

**SOCIAL WORK RESEARCH  
(DSW05)  
(M.A. SOCIAL WORK)**



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**Lesson-1****The Scientific Method; Nature And Characteristics****1.0. Objectives:**

The objectives of this lesson are to explain the nature and characteristics of scientific method.

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- 1.2. Scientific method
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**1.1. Introduction:**

Science has been defined as an accumulation of systematic knowledge. Knowledge refers to the goal of science. 'systematic' refers to the method of reaching that goal. Knowledge is something to do with knowing. We know the things through acquaintance. Knowing may also be through the description of the characteristics of certain things. Human knowledge takes the form of belief or judgement. Some beliefs are supported by evidence and some are not supported by evidence. Knowledge may be collected from different sources e.g. experience, human beings, books, Nature, etc..... knowledge includes facts as well as the principles and inference. Knowledge has three elements : (i) There is a system of ideas, (ii) The ideas refer to things actually existing; and (iii) There is belief in such correspondence.

**Science:** Science is the pursuit of knowledge. Science is quest for knowledge. The purpose of science is the creation of reliable knowledge about empirical world. Science helps in the advancement of knowledge. Science is conquest of nature, of ignorance, of poverty and diseases and of the evils.

**Method:** The term 'Method' means an apt way of doing something. Every science has to use an appropriate way of investigating into its field of study. As Karl Pearson remarked, "The unit of all sciences consists only in its method, not in its Material" Every science uses scientific Method or the study. Experimentation is possible in physical and natural sciences. It is sciences like sociology. Social phenomena is too complex for studying under

Scientific truth is rational in structure and empirical in content. Scientific truth is public truth. Since science is concerned with what is happening in this world, the content of scientific truth is empirical.

### 1.2 Scientific Method:

Scientific knowledge is based on observable facts. George Lundberg defines scientific method as one consisting of systematic observation, classification and interpretation of data. There is difference between ordinary generalization and the scientific method. Scientific method is characterized by formality, rigorousness, verifiability and validity.

Scientific method helps for discovering and creating empirical knowledge. Empirical knowledge means observable knowledge. We can gather knowledge through the senses

### 1.3 Definition of Scientific Method:

L.L Bernard has defined the term 'scientific method' as "science may be defined in terms of its major process that takes place within it. These are testing, verification, definition, classification, organization including prediction and application".

According to Lundberg "The scientific methods consist of systematic observation, classification, and interpretation of data".

Prof. Wolf has defined the scientific method "in a wide sense as a mode of investigation by which science has been built up and is being developed, and it is entitled to be called a scientific Method".

According to Encyclopedia Britannica,..... "In a wide sense any method of investigation by which scientific or other impartial and systematic knowledge is acquired is called a "scientific Method"

Though the term 'scientific method' has been defined differently, it simply means 'a systematic method of analysis'. Bernard says that scientific method involves six stages Viz., testing, verification, definition, classification, prediction and application.

### 1.4 Assumptions:

Scientific method is based on certain assumptions. The following are the assumptions.

#### 1. Regularities:

Scientific method assumes that the world is regular and phenomena would occur in pattern.

#### 2. Verification:

Since science is empirical study, verification is the prime condition of the methods.

#### 3. Techniques:

Scientific method assumes that correct techniques and interpretation are to be adopted.

#### 4. Quantification:

For the purpose of precision and accuracy, mathematical formulas and measurements are applied. All observations must be quantified.

5. **Values:**  
Science is value free. It has nothing to do with moral or ethical considerations.
6. **Systematisation:**  
The scientific method, is well-organised logical and theory oriented analysis.
7. **Pure science:**  
For analyzing a social problem, pure science approach is necessary.
8. **Integration:**  
Integration of social sciences is necessary to get a clear, and correct picture of the problem.

Thus, it can be understood that " Scientific Method implies an objective, logical and systematic method of analysis".

#### 1.5 Characteristics of Scientific Method:

The following are the characteristics of scientific method:

##### 1. Inter- subjective reliability:

A piece of information or statement of events or relationship must have inter-subjective reliability. If several observers use similar methods of test, and agree upon the statement, it is said to have inter-subjective reliability.

##### 2. Verifiability:

The conclusions must be subject to verification at anytime. The phenomenon must be capable of being observed and measured. For example we may take the famous scientific law that all matter expand on being heated. To verify this statement we can heat a matter and see whether it has expanded. Suppose we arrive at the conclusion that illiteracy is the cause of criminality among the people. This statement should be verified from our observation. We must verify whether criminals are more among illiterates or not. That is how the facts are verifiable in the scientific method.

##### 3. Objectivity:

Science demands that a piece of information is said to possess objectivity. It should be described in terms of a public standard rather than a private or subjective one. There is no place for subjectivity. The facts should not be by one's own wishes. All persons should arrive at the same conclusion about the phenomena. For example when we say, coal is black, coal will appear black to all people. But if we say coal is useful, all may not agree with this view.

##### 4. Quantifiability:

Another characteristic is that the proposition must be quantifiable. It must be capable being measured and expressible in numerical terms. The measurement may be very precise.

##### 5. Theoretical Orientation:

Science is characterized by an orientation to the theory. The object of science is to produce a body of propositions. These propositions should have theoretical orientation. These propositions are interrelated to explain the social phenomena. The propositions should be theoretically meaningful and relevant.

**6. Universality:**

Science is concerned with types, kinds and classes of objects. The scientific principles or laws should have universal application. The time, place and circumstances have no effect on the principles / laws laid down by scientific method. For example, the sunrises in the east and sets in the west is a universally known phenomenon. Complete universality is a myth in social sciences due to heterogeneous nature of social phenomenon. The laws are true only under given circumstances.

**7. Predictability:**

The results of science can be predicted with sufficient accuracy. For example we can say with certainty that if the water is reduced to Zero degree, it will change into ice. Predictability depends on the nature of phenomena and the causative factors. Accurate prediction is not possible in the case of social phenomena. In social sciences the number of causative factors would be more. Hence prediction becomes difficult.

**8. System:**

System pertains to the method of arriving at the result. The conclusions must be drawn from systematic mode of investigation. Haphazard methods cannot be called scientific. The results arrived at by means of haphazard methods even if true, cannot be called scientific because their accuracy is purely accidental.

**1.6 Application of Scientific method to social phenomena:**

Social research deals with the social phenomena. There is difference between physical phenomena and social phenomena. Experimentation is possible with physical phenomena. Social phenomena cannot be put to laboratory tests. We may face certain difficulties in the application of scientific method to social phenomena. The following are the difficulties in the application.

**1. Complexity of social Data:**

Human behaviour is complex. Many factors influence human behaviour. No two persons are alike. The behaviour of man changes from time to time and the social data is very complex. It cannot be put to scientific tests. However, social data is not so complex. Though persons differ from one another, they have similarities also. Complexity is a relative term. It depends upon our knowledge of the subject matter. Even in physical sciences, there is some degree of complexity.

**2. Unpredictability:**

Another characteristic of science is predictability. Prediction is possible in the case of physical sciences. But it is not so in case of social phenomena. Social behaviour is irregular and unpredictable. Even this argument is not totally correct. Though it is difficult to predict the behaviour of individual, the behaviour of group can be predictable.

**3. Subjectivity and intangibility of social phenomena:**

Social phenomena has subjectivity. It lacks objectivity. Traditions, customs, attitudes, values etc., are subjective. Verification becomes difficult in the case of such subjective things, The above abstract things like tradition and custom have become standardized. All the people understand them in the same way. Techniques have been developed to measure subjective things in an objective manner.

**4. In capacity of being dealt through empirical methods :**

Quantitative Measurement is not possible in the case of social phenomena. Social phenomena is mostly qualitative. For example, we cannot measure urbanisation quantitatively. Even this argument is not correct. In the beginning physical sciences also used qualitative methods. Quantitative methods were developed in social sciences also. Social phenomenon is also capable of being dealt through empirical methods.

**5. Lack of Homogeneity:**

It is argued that no two persons are alike. Hence the conclusions cannot be applicable to all persons and to all cases. Social phenomena is not homogeneous. This argument is also not correct. Though no two persons are alike in some respects, they are certainly alike in certain other respects. Hence the conclusions of the study will apply to other persons also.

**6. Difficulty in the use of Experimental Method:**

Physical sciences can use laboratory tests. Physical phenomena can be tested and verified at any time. In social sciences, such a facility is lacking. We cannot put human beings to laboratory test. This argument is also not correct. Some of the physical sciences like astronomy cannot be put to laboratory tests. In recent years laboratory tests have been successfully applied to social sciences also.

**7. Interdependence of cause and effect:**

In social phenomena, the cause and effect are interdependent. It is difficult to find as to what is the cause and what is the effect. It is difficult to know whether low wages are the cause of poverty or whether poverty is a cause of low wages.

**8. Dynamic nature of social phenomena:**

Human society is constantly changing. What was true of past may not be true of the present or future. There is no use of studying a thing which is frequently changing. This is also not correct. Although human beings are changing, their fundamental nature remains unchanged.

Thus various arguments declaring the difficulties in the application of scientific methods to social phenomena do not hold much water.

It is to be noted that the tendency towards the use of scientific methods is fast growing in social sciences. In the near future, the laboratory techniques may also be developed in social sciences.

**1.7 The components of Scientific Approach:**

The scientific approach has two components: the procedural and the personal

**Procedural component:**

The procedural component has the following steps.

1. Define the problem
2. Establish hypothesis
3. Collect the data
4. Analyse the data to test the hypothesis and draw inferences.

The researcher must have thorough knowledge of the subject-matter of the problem. He must operationalise the concepts. He must select appropriate methods for collection of data. He must use relevant statistical techniques and tests for testing hypothesis. All these steps require creative imagination, extraordinary care and patience.

### **The Researcher's personal qualities:**

As stated by Eigelberner, the researcher needs, " the scientific imagination to construct hypothesis, the analytical ability to devise crucial experiments to test the hypothesis, the resourcefulness, manipulative skill and persistence to carry through the experiment, the perspective which distinguishes the essential from the non-essential, and the reasoning which coordinates individual facts into a principle. He must possess integrity, honesty, sincerity, poise and perseverance. He must also possess. " the spirit independence and the spirit of originality".

In short, a true scientist must possess the devotion of a mother, the poise of judge, the objectivity of a philosopher, the courage of a soldier, the perseverance and patience of beaver, the fervour of a patriot and the vision of a prophet.

### **1.8. Scientific Attitude:**

The scientific method calls for scientific attitude. The following are the elements of scientific attitude.

- (i) Consistent thinking
- (ii) Objective, dispassionate and unbiased devotion to collection and treatment of facts.
- (iii) Overcoming personal preconceptions and value judgements.
- (iv) Avoiding personal and vested interests
- (v) Avoiding wishful thinking
- (vi) Taking nothing for granted without evidence, tests and proofs.

### **1.9 Essentials of good scientific methods:**

- 1) Careful logical analysis of the problem, isolating it from other problems and separating its elements
- 2) Definition of terms and concepts and statistical units and measures
- 3) Collection of cases and data pertinent to the subject on hand
- 4) Classification of cases and phenomenon and data.
- 5) Expression of factors in quantitative terms wherever possible.
- 6) Rigorous experimental or statistical procedure in summarizing the data.
- 7) Sound logical reasoning in drawing conclusions and generalizations.
- 8) Statement of conclusions and generalizations in clearer terms.
- 9) Elimination of the personal equation
- 10) Complete and careful reporting of the data and the methods of analysis so that others can check the analysis.

### **1.10 Use of Scientific Method:**

There is universal human urge for possession of knowledge. But people may not have strong desire for a critical type of enquiry. Scientific method is concerned with the verification of the acquired knowledge. The conclusions drawn by scientific method have objectivity. It is only through scientific

method, we can increase the body of tested knowledge and eliminate arbitrary opinions. The desire to acquire truth requires scientific method. If this desire is strong, the progress of scientific method becomes rapid. The scientific method may not lead to final truth. But it helps us to take correct step in the right direction. It minimizes the dangers associated with adventure, uncertainty and hasty decisions.

It settles differences in a rational way, which is appealing to all. It eliminates narrow outlook and subjective element. All people accept the rational procedure. Because it requires detachment and disinterestedness, it is the finest test of a liberal civilization.

