M.D. from mean} = \frac{\sum |x - \bar{x}|}{n}$$

$$b) \text{ M.D. from median} = \frac{\sum |x - \text{Median}|}{n}$$

$$c) \text{ M.D. from mode} = \frac{\sum |x - \text{Mode}|}{n}$$

Where n represents total number of observations.

For Grouped Data, $N = \sum f$

$$a) \text{ M.D. from mean} = \frac{\sum f |x - \bar{x}|}{N}$$

$$b) \text{ M.D. from median} = \frac{\sum f |x - \text{Median}|}{N}$$

$$c) \text{ M.D. from mode} = \frac{\sum f |x - \text{Mode}|}{N}$$

2) Coefficient of Mean Deviation:

It is a ratio of the mean deviation and the measure from which the deviations are considered.

Being a relative measure of dispersion, it is a pure number, independent of the unit of measurement of the variable. Hence, it can be used to compare two or more sets of data. It is defined as follows:

$$a) \quad \text{Coefficient of M.D. from mean} = \frac{\text{M.D. from Mean}}{\text{Mean}}$$

$$b) \quad \text{Coefficient of M.D. from median} = \frac{\text{M.D. from Median}}{\text{Median}}$$

$$c) \quad \text{Coefficient of M.D. from mode} = \frac{\text{M.D. from Mode}}{\text{Mode}}$$

Illustration 1:

Find the mean deviation from mode and the corresponding coefficient of mean deviation for the following data:

Income in Rs.	800-1000	1000-1200	1200-1400	1400-1600	1600-1800
No. of Persons	16	34	60	37	13

Solution:

First calculate mode as follows:

Here the modal class is 1200-1400 as the corresponding frequency 60 is the maximum frequency.

Now, $l_1 = 1200, l_2 = 1400, f_1 = 60, f_2 = 37, f_0 = 34$

$$\begin{aligned} \text{Mode} &= l_1 + \frac{l_2 - l_1}{2} \frac{f_1 - f_0}{f_1 - f_0 - f_2} \\ &= 1200 + \frac{1400 - 1200}{2} \frac{60 - 34}{60 - 34 - 37} \\ &= 1200 + \frac{200}{2} \frac{26}{-11} = 1200 + \frac{5200}{-49} \\ &= 1200 + 106.12 = 1306.12 \end{aligned}$$

So that modal income is Rs. 1306.12

Now, prepare the following table to calculate $\sum f|x - \text{Mode}|$.

Income in Rs.	No. of Persons	X	$ x - \text{Mode} $	$f x - \text{Mode} $
800 – 1000	16	900	406.12	6497.92
1000 – 1200	34	1100	206.12	7008.08
1200 – 1400	60	1300	6.12	367.20
1400 – 1600	37	1500	193.88	7173.56
1600 – 1800	13	1700	393.88	5120.44
Total	160			26167.20

No, $\sum f|x - \text{Mode}| = 26167.2, N = 160$

$$\text{M.D. from mode} = \frac{\sum |x - \text{Mode}|}{n} = \frac{26167.2}{160} = \text{Rs. } 163.545$$

$$\begin{aligned} \text{Coefficient of M.D. from mode} &= \frac{\text{M.D. from Mode}}{\text{Mode}} = \frac{163.545}{1306.12} \\ &= 0.1252 \end{aligned}$$

Merits of Mean Deviation

- i) It is rigidly defined.
- ii) It is easy to understand.
- iii) It is based on all the observations.
- iv) Its value is minimum when calculated from median.
- v) It is less affected by extreme values.
- vi) As it takes into account deviations from averages it is more scientific than range or quartile deviation.

Limitations:

- i) It requires more calculations for continuous variables.
- ii) It ignores the negative signs for deviations and only absolute values are considered.

18.5 STANDARD DEVIATION

It is defined as the positive square root of the arithmetic means of the squares of the deviations of the observations from the arithmetic mean. It is denoted by σ (sigma). It is an absolute measure.