#### 1.11. Limitation of Scientific method:

Scientific method has the following limitations;

1. Scientific method involves abstractness.
2. Scientific explanation is never complete.
3. The conclusions drawn by scientific method are not final.
4. Sciences have limited scope, dealing with a particular area. They are based on certain assumptions.
5. Superstition and cherished beliefs are hostile to the growth of scientific method.
6. Formal procedures are fruitless: definitions and formal distinctions are not often used properly: and statistical information may be irrelevant
7. Scientific judgement is difficult and sometimes impossible when situations demand immediate action.
8. In a society where there is no desire for truth or freedom for expression of intellectual doubt, growth of scientific method is hampered.
9. Scientific researchers in social fields are often in the hands of those who cannot oppose established opinion or taboos.
10. Scientific method cannot guarantee certainty of achieving the goal.

#### 1.12. Summary:

Science is the pursuit of knowledge. The term 'method' means an apt way of doing things. Scientific knowledge is based on observable facts. Scientific method helps for discovering and creating empirical knowledge. Scientific method is based on the following assumptions.

- (i) Regularities
- (ii) Verification,
- (iii) Techniques,
- (iv) Quantification
- (v) Value-free
- (vi) Systematization
- (vii) Pure science approach
- (viii) Integration

The following are the characteristics of scientific method

1. Inter-subjective reliability
2. Verifiability



3. Objectivity
4. Quantifiability
5. Theoretical orientation
6. Universality
7. Predictability
8. System

There are difficulties in the application of scientific method to social phenomena due to the following factors;

1. Complexity of social data
2. Unpredictability;
3. Subjectivity
4. Lack of homogeneity
5. Difficulty in the use of experimental method
6. Dynamic nature of social phenomena

Scientific method calls for scientific attitude. Through scientific method, we can increase the body of tested knowledge. The essentials of scientific method include careful logical analysis, definition of the terms, collection of the cases and data, classification of cases, summarizing the data and careful reporting of the data. The scientific approach has two components, the procedural and the personal. The researcher must possess integrity, honesty, sincerity, poise and perseverance. Scientific method has certain limitations. The conclusions drawn by scientific method are not final.

#### 1.13 Key Words:

- a) Scientific method
- b) Objectivity
- c) Scientific Attitude

#### 1.14. Exercises:

1. Discuss the characteristics of a scientific method
2. Explain the difficulties in the application of scientific method to social phenomena
3. What are the assumptions and limitations of scientific method?

#### 1.15 Reference Books:

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**Lesson - 2****SOCIAL RESEARCH AND SOCIAL WORK RESEARCH****2.0 OBJECTIVES :**

The objectives of this lesson are to explain the nature of Social research and Social work Research and to bring out the difference between Social research and Social work research.

**CONTENTS:**

- 2.1. Introduction
- 2.2. Social Research
- 2.3. Objectives of Social Research
- 2.4. Social Work Research
- 2.5. Social Work Research Project
- 2.6. Social Research and Social Work Research
- 2.7. Scope of Social work Research
- 2.8. Subjects for Social Work Research
- 2.9. Limitations of Social Work Research
- 2.10. Summary
- 2.11. Key words
- 2.12. Model Questions
- 2.13. Reference Books

**2.1 INTRODUCTION :**

Social research is directed towards the advancement of any of the basic social sciences. There is difference of approach between social workers and social scientists, it is difference in orientation. Social scientists separate their values from scientific theory. Social science research is value-free. Social scientists apply rigorous empirical investigations. They study the phenomena objectively and disinterestedly. Their research is designed without reference to practical results. It has been called " pure research". Social work research is concerned with the solution of specific social problems. Social scientists are research-minded. Social workers are action oriented.

**2.2. SOCIAL RESEARCH:**

Research is done in the field of social sciences, behavioural sciences, sociology, anthropology and other social sciences. Research is done in social sciences to improve knowledge, to understand human behaviour, to reject old theory and modify them or to propound new theory. Social research helps in policy-making and in planning. The researcher does research with academic orientation, taking into account the gaps in the knowledge of social sciences. The aim of social research is to understand social phenomena.

**Classification of Social Research :** Social research may be classified into two main categories.

1. **Theoretical type of research :** Theoretical research is also called pure research. Such research may not depend on primary data or secondary data, but it will contribute to the realm of theory and to the existing literature on the subject by way of interpretation or a different approach to the problem.
2. **Empirical Research :** Empirical research is based on the empirically gathered primary data. Such studies aim at an accurate assessment of the conditions in the society. Such research aims at discovering of facts, the root causes of the problem and solving them. For example, a study of the relationship between illiteracy and crime in a central prison falls under this category. If we study the level of literacy of the prisoners in a central prison, the findings may reveal that majority of the prisoners are illiterates. Hence the study establishes the relationship between illiteracy and crime.

### 2.3. OBJECTIVES OF SOCIAL RESEARCH:

1. **Development of knowledge :** Social research aims at collecting a systematized body of knowledge. Adding to the existing knowledge is the main objective of research. Social research is a scientific effort to acquire further knowledge about the social phenomenon.
2. **Scientific Study of Social life :** Social research is a Scientific study of Social phenomenon and Social facts. The researcher studies collective processes, Social structure and Social processes. Social research studies human being, human behaviour and social life of man.
3. **Welfare of Humanity :** No one makes a study only for the sake of study. His study is for a higher objective. Welfare of humanity is the higher aim of research. One may set his goal material gain or social prestige. For some Scientists, Scientific enquiring is an end in itself.
4. **Classification of facts :** P.V. Young states that "Social research aims to clarify facts. In a given Universe of discourse to find the specific determined sequences and interrelationships of facts and their Social setting. To develop a series of clear cut concepts and to examine the old concepts which are to define Social life".
5. **Social control and prediction :** Prediction of the behaviour of particular type of individuals under specified conditions is one of the objects of research. Social research studies, Social values, beliefs, events etc. It finds out new facts and verifies the old facts. It is a scientific study of Social life.

#### Basic assumptions of Social Research :

- (1) It is assumed that an objective and unbiased study is possible.
- (2) It is also presumed that there is some kind of natural law.
- (3) It is possible to predict the future course of Social phenomena.
- (4) There is causal relationship between Social behaviour and events.
- (5) It is possible to draw a representative sample from the whole of the population.
- (6) It is possible to measure different variables in quantitative terms.

- (7) The Social Scientist has no pre-conceptions about the subject under study.
- (8) It is assumed that controlled and limited experiments may be conducted in Social Sciences.

#### **Trends in Social Science Research:**

- (1) There is increased impetus to research on Social problems.
- (2) The trend is now towards an objective and Scientific approach.
- (3) Social Science research is becoming more and more cumulative in the sense, researchers build up on data already collected by others.
- (4) Social Science research is now involving team work.
- (5) Social events are also amenable for Scientific study, since human behaviour follows some definite trend.

#### **2.4. SOCIAL WORK RESEARCH :**

"Social Work research is the systematic critical investigation of questions in the Social Welfare field, with the purpose of yielding answers to problems of Social Work and of extending and generalizing Social Work knowledge and concepts". (Friedlander).

The methods applied in Social Work research are mostly borrowed from Sociology, Social psychology, History and Anthropology.

Research contributes to knowledge. Social Work knowledge is drawn from Social Work research. Research work in Medicine, Psychology, Psychiatry, Biology, Law, Economics, Sociology and other related disciplines made important contributions to Social Work knowledge. In the beginning Social Work was hesitant in applying the research methods of other Social Sciences. The hypotheses of Social Work research were not tested by the methods of Social Science research. In the beginning Social Work research included community studies of social problems, agency programmes, structure and operation and the like. These studies served only to prove the need for existing or new Social services. These studies facilitated community welfare planning. They did not contribute to the Scientific knowledge of human nature and behaviour. There is need for new Social Work methods for research.

Social Scientists were skeptical about the results of Social Work research. These differences resulted in mutual criticism and misunderstanding. Now Social Workers are expanding their research to include Social Work theory, diagnosis and treatment typologies. They included methodological theory research. They also included operational research, exploring new areas for Social Work practice and research.

#### **2.5. SOCIAL WORK RESEARCH PROJECT :**

A Social Work Research Project may follow the following procedure.

1. **Selection of Research Project :** Experiences and data of social work practice with individuals, groups or communities are used to define and formulate the social work research problem. The research project aims either to clarify a specific problem through the application of social theory or to systematize the various aspects of the selected problem.
2. **Formulation of hypotheses :** The hypotheses may be formulated to clarify and solve the problem in question.
3. **Construction of a research design :** A research design that is suited to test the validity of the hypotheses by empirical verification or rejection may be constructed.

4. **Fact-finding process** : It may include observations, interviews and inquiries to obtain the facts and data that are required by the hypotheses and the research design.
5. **Analysis** : Analysis of the collected facts and data in order to determine whether they logically support the hypotheses or refute them.
6. **Interpretation and evaluation** : Interpretation and evaluation of the research findings and their conclusions to determine whether the findings support a convincing answer to the problem studied and whether they may serve as the basis of further studies.

## 2.6. SOCIAL RESEARCH AND SOCIAL WORK RESEARCH :

"The Social research is directed towards the advancement of any of the basic Social Sciences while research in Social Work deals with problems faced by professional Social Workers and by the community in its concern with Social Work functions. In Social Work research the problem to be investigated is always to be found in the course of doing Social Work or planning to do it. Both the methods and theories of Social Sciences may be utilized, but they are useful to Social Workers only as they help to answer questions arising out of Social Work" (S.Dasgupta 1968).

Social Work research can survey the whole Social phenomena like Social Science research but its objective will be to study from the point of view of Social Work. The data interpretation and analysis will be in the form that it is useful for the professional Social Worker.

Social Work research is the application of systematic and Scientific knowledge in order to find answers to questions related to alternate intervention in Social Work and to problems faced by Social Work practitioners in the practice of their profession.

Research aims at enhancing knowledge related to Social Science but also put this knowledge into practice, through Social Work practice.

Research is used to enhance Social functioning at individual, group and community levels.

Social Work research is a part of Social research. Research begins with practical orientation taking into account the needs and problems faced by the people. The aim of Social Work research is to assess the problems related to individual, group or community and formulate effective intervention-strategy or to assess the effectiveness of intervention-strategies.

## 2.7. SCOPE OF SOCIAL WORK RESEARCH :

Social work research may be undertaken covering the subjects like theory building in Social Work, fact finding, policy making, programme formulation, programme implementation, programme monitoring and programme evaluation. Research may be taken up in all fields of Social work, like-school, family, elderly, correctional Social Work, community development, Medical and psychiatric Social Work etc. The changing Socio-economic scenario advancement of science and technology and changing ideologies makes the scope of Social Work research ever expanding. Social Work research is advantageous in formulation of welfare services, social policy, social legislation and strengthening the social security of various groups.

**Social Work Research in India** : The research in Social Work in India has not made much head way. The researchers in India are still under the influence of methods, theories and techniques developed in the western countries. Those methods and techniques have to be modified to suit the Indian situation. The Social Work researchers are not motivated enough to carry out substantial research. Though the demand for professional social workers has increased, there seems to be a meager change in the

field of research. The studies are conducted to match the needs of the fundings organizations rather than those of community people.

## 2.8. SUBJECTS FOR SOCIAL WORK RESEARCH:

Some of the areas in which Social Work research in India needs to be done are:

1. **Studies in methods of Social Work** : Studies in the methods of Social Work may be undertaken to assess their efficacy in the Indian context. The contribution of case Work, group work, community organization and social action in various settings in India needs to be studied.
2. **Study of Social Problems** : Studies of Social problems may include subjects like poverty, prostitution, drug abuse, problems of disadvantaged groups like scheduled castes, scheduled tribes, unorganized labour and stigmatized groups like mentally challenged, HIV patients, Leprosy patients etc.
3. **Social Policy** : Studies of existing social policy measures for various groups like the elderly, women, children, youth etc may be undertaken to examine their adequacy.
4. **Human Rights** : Research studies on human rights violations, exploitation of the weaker sections, Atrocities on scheduled castes, scheduled tribes and women may also be taken up.
5. **Training and Field Work** : Research is needed in development of training curricula, evaluation of training techniques and in integrating the field experience with the contents of training programmes.
6. Studies of the History of charitable institution
7. Social Welfare legislation
8. Social welfare Programmes
9. Social work concepts
10. Studies of the expectations, perceptions and situation evaluations of social workers.
11. Studies of the intentions, goals and self image of Social workers
12. Studies of the content of Social work processes.
13. Studies that test the adequacy of available social services in relation to the needs of the individuals, groups and community.
14. Studies of client's expectations, goals, perceptions and evaluation of situations.
15. Studies of client's behaviour in relation to their reactions to social work practice.
16. Studies in the methodology of social work research.

## 2.9. LIMITATIONS OF SOCIAL WORK RESEARCH:

Social work research suffers from certain limitations as follows.

The Complex Social Phenomena are broken down into simpler parts and only one part is assessed. The interaction between the other parts is neglected. Such studies may not give correct solutions to the problems.

Though one accepts universality of social work theory and practice, in the context of cultural and social differences, modifications may be necessary. Biases of the researcher, funding organizations, Government departments and NGOs have led to the mismatch between the needs and programmes. People expect research to solve almost all human problems. But people may not use the knowledge arrived at through research. Hence all social work research may not lead to change, always.

#### **Skills of a Social worker in Social work research :**

For conducting interviews, the skill of interpersonal interaction and rapport will facilitate social work research. Social group work skill helps the social worker to minimize the biases emerging in focused group discussions. During participant observation, social workers can understand the occurrence of a Social phenomena in its real essence. The skills of case work method guide the worker to assess the problems in case study method in a much better way. The philosophies and principles of Social work match with the ethics and norms of Social work research.

#### **Definition of Social work terms and concepts :**

Social work research needs to develop its own conceptual tools. There is need for clarification of the definition of social work terms. Terms such as social adjustment, Adaptation to stress, environmental change, group therapy, social work treatment etc., may be defined. These concepts require precise definition and delimitation. These concepts may be integrated with the concepts of the social sciences. Such integration will eliminate serious differences between social scientists and social workers. It may also increase the possibility of inter disciplinary studies. Social work research will provide central concepts which are necessary for a growing and systematic social work research.

There is progress in social work research in the recent years. As a result, scaling techniques and other statistical measures have been developed. There is development of evaluating criteria for group work practice. Devices for interviewing and clinical observations are also developed. There still remains the challenge of defining and developing special appropriate research measures for Social work phenomena. This cannot be achieved without the creation of a conceptual framework.

#### **2.10. SUMMARY :**

Social research is directed towards the advancement of any of the basic social sciences. There is difference of approach between social workers and social scientists. Social research may be classified into two Main categories, theoretical type of research and empirical research. The objectives of social research include (1) Development of knowledge, (2) Scientific study of social life, (3) Welfare of humanity, (4) Classification of facts, (5) Social control and prediction. Social research is based on certain assumptions.

Social work research is the systematic critical investigation of questions in the social welfare field. Social work knowledge is drawn from social work research. Social work research project may follow the following procedure;

- (1) Selection of research project,
- (2) Formulation of hypothesis;

- (3) Construction of research design,
- (4) Fact finding process,
- (5) Analysis,
- (6) Interpretation and evaluation.

The social research is directed towards the advancement of any of the basic social sciences while research in social work deals with problems faced by professional social workers and the community. Social work research may be undertaken covering the subjects like theory building in social work, fact finding, policy making, programme monitoring and programme evaluation. The research in social work in India has not made much headway.

Subjects for social work research may include studies in methods of social work, study of social problems, social policy, human rights, training and field work etc., social work research needs to develop its own conceptual tools. There is progress in social work research in recent years.

#### 2.11 KEYWORDS :

- (1) Research design
- (2) Hypothesis
- (3) Evaluation.

#### 2.12. EXERCISES :

- (1). Distinguish between social research and social work research.
- (2). Discuss the scope of social work research.

#### 2.13. REFERENCE BOOKS :

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**Lesson - 3****CASE STUDY AND STATISTICAL METHODS****3.0. OBJECTIVES :**

The objectives of this lesson are to explain case study and statistical methods and to bring out the difference between the case study and statistical methods.

**CONTENTS :**

- 3.1. Introduction.
- 3.2. Definition
- 3.3. Assumptions
- 3.4. Sources of case Data
- 3.5. Characteristics of case study method
- 3.6. Case study method and statistical method
- 3.7. Importance of case study method
- 3.8. Limitations of case study method
- 3.9. Improvement in case study method
- 3.10. Summary
- 3.11. Key words
- 3.12. Exercises.
- 3.13. Reference Books

**3.1. INTRODUCTION:**

We may divide the methods of social research broadly under two parts namely case study methods and statistical methods. Statistical methods are based on large scale collection of facts. Case study is confined to very small number of cases. The case study is more intensive in nature. The field of study is limited. It has more depth and aims at studying something about everything.

**3.2. DEFINITION :**

Pauline V. Young defines case study as, "A comprehensive study of a social unit, be that unit a person, a group, a social institution, a district or a community. " "Institutions such as industrial organizations, public transport corporations, insurance and Banking companies have also been studied as social units."

H-odum has explained, that " case study method is a technique by which individual factor whether it be an institution, or just an episode in the life of an individual or a group is analyzed in its relationship to any other in the group"

According to goode and Hatt, " It is a way of organizing social data so as to present the unitary character of the social object being studied."

Start a queen defines case study as "the examination of a single situation, persons, groups, or institutions as complex wholes in order to identify types and process."

Burgess used the words "the social Microscope" for the case study method.

From the above definitions, we can say that case method is a form of qualitative analysis. In case study method, complete observation of an individual or a situation or an institution is possible. One can study every aspect of the concerning unit in minute detail. Case study method is a study of a particular unit in detail.

### 3.3. ASSUMPTIONS :

1. **Totality of the Being :** A unit is indivisible whole. It cannot be studied piece-meal. Hence it has to be studied in its wholeness.
2. **Underlying unity :** Though there is diversity among the units, there is an underlying unity. A unit is not different from other units in all respects. Hence the study of a particular unit has some significance.
3. **Complexity of social phenomena :** Social phenomena is very complex. Hence it requires much deeper study. This is possible only through case study.
4. **Influence of Time :** Social phenomena are influenced by time. We have to study the problem in its historical perspective. Hence under case study, we study the unit over a period of time.

### 3.4. SOURCES OF CASE DATA:

Following are the main sources of case data.

1. **Personal Documents :** Most of the people keep diaries and write their autobiographies. These are personal documents. They are self revealing records. These documents are important for social research.
2. **Life History :** The life history is the study of various events of individual's life. This can be obtained through interviews with the respondent. In this study, the entire life of the respondent is taken into account. The entire life cycle of an individual is studied, tested and enquired in this type of case study.

### 3.5. CHARACTERISTICS OF CASE STUDY METHOD :

In modern social research, case study method is extensively used in different disciplines. It is a 'qualitative' technique. Following are the important characteristics of the case study method.

1. **Single unit Analysis :** The case study method is generally known as 'single analysis method'. The unit of study may be an individual, a family, an institution, a culture group or entire community. For instance study of a criminal, a tribe, any NGO may come under the purview of case study method.
2. **Intensive study :** In this method, the unit is studied intensively. The study covers long period of time to know the historical background of the unit. For instance a village panchayat is studied under case study method; a period of 5 to 10 years is taken for consideration to know the historical background of the panchayat institution.

3. **Integrated study** : One has to make a complete study of the social unit covering all facts. Since social units are complex phenomena, the study will have to cover all the aspects of the unit. Hence an integrated study is needed to understand the social unit.
4. **Qualitative Analysis** : This method is used for qualitative analysis in the sense that it collects information covering all aspects of life, but it gives us a clear insight into life. For example, we study not only the crimes committed by an individual, but also we study the circumstances which made him a criminal.
5. **Interrelationship can be studied** : Different factors act and react upon each other. One has to take into consideration the mutual interrelationship of the causal factors.
6. **Behaviour pattern can be studied** : Under case study method, we study not only the cause and effect relationship, but also the reasons for the change in the behaviour of the unit. For example, we study the factors which cause increase in crimes in a particular social unit.
7. **It helps to formulate hypothesis** : The case study method helps to formulate the hypothesis or to test the hypothesis and generalization.
8. **Interrelationship of causal factors** : Under case study method, one can understand the mutual interrelationship of causal factors.
9. **Complementary study** : It is complementary and supplementary to the statistical method. Research requires not only quantitative analysis but also qualitative analysis. The statistical findings are supported by the case studies. In most of the research studies, besides statistical analysis of data, case studies are also illustrated in support of the statistical explanation of the phenomena.

### 3.6 CASE STUDY METHOD AND STATISTICAL METHOD :

Case study method and statistical method are two of the significant methods of investigation in research. One is known as qualitative analysis and the other is a quantitative method. The statistical method is usually applied in physical sciences and the case study method is used extensively in social science research. These two methods are different in many respects. There are also points of similarities between case study method and statistical method.

Kimball young has brought out some points of similarity between these two methods.

#### Points of Similarity:

- 1) Some studies under case study method recognize the problem of sampling
- 2) In case study method, the typical case is similar to the average in the statistical method.
- 3) In case study, variations from other cases are also studied. This is similar to the statistical method of variability.
- 4) In case study the cases are compared to other cases to find out points of similarity and dis-similarity. This is similar to the study of statistical correlation or study of covariance.

Thus the two methods are interdependent. In recent years, statistical methods are being used in case study for making it more accurate. So also case study method is also used in statistical method. Thus they support each other.

**Points of Dissimilarity:**

1. Case study depends upon description of life situations. In statistical method these situations are quantitatively measured.
2. Case history depends upon narrative type description. Statistical method tries to measure them quantitatively.
3. Case study seeks to determine social process, while statistical method deals with few factors and indicates frequency trends and degree of association.
4. Case study takes fewer cases and studies more intensively. In statistical method, we take large number of cases and study more extensively.
5. The statistical method can study a social change, social adjustments or maladjustments and other types of human behaviour which could be confirmed or disapproved. It may not be possible in case study method.
6. In case study we study more aspects. In statistical method we study one or two aspects.
7. Though the number of cases studied under case study method is less in number, it covers totality of the aspects. In statistical method, though it studies large number of cases, it cannot present full picture of the problem.
8. The generalizations made on the basis of case study method are not reliable, where as the statistical method which is based on mathematics is more objective.
9. In case study method, it is assumed that circumstances and emotions have great influence on the activities of men. In statistical method, this impact is nullified as it is based on mathematics.
10. Selection of cases in case study method is not based on sampling as in the case of statistical method.
11. Case study is not subjected to mathematical treatment. Statistical methods are subjected to Mathematical treatment.
12. Case study emphasizes the emotional side of social phenomena. This is not possible in statistical method.

**Case study and case work :** Case study and case work are complementary. Case study is the first step in case work process—study, diagnosis and treatment. Case studies are used not only in social research but also in case work practice. Case study refers to the intensive investigation of a particular unit while case work relates to the developmental and adjustmental procedure that follows the diagnosis. Case study method has been used extensively in psychology, education, sociology, economics, commerce, management and political science.

**Case study and Interview :** Case study method is similar to story type interview in many respects. However, there is some distinction between the two. In case study method relatively smaller number of cases are taken. The information we collect from case study is more comprehensive in nature. Case study interviews continue over long periods. Apart from interview, other methods like observations and objective tests are used in case studies.

**3.7. IMPORTANCE OF CASE STUDY METHOD :**

Case study has certain advantages

- 1) It helps in formulating valid hypothesis.

- It is useful in framing questionnaire, schedule or other forms.
- 3) Case study is a suitable method for studying courtship process, clique formation etc.,
  - 4) Case study enlarges the range of personal experience of the researcher.
  - 5) Case study method is very intensive in nature. It studies everything about something rather than something about everything.
  - 6) In case study method, data collection is flexible.
  - 7) In this method, data is collected in natural setting.
  - 8) This method is less expensive than other methods.
  - 9) It enables us to understand fully the behaviour pattern of the concerned unit.
  - 10) It helps us to generalize knowledge.
  - 11) In case study method, the researcher can use more than one research method such as depth interviews, questionnaires, documents, letters etc.
  - 12) It is one of the means to study the historical background of the unit.
  - 13) This method is useful in enhancing the ability and skill of the researcher.
  - 14) It is useful in understanding social change.
  - 15) It is useful in diagnosis and therapy and in solving the practical problems.

### 3.8. LIMITATIONS OF CASE STUDY METHOD :

Case study method suffers from certain limitations.

1. In case study, the researcher develops over confidence. This is detrimental to any scientific outlook.
2. In case study, generalizations are drawn from the few cases. These generalizations can be applicable only to a particular person.
3. The method is quite loose and unsystematic. There are no controls on the researcher and the informant.
4. The informant has a tendency to describe what is more imaginary than real.
5. The time and money needed for case study is much greater than in other method.
6. It does not provide universal impersonal and common aspects of a phenomena.
7. It consumes more time, money and Man-Power.
8. This method is unscientific and unsystematic.
9. It is difficult to apply the scientific method in case study analysis.
10. The results obtained in one case may not be obtainable in second case. Hence it is not comparable.
11. There is scope for errors due to inaccurate observations of a case.
12. In case study method, objectivity may be lost.
13. The method being qualitative in nature is not useful for quantitative analysis.
14. This method can be used in a limited sphere. Sampling is also not possible under case study method.
15. Pauline young pointed out, " the records are open to errors of perception, memory, Judgment and unconscious lies with a special tendency to over-emphasise, Unusual events.