(a) For ungrouped Data

If x_1, x_2, \dots, x_n are n observations then $\bar{x} = \frac{\sum x}{n}$

$$\text{and } \sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

The alternative formula

$$\sigma = \sqrt{\frac{\sum x^2}{n} - \bar{x}^2}$$

(b) For Grouped Data

If x_1, x_2, \dots, x_n are n distinct values of a variable with frequencies f_1, f_2, \dots, f_n then

$$\bar{x} = \frac{\sum fx}{N}, \text{ where } N = \sum f \text{ and } \sigma = \sqrt{\frac{\sum f (x - \bar{x})^2}{N}}$$

The alternative formula is

$$\sigma = \sqrt{\frac{\sum fx^2}{N} - \bar{x}^2}$$

For continuous variate, x_1, x_2, \dots, x_n are the class marks.

Note: There are two possibilities for value of \bar{x} . They are (i) \bar{x} is integer and (ii) \bar{x} is not an integer. Any one of the two formulae can be used in any case. But usually, the first formula is used when \bar{x} is an integer and the alternative formula is used when \bar{x} is not an integer, to simplify the calculations. Now consider some examples.

Illustration 1:

Find standard deviation for the following data:

Class Interval	0-10	10-20	20-30	30-40	40-50
Frequency	11	15	25	12	7

Solution:

The variable is a continuous variable so x represents the class marks of the class intervals i.e. x values are 5, 15, 25, 35 and 45.

Prepare the following table for the product term fx, fx^2 to obtain mean and S.D.

Class Interval	Frequency	Class-mark	fx	fx^2
0-10	11	5	55	275
10-20	15	15	225	3375
20-30	25	25	625	15625
30-40	12	35	420	14700
40-50	7	45	315	14175
Total	70		1640	48150

$$N = \sum f = 70$$

$$\sum fx = 1640$$

$$\bar{x} = \frac{\sum fx}{N} = \frac{1640}{70} = 23.4286$$

As it is not an integer, we use the following formula for standard deviation σ .

$$\sigma = \sqrt{\frac{\sum fx^2}{N} - \bar{x}^2}$$

$$\text{Now, } \sum fx^2 = 48150, \bar{x} = 23.4286, N = 70$$

Substituting these values, in the formula

$$\sigma = \sqrt{\frac{\sum fx^2}{N} - \bar{x}^2}$$

$$= \sqrt{\frac{48150}{70} - 23.4286^2}$$

$$= \sqrt{687.8571 - 548.8993} = \sqrt{138.9578}$$

$$= 11.7880$$

So, the standard deviation is 11.788.

Illustration 2:

Find standard deviation for the distribution of weights of 90 children.

Weight in kgs.	20-25	25-30	30-35	35-40	40-45
No. of Children	11	15	24	26	14

Solution:

We prepare the following table to calculate the product terms fx and fx^2 .

Weight in kgs	No. of Children	x	fx	fx^2
20-25	11	22.5	247.5	5568.75
25-30	15	27.5	412.5	11343.75
30-35	2	32.5	780.0	25350.00
35-40	26	37.5	975.0	36562.50
40-45	14	42.5	595.0	25287.50
Total	90			104112.50

$$\therefore \sum fx = 3010 \text{ and } N = 90, \sum fx^2 = 104112.5$$

$$\bar{x} = \frac{\sum fx}{N} = \frac{3010}{90} = 33.4444$$

The standard deviation is given by

$$\begin{aligned} \sigma &= \sqrt{\frac{\sum fx^2}{N} - \bar{x}^2} \\ &= \sqrt{\frac{104112.5}{90} - 33.4444^2} \\ &= \sqrt{1156.8055 - 1118.5278} = \sqrt{38.2777} \\ &= 6.1869 \end{aligned}$$

Hence, the standard deviation is 6.1869.

It can be observed that if the class marks are expressed as fractions or if the class intervals are more, the calculations become lengthy and tedious.

Merits and demerits of standard Deviation

Merits of standard Deviation.

- 1) It is rigidly defined.
- 2) It is based on all the observations.

- 3) It is not affected much by sampling fluctuations.
- 4) It is amicable to further mathematical treatment.

Demerits:

- 1) It is not easy to understand and easy to calculate
- 2) As it consider the sum of the squares of deviations of items from the mean. The items away from mean gets more weight age than those near the mean. Thus, standard deviation gives more weight age to extreme value.