16. Goode and Hatt mentioned the following difficulties in case study method-" a false sense of certainty about conclusions, temptations to ignore basic principles of research design, failure to make explicit the generalizations underlying the analysis of cases, failure to test reliability and finally case study is time consuming and requires more financial resources.

### 3.9. IMPROVEMENT IN CASE STUDY METHOD :

In the recent years, attempts have been made to quantify the case data. Case study has been subjected to statistical analysis. Various kinds of socio-metric scales are being used in case study method. Various controls are made on the researcher and on the informant. In spite of the limitations, social scientists are in need of this method for research. Many scientists like Care Rogers, Alfred Kinsey, John Dollard and Elton Mayo, suggested some methods for improvement of case study method as follows.

- 1) The life-history material should be organised and properly conceptualized
- 2) The important role of any group or institution which is responsible for transmitting a culture should be recognized.
- 3) In a case study of individuals, the continuously related experience from childhood should be stressed.
- 4) The social situation should be specified as a part and parcel of the study.

Despite the limitations and shortcoming, case study method has been widely used in social science research. The shortcomings can be removed if little care is taken by the researcher. If the researcher is well trained, he can apply the modern techniques of data collecting, classifying and processing the same and reduce the shortcomings of this methods.

### 3.10. SUMMARY :

Case study is a comprehensive study of a social unit, be that a person, a group, a social institution, a district or community. The following are the assumptions of case study method:

- (1) Totality of the Being
- (2) Underlying unity
- (3) Complexity of social phenomena
- (4) Influence of time

The sources of case data include personal documents, life history, letters etc., The following are the important characteristics of case study method.

- 1) Single unit analysis,
- 2) Intensive study
- 3) Integrated study
- 4) Qualitative analysis
- 5) Interrelationship can be studied,
- 6) Behaviour pattern can be studied
- 7) It help to formulate hypothesis
- 8) Interrelationship of causal factors
- 9) Complementary study.

There are some points of similarity between case study method and statistical method: (1) Case study recognizes the problem of sampling. (2) The typical case is similar to average. There are points of dissimilarity between case study method and statistical method. (1) Case study describes life situations and these situations are quantitatively measured. (2) Case study depends on narrative type description. Statistical method tries to measure quantitatively.

Case study and case work are complementary. Case study method is similar to story type interview in many respects. There are certain limitations of case study method: (1) The researcher develops overconfidence, (2) Generalisations are drawn from the few cases. In recent years, attempts have been made to quantify the data. Projective techniques are also used in case study. Case study has certain advantages. (1) It helps to formulate valid hypothesis, (2) It is useful in framing questionnaire (3) case study method is very intensive in nature. Despite the limitations and shortcomings, case study method has been widely used in social science research.

### 3.11. KEY WORDS :

- (a) Life History                      (b) Case Work                      (c) Projective techniques.

### 3.12. EXERCISES :

- (1) Explain the assumptions and characteristics of case study method
- (2) Distinguish between case study method and statistical method.
- (3) Discuss the relative advantages and disadvantages of case study method and statistical method.

### 3.13. REFERENCE BOOKS:

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**Lesson-4****EXPERIMENTAL METHOD****4.0. OBJECTIVES :**

The objectives of this lesson are to explain experimental method in social work research.

**CONTENTS :**

- 4.1. Introduction
- 4.2. Design of Experimental studies
- 4.3. Experimental group and control group
- 4.4. Variables.
- 4.5. Types of experiment
- 4.6. Planning an experiment
- 4.7. Difficulties of social experiments
- 4.8. Merits of Experimental method
- 4.9. Experimental Research designs categorized.
- 4.10. Summary
- 4.11. Key words
- 4.12. Exercises
- 4.13. Reference books.

**4.1. INTRODUCTION :**

The experimental method is primarily used in the physical sciences. Now this method is gradually finding favour with social sciences as well. Experiments play now an important part in research, in psychology, sociology and anthropology. Social experiments have certain limitations due to the nature of social phenomena. Experiment may be described as observing the effect on a dependent variable of the manipulation of an independent variable.

**4.2. DESIGN OF EXPERIMENTAL STUDIES :**

The term 'experiment' is usually linked with laboratory. In experimental studies, the effect of manipulation of the independent variable on the dependent variable is measured. The operation of other relevant factors is held to a minimum. Experimental studies are most suitable for testing the causal hypothesis. The causal relationship asserts that a particular characteristics or occurrence (x) is one of the factors that determine another characteristic or occurrence(y). That is to say that, for example to establish that there is causal relationship between illumination and efficiency of the worker, we have to conduct the experiment in the work spot by manipulating the independent variable i.e illumination and measure its effect on the dependent variable i.e efficiency of the worker. If the productivity



of the worker is increased by increasing the volume of illumination, it is proved by the experiment that there is causal relationship between the illumination and efficiency of the worker.

### 4.3. EXPERIMENTAL GROUP AND CONTROL GROUP :

The purpose of experimental studies is to test a hypothesis of causal relationship between two variables. For experimental study, two groups are required. One is experimental group and the other is control group. The two groups must be similar in every respect except the assumed causal (independent) variable. The two groups are compared in terms of the assumed effect of the independent variable on the dependent variable. For example we want to know the effect of weekly test on the experiment by taking two groups of students who are similar in every respect except the stimulus i.e weekly test. Weekly test will be conducted for the experimental group and not for the control group. The performance of the two groups will be compared at the end of the year. If the performance of the experimental group is better than that of that of the control group, the difference is attributed to the weekly test. It is established that there is causal relationship between weekly test and performance of the students.

### 4.4. VARIABLES :

Experiments are studies involving intervention by the researcher beyond that required for measurement. The usual intervention is to manipulate some variable in a setting and observe how it affects the subjects being studied (e.g., people or physical entities). The researcher manipulates the independent or explanatory variable and then observes whether the hypothesised dependent variable is effected by the intervention.

There is at least one independent variable (IV) and one dependent variable (DV) in a causal relationship. We hypothesise that in some way the IV "causes" the DV to occur. (The researchers should be confident that other extraneous variables did not influence the dependent variable. To ensure that these other variables are not the source of influence, under laboratory conditions, standardized conditions for control can be arranged.

While such conditions are important, further precautions are needed so that the results achieved reflect the influence of the independent variable alone on the dependent variable.

The researcher experiments by observing the effects of one or more variables upon others under controlled conditions. Controlling of conditions means that the phenomenon or the conditions should not be allowed to change while the experimentation is going on. In social sciences there is possibility of error on the part of the researcher as well as the subject of experiment. The subject in social science being human beings may not be amenable for the rigorous experiment.

The experiment involves creating artificially the conditions for conducting the experiment. Carl smith clarifies that "an experiment differs from other types of scientific investigations in that the experimenter creates the conditions necessary for observation rather than researcher for naturally occurring situations".

### 4.5. TYPES OF EXPERIMENT :

Social experiments may be divided into various types.

1. **Trial and Error Experiment** : Under this method the researcher does not prepare a plan of study. He prepares a hypothesis and **tries to test** it on whatever group he finds it convenient. This is hardly called scientific.

2. **Controlled Observational study** : This includes observation of the phenomena under controlled conditions. This comes nearer to laboratory type experiments. Under this a stimulus is provided to the subject. The cause and effect of stimulus are observed.
3. **Natural experiment** : This is also known as field experiment. The experiment is conducted in the natural setting. This experiment is used for studying advertising techniques, training methods, effect of political propaganda and the like.
4. **Ex-Post-Facto Technique** : This technique moves from present to future. For instance if we want to study the influence of Hindi and English education upon future adjustability in life, we study the students learning English and Hindi. After ten years we study the same students and know their adjustability to life. This method has some weakness. We can also study from present to past. For instance if we want to know the relation between scouting and delinquency, we take older boys consisting of delinquents and Non-delinquents. Then we try to find how many of them learnt scouting. This is a study before and after.
5. **Laboratory Experiments** : Under this, the researcher creates a situation. He controls some variables and manipulates other variables. In a laboratory experiment, the setting is artificially created. The phenomena is subject to greater control and manipulation. Laboratory experiments are chiefly used in the field of social psychology.

#### 4.6. PLANNING AN EXPERIMENT :

Pre-planning of an experiment is very important. Planning consists of certain steps.

1. **Selecting the problem** : All problems cannot be studied through experimental method. Only certain problems like advertising techniques, training methods, political propaganda can be studied by this method. Hence we have to decide whether a particular problem can be studied through this method.
2. **Selection of setting** : The second step is to create the setting artificially or we have to find out the natural setting where the experiment can be made.
3. **Pilot study** : Some sort of pilot study is necessary for successful planning. The researcher can understand the conditions in which he will have to conduct the experiment.
4. **Research design** : The researcher has to prepare the experimental design in advance. He has to conduct the experiment under controlled conditions. Some methods are used to exercise this control.
  - (a) **Control group** : The researcher will take the experimental group and the control group. The experimental group is stimulus group. The control group is Non-stimulus group. The difference between these two groups is observed. This difference is attributed to the stimulus.
  - (b) **Control through Measurement** : We must know the causative factors at work and measure their degree of influence. At the end of experiment, we shall measure them again. Thus we can understand the influence of these causative factors on the dependent variable.
  - (c) **Replication** : The experiment is repeated in the same setting. By this we know whether there is any difference between the two experiments. By repetition we can confirm the findings of the earlier experiment.

- (d) **Insulation** : One way of controlling the phenomena is through insulation. By this we mean isolating the experimental group from other groups. By this the influence of other groups on the experimental group is avoided.
- (e) **Problems of Cooperation** : When the experiment is to be conducted in an industry, the cooperation of the Management and the workers is necessary. Cooperation is to be sought before we conduct the experiment.

#### 4.7. DIFFICULTIES OF SOCIAL EXPERIMENTS :

The experimenter has to face many difficulties in conducting an experiment. The first difficulty is in finding out proper setting. There are difficulties of cooperation from the people with whom we conduct the experiment. It is difficult to control the causative factors at work. It is difficult to control social phenomena.

**Validity of Results** : The unit of study in the experiment is vary short. The unit of study must be small. The results obtained from such a study may not be applicable to other units. Human behaviour is not governed by particular cause but by the total situation as a whole. Hence the validity of experimental method is doubted. However, the improved techniques in experimental method may lead to accurate results.

#### 4.8. MERITS OF EXPERIMENTAL METHOD :

The experimental method has some advantages over other methods of study.

1. It permits determination of cause and effect relationship more clearly than other methods.
2. It is more precise and accurate.
3. It is the best method for testing a hypothesis.
4. Experimental method has universally accepted as **the most scientific** method.
5. It is possible to isolate factors involved in a phenomenon. This can be done by making one factor variable and the other factors constant.
6. In experiment, we can easily reproduce the phenomenon and vary the circumstances indefinitely.
7. In experiment, the circumstances **are within our control**, things can be examined with sufficient calmness, care and poise.

The experiment is usually **far removed** from real life phenomena. For example, the human beings cannot be put for laboratory tests **as done** in case of non-human beings.

#### 4.9. EXPERIMENTAL RESEARCH DESIGNS- CATEGORISED :

Experimental designs can be broadly divided into two groups:

- (i) Informal experimental designs.
- (ii) Formal Experimental Designs.

##### Informal experimental designs :

**Before – and- after without control group** : In this experimental design, the dependent variable measured before the treatment is given and after the treatment is given in a single test group or area.

The dependent variable is measured again. The effect of the treatment shall be the difference in magnitudes.

**Example :** Let us have a group of people who are unhealthy. Measure their health status before making them practice yoga. Now give yoga training to these people and after one month of yoga practice again measure their health.

Thus effectiveness can be measured by the difference in their health status.

**Limitation :** With the passage of time, extraneous variations may be there in the treatment effect.

**Time series design involving control group :** In this design, two comparable groups are selected (control group and experimental group) and the treatment is given only in the experimental group. The dependent variable is then measured in both the groups at the same time.

**Example :** Consider two comparable groups of people addicted to smoking.

Let us call them

- (i) Control group
- (ii) Experimental group

Now make the people belonging to group II. (experimental group) only avoid smoking.

Now measure their health status

Treatment effect = health of experimental group - health of control group

Research designs are also classified as:

1. Pre- experiments
2. True experiment
3. Quasi-experiments.

The Main distinction among **these types** is the degree of control, that the researcher can exercise over validity problems.

#### **4.10. SUMMARY:**

Experiments play now an important part in research not only in physical sciences but also in social sciences. Experimental studies are most suitable for testing the causal hypothesis. For experimental study two groups are required. One is experimental group and the other is control group.

There is at least one independent variable (IV) and one dependent variable (DV) in a causal relationship. We hypothesise that the independent variable causes the dependent variable to occur. The researcher experiments by observing the effects of one or more variables upon others under controlled conditions.

Social experiments may be divided into various types,

- (1) Trial and Error Experiment,
- (2) Controlled observational study,
- (3) Natural experiment

(4) Ex-post-Facto technique

(5) Laboratory experiments

Planning an experiment consists of the following steps.

(1) Selecting the problem

(2) Selection of setting

(3) Pilot study

(4) Research design which includes

(a) Control group

(b) Control through measurement

(c) Replication

(d) Insulation

(e) Problems of cooperation.

The experimenter has to face many difficulties in conducting an experiment. The validity of the experimental method is doubted. Human behaviour is not governed by particular cause but by total situation as a whole. The experimental method has some advantages over other methods of study. It is more precise and accurate. It is the best method for testing a hypothesis. However, the human beings cannot be put for laboratory test as done in case of Non-human beings. Experimental designs can be broadly divided into two groups,

(i) Informal Experimental designs

(ii) Formal experimental designs.

#### 4.11. KEY WORDS :

(a) Experimental design

(b) Control group

(c) Ex-Post-Facto technique

#### 4.12. EXERCISES :

1. Analyse various types of experiment. Explain the steps in planning an experiment.
2. Discuss the difficulties and merits of experimental method.

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**Lesson - 5****Research Design : Explorative, descriptive and Analytical Design****5.0. Objectives:**

The objectives of this lesson are to explain explorative, descriptive and analytical design.

**Contents:**

- 5.1. Introduction
- 5.2. Definition of Research design
- 5.3. Importance of research design
- 5.4. Essentials of a research design
- 5.5. Characteristics of a good research design
- 5.6. Relation between problem formulation and research design.
- 5.7. Types of research design
- 5.8. Exploratory or Formulative design
- 5.9. Descriptive design
- 5.10. Analytical design
- 5.11. Summary
- 5.12. Key words
- 5.13. Exercises
- 5.14. Reference Books

**5.1. Introduction:**

The artist makes a design before he executes his ideas. An architect prepares a blue print before he approved a construction. A Mechanist makes a mould to test his models. An army prepares a strategy before launching an attack. Any prudent man makes a plan before he undertakes work. So also the research scholar makes a plan of his study before he undertakes his research project. By this he can economise his time and resources. Such a plan of study or a blue print for study is called research design.

**5.2. Definition of Research Design:**

Pauline V. young defines a research design as, " the logical and systematic planning and directing a piece of research". The design " results from translating a general scientific model into varied research procedures".

Russel Ackoff has defined it, as "Design is the process of making decisions before a situation arises in which the decision has to be carried out. It is a process of deliberate anticipation directed towards bringing an unexpected situation under control".

Prof. Miller has defined it as, " the planned sequence of the entire process involved in conducting a research study".

Jahoda, Deutsch and cook have defined it as " a research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure."

General Def has defined research design as " the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and control variance."

### 5.3 Importance of research design:

A research design is a plan for the collection and analysis of data. It is a logical strategy to answer a question. It is a strategy to describe a situation. It is a strategy to discover a problem or test a hypothesis. The design will depend on the research problem. It also depends upon the specific objectives of the study. It is a outline of the structure and process of the research programme. Without such a plan of action, no scientific study is possible.

Research without a pre-drawn plan is like a journey without a direction. Research plan gives direction to the study. The researcher has to take various decisions regarding the objectives of the study, investigative questions, sources of data, universe and sampling method. Without a plan, research work becomes unfocussed. Research plan prevents blind search and indiscriminate gathering of data. It guides the researcher to proceed in the right direction. The researcher can proceed systematically with his research work with research plan.

Research design yields maximum out put with minimum effort, time and money. We need a blueprint for the construction of a house with minimum cost. So also, we need a plan of study to minimize the cost of research. It is useful to prepare an advance plan for collecting and analyzing the data.

### 5.4 Essentials of a research design:

The following are the essentials of a good research design.

1. It is a plan that specifies the objectives of the study and the hypotheses to be tested.
2. It is an out line that specifies the sources and types of information relevant to the research questions.
3. It is a blueprint specifying the method to be adopted for gathering and analyzing the data.
4. It is a scheme defining the domain of generalisability i.e whether the obtained information can be generalized to a larger population.

### 5.5. Characteristics of a good research Design:

A good research design is characterized by objectivity, reliability, validity, generalization. The design should minimize bias and maximize reliability of the data collected. A good research design is characterized by the following conditions.

#### 1.Objectivity:

Objectivity means objects oriented research. In objective type of research, multiple choice questions are given and the respondents are asked to choose the answer given there in.

#### 2. Reliability:

It means consistency in response. If the researcher asked the question about the causes of over population and, if the same answer is given repeatedly by the respondent, then, there is said to be reliability in research.

#### 3. Validity:

Tools for measurement should be used for which they are made. An intelligence test constructed for measuring intelligence should measure only intelligence and nothing else.

**4. Generalization:**

It means application of the results of data to the larger group. If the same inferences drawn from the sample are applicable to the larger group or universe from which the sample is selected, the generalization is said to be correct.

A good research design should ensure that:

1. The measuring instruments can yield objective reliable and valid data.
2. The population should be defined in clearer terms.
3. The sample should be selected using some sampling technique
4. Appropriate statistical analysis has to be employed.
5. The findings of the present study can be generalized.

**5.6. Relation between problem formulation and research design:**

The research problem may be formulated in different forms. It may be formulated with different purposes. The nature of the design depends upon the way in which the problem is formulated.

1. If the problem is an exploratory one, it requires exploratory design.
2. If the problem involves historical analysis, it calls for a historical design.
3. If the problem is to describe characteristics of groups or situations, descriptive design is necessary.
4. If the study aims at the solution of a specific problem, a diagnostic design is necessary.
5. If the researcher wants to test a hypothesis of causal relationship between variables, the experimental design is necessary.

**5.7. Types of Design:**

We have thus the following types of research design.

1. Exploratory or formulative
2. Historical design.
3. Descriptive design.
4. Diagnostic design
5. Experimental design
6. Analytical design.

The researcher will decide which particular design is appropriate for his study. He selects a particular design depending on the research problem. In certain cases, a combination of two or more types of design may be necessary, if the study is complex.

**5.8. Exploratory or Formulative design:**

Exploratory studies require exploratory design. It is also called formulative design. In exploratory studies, we discover new ideas and insights. These studies try to identify sound questions, promising concepts and hypothesis; studies of entirely of new field, which has not yet developed, are called exploratory studies. The exploratory design must be flexible. It has to consider many aspects of a problem. In these studies the researcher tries to get familiarity with the phenomenon. Exploratory study is also called an experience survey. It provides information and experience about the practical cases. These studies are helpful in the development of the theories

**Survey of literature:**

In exploratory studies, literature may not be available largely. Hence the literature of the related fields is a good source of information. Journals articles and research reports dealing with similar areas are other sources of information.



**Experience survey:**

This is also called experience survey. We have to interview people who are connected with the problem. The people are supposed to have personal knowledge of the problem. We may interview a social worker dealing with the delinquents, if the problem is related to it. We may interview a personnel officer handling labour problems, a local leader dealing with local issues. These people will be useful informants. The sample is not selected at random but purposively. We need not have structured interviews. The interview may be unstructured and informal. Since the experiences of people are recorded, this study is called experience survey.

**Insight stimulating examples:**

Some times actual cases would promote insights into the problem. Cases like new comers to a community, immigrants to a country, visitors and strangers to a place will provide insights into the problem. Study of such cases will give us greater understanding of the problem. In exploratory studies, we study relatively a new phenomena. We want to have familiarity with such a new phenomena. This phenomena has not been studied by previous scholars. Hence we have to achieve new insights into the problem. We have to explore the problem. We have to formulate a more precise research problem. We have to develop a hypothesis.

**5.9 Descriptive design:**

Descriptive studies require descriptive design. These studies are undertaken to portray the characteristics of groups, or situations. There should be more accuracy in these studies. We have to minimize bias. If these studies are undertaken for the discovery of a problem, they are also called "diagnostic studies."

**Examples of descriptive studies:**

In descriptive studies, we study special characteristics of a caste, community, racial group, marriage process, leisure time activities, working habits etc., Attitudes of people towards anything may also be studied under descriptive studies. Attitudes towards capital punishment, president's rule, family planning, are some of the examples of descriptive studies. Patterns of behaviour may also be studied. Under descriptive studies, we may try to find out what kind of people become nexalites ; who are inclined to the Marxist ideologies; who are strongly opposed to it; the pattern of voting in the next general election may also be studied. Which occupations are likely to produce more mental cases may also be studied under descriptive studies.

**Characteristics:**

Such studies do not require any specific hypothesis. They do not pre-suppose much knowledge. In descriptive studies the researcher has to define his objective clearly. He must specify what he wants to measure. The descriptive design cannot be flexible as the exploratory design. The aim of the descriptive study is to obtain complete and accurate information. The researcher should avoid bias. He must show concern for economy.

The descriptive study tries to answer the questions of who, what, where, when and how much. Its essential function is reportorial. Descriptive studies give us an idea regarding the magnitude of the problem.

**5.10. Analytical Design:**

Analytical studies require analytical design. Experimental or analytical design are almost the same. If analysis take place along with experiment it becomes analytical study. Analytical study need not always employ experimental methods.

Descriptive studies form a basis for analytical study. In analytical problem, we are interested in the how and why. Analytical studies examine the relationships existing among already described phenomena. Thus descriptive studies form the basis for analytical studies. The analytical study is basically concerned with the problem of ascertaining causality i.e., to say it answer the question of how and why.

#### **The function of the analytical study:**

Analytical study ascertains what happens and how and why it happens, when two or more factors result in a given factor. Analytical design is generally basic to all scientific analysis. The analytical design in the laboratory takes the form of experimental method.

#### **Advantages of Research Design:**

Research design has the following advantages;

1. Saves a lot of researcher's time
2. Guides him for executing the various activities
3. Better documentation of the activities
4. Ensures project time schedule
5. Instills and builds up confidence in the student
6. Provides satisfaction and sense of success.

Important points are to be considered in formulation of research design. All the steps are to be put on paper to avoid ambiguity. An unplanned research work is fruitless and leads to wastage of time, money and effort.

#### **5.11. Summary:**

The Research scholar makes a plan of his study before he undertakes his research project. A research design is a plan for the collection and analysis of data. The nature of the design depends upon the way in which the problem is formulated. We have the following types of research design, 1. Exploratory or formulative, 2. Historical design, 3. Descriptive design, 4. Diagnostic design, 5. Experimental design, 6. Analytical design.

Research without a pre-drawn plan is like a journey without a direction. Research plan gives direction to the study. A good research design has the following characteristics; 1. Objectivity, 2. Reliability, 3. Validity, and 4. Generalisation.

Exploratory studies require exploratory design. It is also called formulative design. Studies of entirely of a new field which has not yet developed are called exploratory studies. These studies are helpful in the development of the theories. In exploratory studies, literature may not be available largely. This is also called experience survey. There may be insight stimulating examples. Sometimes actual cases would promote insights into the problem.

Descriptive studies require descriptive design. In descriptive studies, we study special characteristics of a caste, community, racial group, marriage process, leisure time activities, working habits etc., Analytical studies require analytical design. Experimental or analytical design are almost the same. If analysis takes place along with experiment, it becomes analytical study.

Research design has advantages. It saves lot of researcher's time. It guides him for executing various activities. It helps for better documentation of the activities. It ensures project time schedule. It instills and builds confidence in the student.

**5.12. Key Words:**

- a) Exploratory design
- b) Descriptive Design
- c) Analytical design

**5.13. Exercises:**

1. Discuss the Meaning, importance and advantages of research design.
2. Give an account of exploratory, descriptive and analytical design.

**5.14. Reference Books:**

- |   |  |
|---|--|
| 1. Ackoff, R.L. (1953) :                  | The Design of social Research<br>University of Chicago press, Chicago.                 |
| 2. Goode and Hatt, (1952):                | Methods in social research, Mc Graw<br>Hill series, New York.                          |
| 3. Saravanavel, P(2004) :                 | Research methodology, Kitab Mahal, Allahabad.  |
| 4. Wilkinson, and Bhandankar, :<br>(1982) | Methodology and Techniques of social<br>research, Himalaya Publisjing<br>House Bombay. |

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select for sample study only rich students, Our results will be highly erroneous if extended to all students.