18.6 CHECK YOUR PROGRESS

- 1) What do you mean by Range?
- 2) What is Mean Deviation?
- 3) Explain Quartile deviation.

18.7 REFERENCES

- 1) Borwankar P.V. – Research Methodology Seth Publisher 1995.

18.8 QUESTION

- 1) What is standard deviation? What are it merits and demerits?
- 2) What is mean deviation? Discuss its as merits and demerits.



Syllabus

T.Y.B.A Sociology Paper IX Research Methodology

Objectives:

- To introduce students to the nature of scientific method in social science research.
- To provide students an understanding of the research process in social sciences.
- To familiarizes students and acquaint them with knowledge of quantitative and qualitative techniques and methods commonly used in sociological research.
- To enable students to apply theoretical knowledge of social research to field study. Students are required to prepare a project based on field study.

1. Social Research – Introduction

- a) Historical Context of Research.
- b) Scope of Social Research – Knowledge Buildings, Study of Social problems, Theory Making and Policy Making.

2. Research Methodology

- a) Survey Approach, Historical Approach
- b) Objectivity and Ethical Neutrality

3. Study of Research Designs

- a) Exploratory Design
- b) Descriptive Design
- c) Action Research
- d) Experimental Research

4. Quantitative Research

- a) Questionnaire
- b) Interview Schedule
- c) Scaling Techniques-Social Distance, Sociometry

5. Qualitative Research

- a) Participant Observation (Ethnography)
- b) Case Study
- c) Focused Group

d) Content Analysis

6. Sampling

Meaning, Significance, Probability and non-probability sampling.

7. Presentation of Data

Graphic Presentation of Data

Pie Chart, Bar Diagram, Histogram, Frequency Polygon, Ogive

Measures of Central Tendency – Mean, Mode, Median
(Sums-Grouped data)

8. a) Measures of Dispersion-

Range, Quartile Deviation, Mean Deviation, Standard Deviation (Sums-ungrouped Data and Grouped Data)

b) Normal Distribution Curve.

c) Introduction to SPSS

9. Project Work-

The teacher should provide a brief orientation into the following: Formulation of Research Problem, Literature Search, Statement of the Problem, Formulation of Hypothesis, conceptualization, variables, data collection, classification and coding, tabulation, analysis and interpretation of data and report writing. This is to enable students to conduct project work effectively.

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Question Paper

T.Y.B.A Sociology Paper IX

Research Methodology

(Revised Course)

(3 Hours)

(Marks: 100)

- N.B :** 1) Attempt any four questions from question Nos. 1 to 8.
 2) Attempt any one question from question Nos. 9 & 10.
 3) All questions carry equal marks. (20 each)

- Q.1 a) Define social research. Delineate the scope of social research.
 b) Discuss positivist perspective in research.
- Q.2 Explain and examine the uses and limitations of survey approach in social sciences.
- Q.3 What is a questionnaire? Discuss its importance and the various considerations while constructing a questionnaire.
- Q.4 Discuss the significance of case study as an approach to social research.
- Q.5 Explain the meaning and requirements of sampling. Discuss any two methods of probability sampling and any two methods of non probability sampling.
- Q.6 a) Give the merits and demerits of median and mean.
 b) Calculate the mean and median for the following data.

Class	Frequency
10-20	1
20-30	3
30-40	7
40-50	10
50-60	42
60-70	28
70-80	6
80-90	2
90-100	1
	N = 100

OR

Q.6 Explain the following diagrams and graphs.

- a) Bar diagrams c) Histogram
b) Ogive d) Frequency Polygon.

Q.7 a) What is standard deviation? What are its merits and demerits?

b) Compute standard deviation for the following data.

Class	Frequency
30-40	4
40-50	15
50-60	35
60-70	20
70-80	18
80-90	6
90-100	2
	N = 100

Q.8 Write short notes on any two :

- a) Content analysis c) Sociometry
b) Experimental design d) Action research

For I.D.O.L Students only:

Q.9 What is an interview? Give its significance and the process of conducting interviews in research.

Q.10 What is participant observation? Discuss participant observation as a technique of collecting data pointing out its uses.