4. **Need for Specialized Knowledge:** The sample technique can be successful only if a competent and able scientist make the selection. If this is done by average scientist, the selection is liable to be wrong.
5. **When Sampling is not possible:** Under certain circumstances it is very difficult to use the sampling technique. If the time is very short and it is not possible to make selection of the sample, the technique cannot be used. Besides if we need 100% accuracy the sampling technique cannot be used. It can also not be used if the material is of heterogeneous nature.

**When and where Sampling Technique is Appropriate:** The foregoing discussion of *pros* and *cons* of sampling technique shows very clearly that certain defects and limitations notwithstanding, sampling techniques is very widely used. Following are the criteria to sampling techniques:

1. **Vast Data:** When the number of units is very large; sampling technique must be used as it economizes money, time and effort.
2. **When Utmost Accuracy is not required:** The sampling technique is very suitable in those situations where cent percent accuracy is not required; otherwise, census technique is unavoidable, because 100% accuracy is available only by its means.
3. **Infinite Data:** If the data is unlimited, we can but use sampling technique.
4. **Where Census is impossible:** If we want to know the amount of mineral wealth in a country we cannot dig all mines to discover and count. We have to use the sampling technique.
5. **Homogeneity:** If all the units of a domain are alike, sampling technique is very easy to use.

#### 12.6 Essentials of an ideal sample:

A scientific sample has following qualities:

1. **Representative ness:** An ideal sample must be such that it represents adequately the whole data. We should select those units which have the same set of qualities and features as re found in the whole data. It should not lack in a quality found in the whole data.
2. **Independence:** The second feature of sample is independence, that is interchangeability of units. Every unit should be free to be included in the sample.
3. **Adequacy:** The number of units included in a sample, should be sufficient to enable derivation of conclusions applicable to the whole data. A sample having 10% of the whole data is adequate but if it has only 1 or 2% it is not adequate.
4. **Homogeneity:** The units included in sample must bear likeness with other units, otherwise sample will be unscientific.

### 12.3 The value of Sampling Technique:

In the quantified research, the sampling technique is made maximum use of, and in no field of research can its importance and value be belittled. In researches in the education, economic, commercial and scientific domains, the sampling technique is used and considered most apt for research. Sampling technique also has very high value in day-to-day activities. In making our daily purchases of food-stuff, vegetables, fruits, etc., it is not considered necessary to examine each and every piece of the commodity; only a handful of goods are examined and the idea about the whole is formed and this usually proves a justified procedure. In the words of Snedecor: "A cart load of coal is accepted or rejected on the evidence gained from testing only a few pounds. The physicians make inference about a patient's blood through examination of a single drop. Samples are devices for learning about large masses by observing a few individuals." In education, sampling is a widely used technique. The census technique is rarely used, its most striking example being population account.

### 12.4 The main feature of Sampling Technique:

The sampling technique has following good features and these bring into relief its values and significance:

1. **Economy:** The sampling technique is much less expensive, much less time consuming than the census technique.
2. **Reliability:** If the choice of sample units is made with due care and the matter under survey is not heterogeneous, the conclusion of the sample survey can have almost the same reliability to those of census survey.
3. **Detailed Study:** Since the number of sample units is fairly small these can be studied intensively and elaborately. They can be examined from multiple view points.
4. **Scientific Base:** This is a scientific technique because the conclusion derived from the study of certain units can be verified from other units. By taking random samples we can determine the amount of deviation from the norm.
5. **Greater Suitability in most Situations:** Most of the surveys are made by the technique of sample survey, because wherever the matter is of a homogeneous nature, the examination of few units suffice. This is the case in the majority of situations.

### 12.5 Defects of Sampling Techniques:

1. **Less Accuracy:** In comparison to census technique the conclusions derived from sample are more liable to error. Therefore sampling technique is less accurate than the census technique.
2. **Changeability of Units:** If the units in the field of survey are liable to change or if these are not harmonious the sampling technique will be very hazardous. It is not scientific to extend the conclusions derived from one set of sample to other sets which are unlike or are changeable.
3. **Misleading Conclusions:** If due care is not taken in the selection of samples or if they are arbitrarily selected, the conclusions derived from them will become misleading if extended to all units. For example in assessing the monthly expenditure of university students we

**Lesson - 12****SAMPLING METHODS: TYPES AND PROBLEMS OF SAMPLING****12.0 Objective:**

The objective of the present lesson is to study types of sampling methods and problems and techniques of sampling.

**Contents:**

- 12.1 Introduction
- 12.2 Sample Investigation
- 12.3 The value of Sampling Technique
- 12.4 The main feature of sampling technique
- 12.5 Defects of Sampling Techniques
- 12.6 Essentials of an ideal sample
- 12.7 Methods of Sampling
- 12.8 Merits of Sampling
- 12.9 Summary
- 12.10 Key Words
- 12.11 Model Questions
- 12.12 Reference Books

**12.1 Introduction:**

The statistical research can take two forms. In the first, the scientist studies each and every unit or item of the field of survey called domain and derives conclusions by computing the sum of all units. This type of survey is called Census Survey. In the second, the scientist studies only a unit in the field of survey and the survey of this type is known as sample survey. In the sample technique of survey some units are taken as representative of the whole field or domain and the conclusions of these sample units are extended to the whole field. In practice, normally sample survey method is used.

**12.2 Sample Investigation:**

In the technique of sample investigation certain units from the whole domain so survey are selected as being representative. Now these are studied in detail and the conclusions arrived from them are extended to entire field or domain. Unlike census investigation, not all units are studied in sample investigation, but only some of these are selected for study on a certain definite basis. An example would make this clear. If we have to study the monthly expenditure of the students of a university we may not study all the students. We may collect figures of about 5% of them only. Supposing there are 10,000 students; then we may collect expenditure figures of only 500 and extend our conclusions to all of them. If full caution is taken in the selection of representative students and data is collected faithfully, the applicability of these conclusions to the entire set will be of high reliability.

subtle difference between these two recording forms. That is, a schedule is filled by the interviewer. The process of construction of a schedule and a questionnaire is almost same, except some minor differences in mechanics. This process is not a manner of simply listing questions that comes to researcher's mind.

#### 11.15 Key Words:

Hypotheses.  
Interviewer.  
Recording.

#### 11.16 Model Questions:

1. Discuss the need and importance of interview schedule.
2. Explain the advantages and disadvantages of questionnaire and interview schedule methods of data collection.

#### 11.17 Reference Books:

1. B.N.Ghosh (1993) : *Scientific Method and Social Research*, Sterling Publishers Private Limited, New Delhi.
2. D.K.Lal Das (2000) : *Practice of Social Research*, Rawat Publication, New Delhi.
3. Hans Raj (1981) : *Theory and Practice in Social Research*, Surjeet Publications, Delhi.
4. Pauline V. Young (1992) : *Scientific Social Surveys and Research*, Prentice – Hall of India (F) Limited, New Delhi.
5. P. Ramachandran (1993) : *Social Survey for Social Work*, Institute of Community Organisation Research, Bombay.
6. Sadhu and Singh (2001) : *Research Methodology in Social Sciences*, Himalaya Publishing House, Delhi.
7. S.Nakkiran and R.Selvaraj (2001) : *Research Methods in Social Sciences*, Himalaya Publishing House, Delhi.
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Another problem with this method is that it is quite time consuming. The investigator can't reasonably fill in more than 4 to 5 schedules in a day. With this speed the study is likely to take a long time before it is complete.

It is only small areas can be covered. This method is therefore not suited to such studies where the area covered is vast.

Then another difficulty with this method is that it requires quite a good number of investigators. Then each and every person should be sent on the field to see that they are actually working and collecting the information.

In the presence of investigator, the informant will not like to give any confidential information, which in his absence he might have given.

There are of course, few defects in this method, but on the whole, the advantages are many with the result that this method is being considerably liked. It is more particularly so because it becomes easy to analyze the replies and the response rate is considerably high. There are no chances of replies not being received or the replies being received in an incomplete manner.

#### 11.14 Summary:

Schedule is one more important method for the study of social problems. This method is in many respects close to questionnaire method but major difference between the two is that where filling in the questionnaires, is done by the respondent and in schedule, there is an investigator who assists the informants and gives them necessary clarifications as and when required. A schedule is like a questionnaire which contains a set of questions. These questions are required to be replied by the respondent with the help of an investigator.

Whether it is questionnaire or schedule method obviously the main aim is to collect data for a research project in an objective manner. Since the questions are put by the investigator and replies are given by the informants, all these can't be memorized.

The schedule is divided into three parts according to the nature of the contents. These are: Introductory part, main schedule, instructions. Schedules are of different types, though the aim of all the schedules is to collect data.

These types are: *Observation Schedule*: The observation form offers the opportunity for uniform classification in recording the activities and social situations of persons or groups being observed. *Rating Schedule*: In social research rating schedules are used when information is to be collected about attitudes, opinions, preferences, inhibitions and other like elements and their value is to be assessed and value of each is required to be measured. *Document Schedule*: These are used for recording data obtained from documents, case histories, and other materials. *Institutional Survey Schedule*: Schedules of this type are used to visualize the problems faced by or inherent in a given type of institution. The length of such inquiries depends upon the aspects of the given situation under investigation. *Interview Schedule*: Interview schedule is used for testing as well as collecting data as well as for collection of supplementary data.

Some times two terms are quite confused with each other. But in actual practice there is difference between the two. *Goode and Hatt*: "The questionnaire is differentiated from the schedule and interview guide by the fact that it is self administered." This difference in usage gives rise to a



**Data gathering method decision:** At this stage we must choose the method of collection of data to be used. Which communication mode is most appropriate – face – to – face interview or mailing? The choice of question structure depends largely on the communication mode chosen.

**Instrument Drafting:** After determining the data required for the study, first, broad outline of the instrument may be drafted, listing the various broad categories of data.

**Evaluation of the draft instrument:**

In consultation with other qualified persons, the researcher must rigorously examine each question in the draft instrument. This evaluation may be done in terms of the following criteria.

**Pre –testing:** The revised draft must be pre –tested in order to identify the weaknesses of the instrument and to make the required further revisions to rectify them.

**Specification of procedures / instructions:**

The instructions are finalized after pre-tests, and the procedures, for its use. This specification is one way to ensure that different interviewers will deal with specific questions in a standardized manner.

**Designing the format:**

The format should be suited to the needs of the research. The instrument should be divided into different sections relating to the different aspects of the problem.

#### **11.12 Merits of the schedule method:**

In the schedule method, the answers are not biased as the field workers are personally present to remove any doubt.

The field worker is personally present to remove any doubt or suspicion regarding the nature of enquiry or meaning of any question or term used.

The percentage of response is much higher in this method.

The field worker may recreate an atmosphere for proper response.

In the schedule method, a field worker is allowed to use abbreviations of the answers. So it saves time.

Personal contact may reveal any defect in the sampling.

In the schedule method, the field worker is able to find out the sampling defect and can also remove it.

Since the field worker comes in personal contact with the respondent through this method, it enables the field worker to probe more deeply into the character, living conditions, general life style and other necessary details about the respondent.

In the schedule method, the presence of the human element makes the situation attractive and interesting.

Last of all, the schedule method provide an opportunity for human element to be present at the time of filling the schedule.

#### **11.13 Demerits of the schedule method:**

But the method has its own defects as well. It is a method under which investigator is expected to personally go to the field and as such it requires a lot of traveling. Therefore it is very costly method.

*Goode and Hatt*: "The questionnaire is differentiated from the schedule and interview guide by the fact that it is self administered."

The terms schedules and questionnaires are used synonymously by most of the researchers. There is a very thin line of distinction between these terms. It is based on technical distinction. The schedules are those used in personal interviews whereas questionnaires are the forms distributed through mail. This distinction does not seem to have significant bearing on tools. The questionnaire/schedule is scientifically designed. Various steps are involved in the preparation of questionnaires/schedules

### **11.10 Construction of Schedules and Questionnaires**

Schedules and questionnaires are the most common instruments of data collection. These two types of tools have much in common. Both of them contain a set of questions logically related to a problem under study; both aim at eliciting responses from the respondents; in both cases the content, response structure, the wordings of questions, question sequence, etc. are the same for all respondents. Then why should they be denoted by the different terms: Schedule and Questionnaires? This is because the methods for which they are used are different. While a schedule is used as a tool for interviewing, a questionnaire is used for mailing.

This difference in usage gives rise to a subtle difference between these two recording forms. That is, a schedule is filled by the interviewer between these two recording forms. That is, a schedule is filled by the interviewer in a face-to-face interviewing, whereas a questionnaire is filled in by the respondent himself. Hence the need for using two different terms. The tool is referred to as a schedule when it is used for interviewing; and it is called a questionnaire when it is sent to a respondent for completion and return.

### **11.11 The Process of Construction:**

The process of construction of a schedule and a questionnaire is almost same, except some minor differences in mechanics. This process is not a manner of simply listing questions that comes to researcher's mind. It is a rational process involving much time, effort and thought. It consists of the following major steps:

#### *Data need determination:*

As an interview schedule or a mailed questionnaire is an instrument for gathering data for a specific study, its construction should flow logically from the data required for the given study. Hence the data need determination is the first step in the instrument design process.

#### *Preparation of dummy tables:*

The best way to ensure these requirements is to develop Dummy Tables in which to display the data to be gathered. This will help to identify gaps and duplications in the instrument and enable the designer to make appropriate additions, corrections and deletions.

#### *Determination of the respondents level:*

Who are our respondents? Are they persons with specialized knowledge relating to the problem under study? Or are they lay people? What is their level of knowledge and understanding? The choice of words and concepts depends up on the level of the respondents knowledge.

being asked should be very clear and not ambiguous. These should be very short and precise so that respondent does not take a very long time in understanding them.

*Accurate Response:* In order to get accurate response it is better that the schedule should be prepared in a scientific manner and also that the respondent gets inspired to give correct information. The questions should not be of such a nature that while replying the respondent gets bored. Similarly no informant will like to give reply to question which injures his feelings. In fact after such a question has been put to him he will decline to cooperate with remaining part of the schedule and questions contained in that, a very conscious approach in this regard should therefore, be adopted.

In a schedule idiomatic, technical, ambiguous, indefinite, imaginative and private terms should be avoided because it is usually difficult for the investigators to clarify these and much of subjectivity gets introduced in the replies which are recorded, when the same terms are differently understood both by the respondents as well as investigators then the replies will become unreliable and undependable and whole study will become a futile attempt.

No questions should be included and asked which develop a sense of shame in the respondent or on which he is to depend on others for replying or on which he has no information and it is expected of him to go and collect information from others.

#### **11.8 Construction of a schedule:**

For constructing a good schedule, the following steps should be considered:

The investigator should have proper knowledge about the problem and he should know what information is required for a valid and accurate generalization on each problem.

For collecting exact information, the questions must be complete, lucid and precise. They should be so framed that the respondents can easily grasp their meaning.

The physical design of the schedule plays a vital role in getting the information quickly. The schedule should be well-planned and good-looking.

It should be short, with proper margins.

The questions should be scientifically planned and should cover all relevant aspects of the problem concerned.

In order to obtain valid information, the questions should be placed in a well-ordered serial.

After the schedule has been prepared, it should be tested on a sample population. If there is any shortcoming, it must be remedied and the schedule tested again.

Good quality paper should be used.

The print should be easy to read and well-spaced.

If necessary, pictures may be used along with the questions to make the schedule attractive.

#### **11.9 Distinction between questionnaire and schedule:**

Some times two terms are quite confused with each other. But in actual practice there is difference between the two.

*P.V. Young:* "The questionnaire is generally sent through the mail to the informants to be answered as specified in a covering letter, but otherwise without further assistance from the sender. The schedule on the other hand, is generally filled out by research worker or the enumerator who can interpret the questions when necessary."

### 11.6 Types of Schedules:

Schedules are of different types, though the aim of all the schedules is to collect data. These types are:

*Observation Schedule:* The observation form offers the opportunity for uniform classification in recording the activities and social situations of persons or groups being observed. One observer or several may be employed to secure uniformly systematic data in an observation study. An observation schedule usually serves several purposes simultaneously:

It is a specific 'memory tickler.'

It is an objective recording device which makes possible accurate accumulation of large quantities of data.

It is a standardizing device.

It aids to delimit the scope of the study and to concentrate on the circumscribed elements essential to the analyses.

*Rating Schedule:* In social research rating schedules are used when information is to be collected about attitudes, opinions, preferences, inhibitions and other like elements and their value is to be assessed and value of each is required to be measured.

*Document Schedule:* These are used for recording data obtained from documents, case histories, and other materials. In order to secure measurable data, the items included on this type of form are limited to those that can be uniformly secured from a large number of case histories or other records. For example, a study of criminal records might include such items as type of offense, number and types of previous offenses, age at time left school, age at time started work, amount of education. It is generally necessary, however, to inspect a large number of records before the items that will yield measurable factors appearing on an adequate number of records can be ascertained. The document schedule should not be considered a tally sheet. A separate schedule should be used to list the pertinent points from each case record. Tabulations are made from these schedules, either by hand tally or by machine tabulation.

*Institutional Survey Schedule:* Schedules of this type are used to visualize the problems faced by or inherent in a given type of institution. The length of such inquiries depends upon the aspects of the given situation under investigation.

*Interview Schedule:* Interview schedule is used for testing as well as collecting data as well as for collection of supplementary data. The informant takes the schedule with him and interviews the respondents and fills in the forms. Usually in this method certain standardized questions are asked by the interviewer.

### 11.7 Characteristics:

The following are the main characteristics of a schedule according to P.V. Young. *Accurate Communication:* From accurate communication we mean that the questions in the schedule should be so worded that there is no gap in what is asked by the investigator and what is understood by the respondent. If the respondent understands exactly what is asked by the investigator then we can say that there is accurate communication. It is therefore most desirable that the questions

**G.A.Lundberg:** "The schedule is device for isolating one element at time thus intensifying our observation."

**C.A.Moser:** "Since it is handled by investigator it can be fairly formal document in which efficiency of field handling rather than attractiveness is the major operative consideration in design."

From all these definitions it becomes clear that a schedule is list of questions formulated and presented for the specific purpose of testing an assumption or hypothesis. Since in the schedule method an interviewer is always present and he can also provide stimuli, therefore, success of schedule is linked with ability and performance of the interviewer. Similarly since questions are asked and replies noted by interviewer, therefore the way in which questions are asked, replies are noted, depth to which a problem is posed, depends on the interviewer who carries the schedule. A schedule is thus a formal document for maintaining uniformity in questions and it is not always essential that it must be beautifully printed on an attractive paper.

### 11.3 Objectives of a schedule:

P.V.Young has laid great importance on the following aims of the schedule:

\* *Delimitation of the topic:* In the schedule method, the data should be collected in an objective manner.

\* *Aid Memoir.* This method acts as a memory tickler. A set of questions is prepared in a planned manner, and the researcher is always armed with the formal document containing the questions. So, if he forgets to ask some important questions, he may then take the help of the formally prepared document.

\* *Aid to classification and analysis:* Through this method, the data are classified and analysed in a scientific manner.

### 11.4 Aim and Purpose of Schedule:

Whether it is questionnaire or schedule method, obviously the main aim is to collect data for a research project in an objective manner. Since the questions are put by the investigator and replies are given by the informants, all these can't be memorized. A schedule helps in recording what cannot be memorized. Since all the information is available in a written manner therefore, tabulation of the data collected becomes easy. Similarly analysis of the data also becomes very easy, when the information to be analyzed is available on the schedule. Then another purpose of schedule is that it delimits and specifies the object of enquiry because in this method questions are asked about a specific subject and information is collected about that alone.

### 11.5 Contents of schedule:

The schedule is divided into three parts according to the nature of the contents. These are:  
**Introductory Part:** In this part, the name of the survey, the address of the surveyor, serial number of the case, place of interview, date and time of the interview and so on are mentioned clearly.  
**Main Schedule:** This is the main part of the schedule, consisting of titles, columns and questions.  
**Instructions:** In this part, the researcher or interviewer is given directions regarding the method of interview.

**Lesson-11****TOOLS OF RESEARCH - INTERVIEW SCHEDULE****11.0 Objectives:**

Schedule is one more important method for the study of social problems. This method is in many respects close to questionnaire method but major difference between the two is that where filling in the questionnaires, in this method there is an investigator who assists the informants and gives them necessary clarifications as and when required. The objectives of the present lesson are to explain the two methods; in many respects, they are different so far as collection of data is concerned.

**Contents:**

- 11.1 Introduction
- 11.2 Definitions
- 11.3 Objectives of a schedule
- 11.4 Aim and Purpose of Schedule
- 11.5 Contents of schedule
- 11.6 Types of Schedules
- 11.7 Characteristics:
- 11.8 Construction of a schedule
- 11.9 Distinction between questionnaire and schedule
- 11.10 Construction of Schedules and Questionnaires
- 11.11 The Process of Construction
- 11.12 Merits of the schedule method
- 11.13 Demerits of the schedule method
- 11.14 Summary
- 11.15 Key Words
- 11.16 Model Questions
- 11.17 Reference Books

**11.1 Introduction:**

A schedule is like a questionnaire which contains a set of questions. These questions are required to be replied by the respondent with the help of an investigator. **Meaning:** A schedule is a list of questions, which helps to collect data or requisite information. In this method, the investigator himself presents the questionnaire to the individuals whose responses are needed.

**11.2 Definitions:**

*Thomas Carson Macormic:* " The schedule is nothing more than a list of questions which seems necessary to test the hypothesis and hypotheses.

*Goode and Hatt:* " Schedule is the name usually applied to a set of questions which are asked and filled in by the investigator in a face to face situation with another person."

is also divided into *different types* on the basis of nature of the questions. The various types are Open, Closed, Mixed and Pictorial.

The formulation of good questions is much more subtle and frustrating task than is generally believed by those who have not actually attempted it. Thus, the questionnaire should be drafted with full preparations, properly worded, arranged, modified, duly pre- tested and approved by the experts in the area. Proper size and form of a questionnaire plays a vital role in social research. Hence, before preparing a questionnaire, certain points are to be considered.

By pre-testing the questionnaire errors can be eliminated; unwanted questions can be removed; language or the wordings can be corrected.

#### 10.11 Key Words:

Socio-Economic Surveys.  
Structured Questionnaires.  
Unstructured Questionnaires.  
Pre-Test.

#### 10.12 Model Questions:

1. Analyze the significance of questionnaire method.
2. Bring out difference between interview schedule and questionnaire.

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#### 10.13 Reference Books:

1. B.C.Tandon (1987): *Research Methodology in Social Sciences*, Chaitanya Publishing House, Allahabad.
2. B.N.Ghosh (1993): *Scientific Method and Social Research*, Sterling Publishers Private Limited, New Delhi.
3. D.K.Lal Das (2000): *Practice of Social Research*, Rawat Publication, New Delhi.
4. Hans Raj (1981): *Theory and Practice in Social Research*, Surjeet Publications, Delhi.
5. O.R.Krishnaswami (2002): *Methodology of Research in Social Sciences*,
6. William J. Goode and Paul K. Hatt (1981): *Methods in Social Research* McGRAW-Hill International Editions, London.

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### 10.9 Pre-test:

By pre-testing the questionnaire errors can be eliminated, unwanted questions can be removed, language or the wordings can be corrected. Goode and Hatt in their book *Methods in Social Research*, give the following advantages of pre-test.

- *Lack of order in the answer:* lack of order in questions may arise if questions do not tap same experience in each respondent. This may be due to the use of difficult words, or questions which attempt to obtain too much data at one time or the other, but whatever the reason may be, totally unordered answers should always lead to critical re-examination of the questions.
- *All-or-none responses:* Such stereo typed responses being answered by all or none must be avoided and the questions must be re-arranged or worded properly.
- *A high proportion don't know or don't understand answers:* This is an indication that the questions are improperly drawn or that, a bad sample design has been used. Large percentage of *don't know* responses suggests that:- questions are vague, that they are too complex, that they involve difficult answers on which the respondent needs expert interviewing help, that the respondent simply is not in a position to answer the questions.
- *A great number of qualifications or irrelevant comments:* Qualifications are the conditions put in answers, i.e., the respondent adds conditions like, *if* and *but*. If many of these are offered by the respondents the questions need to be changed or re-arranged.
- *A high proportion of refusals to answers:* During the course of the interview some questions may be unanswered. If the refusal order is above 10 percent, questions need revision. Refusals may be due to the inclusion of a taboo subject without any explanation, or a question, which is out of context. Refusal may take place if the interviewer asks personal questions which the respondent thinks that he cannot assure anonymity. Questionnaire Method is a method in social research, in which information is obtained with the help of a questionnaire, which is prepared exclusively for the purpose.

### 10.10 Summary:

Out of the various methods adopted for data collection in socio-economic surveys, the questionnaire and interview schedules are the two most popular and widely used methods. In every socio-economic survey the questionnaire plays an important role as a popular tool for the collection of data and required information. Purpose of questionnaire: To collect information from the respondents who are scattered in a vast area. To achieve success in collecting reliable and dependable data.

There is also a vast variety of questionnaires which can be classified in various ways. Here we confine ourselves to the structured and unstructured questionnaires. *Structured Questionnaires* These are those which pose definite, concrete, and **preordained** questions, that is, they are prepared in advance and not constructed on the spot **during the questioning period**. *Non-structured Questionnaires:* Frequently referred to as **interview guides**, also aim at precision and contain **definite subject matter areas**, the coverage of which is required during the interview. The questionnaire



- *Greater Validity:* Questionnaire has some special advantages as regards validity of information. Some people are generally more shy in talking to a stranger their personal matters, than, in writing them down. Besides, the sender need not put in his signature or address on the form. Thus it has generally been found that people are more frank in giving replies to questionnaire than to a schedule.
- *Rapidity:* Replies may be received in a much smaller time than schedule, provided the respondents co-operate with the investigator. But at times the people to whom the questionnaire has been sent keep it, and send only after constant reminders. In such cases the same time may be taken in questionnaire as in a schedule.

### 10.8 Limitations of Questionnaire Method:

The method of questionnaire is subject to following limitations

- *Unreliability:* The information gathered through questionnaire cannot be said to be very much reliable.
- *Incomplete entries:* Most of the questionnaires are very poorly filled. Some of them are left out altogether, others may be filled in such a way that it may be difficult to follow what the respondent actually means. There may be defects of language. Abbreviations may be used in giving replies.
- *Difficulties of bad handwriting:* The writing on the questionnaire is sometimes illegible. Pencil is sometimes used. Often there is too much erasing or over writing so that it becomes very difficult to follow the replies.
- *Poor response:* The response too sometimes is very poor. A sufficiently large number of cases drop out, thus causing a bias in the sample. The methods of increasing response have been discussed earlier.
- *Possibility of manipulated replies:* In case of schedule the field worker is present face to face. He may observe things, and put cross questions. Thus manipulation of any information is not easy. In case of questionnaire the respondent gets sufficient time to supply manipulated information and it is very difficult to detect the error so caused.
- *Lack of personal contact:* The field workers do not establish any personal contact in case of questionnaire. Thus there is nobody to remove any doubt if it arises. The information supplied by the questionnaire is just blind grouping and no definite confidence can be placed upon the information in the absence of any means of verification.
- *Impossibility of a deeper problem:* In a questionnaire method it is not possible for the researcher to probe deeply into feelings, reactions and sentiments of the respondent. All this requires the creation of a proper atmosphere which requires the presence of the researcher himself.

D. *In the pictorial questionnaire*, Pictures have been used in some studies solely for the purpose of promoting interest in answering the questions. Pictorial Techniques have been used extensively in studies of social attitudes and prejudices in children.

#### 10.5 Characteristics of a Questionnaire:

The formulation of good questions is much more subtle and frustrating task than is generally believed by those who have not actually attempted it. Thus, the questionnaire should be drafted with full preparations, properly worded, arranged, modified, duly pre- tested and approved by the experts in the area.

#### 10.6 Form of a questionnaire:

Proper size and form of a questionnaire plays a vital role in social research. Hence, before preparing a questionnaire, certain points are to be considered. These are the following:

- A. *Size of questionnaire*: The size of the questionnaire must be small and manageable.
- B. *Appearance*: Good quality paper, attractive printing and layout have great importance in the questionnaire method.
- C. *Clarity*: To obtain correct answers, the questions should be clear and precise. There should not be any ambiguity about the idea of the questions.
- D. *Sequence*: The questions should be in proper sequence, lucid and interesting to the respondent.
- E. *Margin*: A proper margin on one side gives a neat look to the questionnaire and it makes filling easy.
- F. *Spacing*: The lines should not be very closely printed. Sufficient space should be left out to demarcate one question from the other.
- G. *Length of questions*: The questions must not be too lengthy.
- H. *Technical Terms*: Technical terms as well as abbreviations should not be used in a questionnaire.
- I. *Attractiveness*: The questionnaire should be formed in such a way as to attract the respondents quickly

#### 10.7 Advantages of Questionnaire Method:

Following are the chief advantages of the questionnaire method

- *Low cost*: The cost of conducting research is sufficiently low. All that the researcher has to spend is on printing of questionnaire or postage charges. The cost per case thus comes sufficiently low.
- *Large coverage*: Under this method a much larger sample may be drawn and people dispersed over very long distances can be contacted with out any extra cost. Thus, this method is specially suitable for those cases where the respondents are scattered over large areas
- *Repetitive Information*: Questionnaire method has also been found to be more useful where information has to be gathered at regular intervals. In case of schedule method the cost of such a repetitive information would become prohibitive.

*Bogardus* "A questionnaire is a list of questions sent to a number of persons for them to answer. It secures standardized results that can be tabulated and treated statistically."

### 10.3 Purpose of questionnaire:

1. To collect information from the respondents who are scattered in a vast area.
2. To achieve success in collecting reliable and dependable data.

### 10.4 Types of Questionnaire:

There is also a vast variety of questionnaires which can be classified in various ways. Here we confine ourselves to the structured and unstructured questionnaires.

#### 1. Structured Questionnaires.

These are those which pose definite, concrete, and preordained questions, that is, they are prepared in advance and not constructed on the spot during the questioning period. Additional Questions may be used only when need arises to clarify vague or inadequate replies by informants or when more details are needed than those supplied by them. The form of the particular questions may require responses which are either closed or open. Structured questionnaires are used in a wide range of projects, both to initiate a formal inquiry and also to supplement and check data previously accumulated. These may pertain to studies of economic or social problems, measurement of opinion on public issues or events, studies of administrative policies and changes, studies on the cost of living, consumer expenditures, child welfare, public health, and numerous other issues. The chief disadvantage of unstructured questionnaires stems from the danger that non additive and non comparable data will be accumulated when no structuring is imposed.

#### 2. Non-structured Questionnaires.

Frequently referred to as interview guides, also aim at precision and contain definite subject matter areas, the coverage of which is required during the interview. The interviewer, however, is free-within limits-to arrange the form and timing of the inquiries. flexibility is the chief advantage of the unstructured questionnaire. It is designed to obtain viewpoints, opinions, attitudes, and to show relationships and interconnections between data which might escape notice under more mechanical types of interrogation. The object is to give the respondent maximum opportunity to reveal how he (had arrived at or developed) his world of experience.

The questionnaire is also divided into **different types** on the basis of nature of the questions. The various types are Open, Closed, Mixed and Pictorial.

- A. *The open-form questionnaire*, on the other hand, is one in which the respondent has full choice of using his own language, expression, length and view-points. In such a questionnaire, the respondent is not limited in his replies to the question posed to him and his response may be free and spontaneous.
- B. *The closed-form questionnaires* are used when categorized data are required, that is, when they need to be put into definite classifications.
- C. *The mixed questionnaire* consists of both closed and open type questionnaires. For social research, this method is very useful.

**Lesson-10****TOOLS OF RESEARCH – QUESTIONNAIRE****10.0 Objectives:**

Out of the various methods adopted for data collection in socio-economic surveys, the questionnaire and interview schedules are the two most popular and widely used methods. They help in gathering facts with fairly reliable data. The purpose of these lessons is to make a brief, yet comprehensive, study of these two methods.

**Contents:**

- 10.1 Introduction**
- 10.2 Definitions**
- 10.3 Purpose of questionnaire**
- 10.4 Types of Questionnaire**
- 10.5 Characteristics of a Questionnaire**
- 10.6 Form of a questionnaire**
- 10.7 Advantages of Questionnaire Method**
- 10.8 Limitations of Questionnaire Method**
- 10.9 Pre-test**
- 10.10 Summary**
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**10.1 Introduction:**

In every socio-economic survey the questionnaire plays an important role as a popular tool for the collection of data and required information. In fact, it may be treated as heart of the survey operation as, in practice, many such operations failed due to ill-drafted questionnaire. Often inadequate attention is paid to framing or drafting of the questionnaire believing that it is a very simple affair. But, in practice, it is not so.

Questionnaire Method is a method in social research, in which information is obtained with the help of a questionnaire, which is prepared exclusively for the purpose. In other words with the help of a set of questions all the required data is collected. A questionnaire method is that method in which a number of printed questions is used for collecting data. This list of questions is sent by mail to the respondents. After filling up the questionnaire they return it to the investigator. The questionnaire method has been defined by different sociologists in different ways.

**10.2 Definitions:**

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

investigator must be present in the field and collect relevant data of his study. Observation method has certain peculiar features and characteristics of its own, which other methods either have not or in which these features do not occupy any important place.

Several types of field observation have been found useful in social research. Here we shall discuss non-controlled and controlled field observation, in their participant and non-participant aspects. *A. Participant Observation:* In this observation, the observer is a part of the phenomenon or group which is observed and he acts as both an observer and a participant. *B. Non-participant Observation:* On the contrary, the non-participant observation is characterized by lack of participation by the observer in the life of the group that a researcher is observing. *C. Controlled Observation:* Controlled observation is not very uncommon in social science research. This technique has been introduced in social science to rectify the defects that are noticed in uncontrolled observation. *D. Non-controlled Observation:* In social science research, most of the data that we derive are from non-controlled observation, whether participant or non-participant. We learn the social behaviour from the situations which we have witnessed or participated. *E. Structured Observation:* Structured observation takes into consideration a clear and specific definition of the units to be observed and data to be recorded. This is possible only when the problem is well formulated. *F. Unstructured Observation:* In a practical situation it is often not possible to plan out the observation process in advance. Particularly, in case of exploratory studies, the researcher does not have enough clues to structure his observations, which may call for changes in what he observes.

#### 9a.11 Key Words:

1. Scientific Enquiry
2. Data Collection
3. Participant Observation
4. Non-Participant Observation

#### 9a.12 Model Questions:

1. Analyze the significance of observation as a method of data collection. And how is it useful in social work research.
2. Discuss the importance and limitations of observation method.

#### 9a.13 Reference Books:

1. B.C.Tandon (1987) : *Research Methodology in Social Sciences*, Chaitanya Publishing House, Allahabad.
2. Pauline V. Young (1992) : *Scientific Social Surveys and Research*, Prentice – Hall of India (P) Limited, New Delhi.
3. P.Ramachandran (1990) : *Issues in Social Work Research in India*, Tata Institute of Social Sciences, Bombay.
4. S.R.Bajpai (1980) : *Methods of Social Survey and Research*, Kitab Ghar, Kanpur.
5. William J. Goode and Paul K. Hatt (1981): *Methods in Social Research* McGRAW-Hill International Editions, London.

## F. Unstructured Observation:

In a practical situation it is often not possible to plan out the observation process in advance. Particularly, in case of exploratory studies, the researcher does not have enough clues to structure his observations, which may call for changes in what he observes. Such changes are characteristics of unstructured observation. Since the unstructured observation is flexible it allows for changes in the focus from time to time if and when reasonable clues warrant such changes.

### 9a.8 Advantages of Observation:

Observation has some distinct advantages which are listed below:

Observation is one of the simplest and non-technical methods. Observational studies can be conducted by persons through proper training.

It is one of the common methods used in all sciences and therefore it is systematized.

It is one of the main sources of formulating hypotheses.

Observation helps to study the subject in-depth.

It helps in the free flow of information as the situation is not disturbed.

It is possible to record behaviour as it occurs.

It is a very useful technique of studying various activities and characteristics of infants and children

The researcher is able to record natural behaviours of the group.

The researcher can collect a wide range of information.

The data collected through observation is more reliable and valid than otherwise.

It is a useful method of doing research in delicate areas.

This method involves less expense.

### 9a.9 Limitations of Observation:

Though observation is a widely used technique, it has its own limitations. They are discussed below:

All occurrences may not be open to observation. For instance, the personal activities are not open to actual observation by an outsider.

Personal bias of the observer at times distorts the observation.

Observation of a phenomena has to be made where it actually takes place. Most of the occurrences are quite uncertain in nature. Their place and time cannot be predetermined. Therefore, systematic and preplanned observation is very difficult.

Sometimes, natural factors, such as weather conditions, side attractions and the like may affect the observational task.

There are difficulties in sampling. Sometimes, it is not possible to ensure that participants represent a cross-section of the population.

### 9a.10 Summary:

Science begins with observation and must ultimately return to observation for its final validation. The sociologist must, then, train himself to observe carefully. Observation is a primary tool of scientific enquiry: It is increasingly employed in social science research as in physical or natural science researches. Observation is a method. Under which data from the field is collected with the help of observation by the observer or by personally going to the field. In observation the

**C. Controlled Observation:**

Controlled observation is not very uncommon in social science research. This technique has been introduced in social science to rectify the defects that are noticed in uncontrolled observation. Not only that, as our ideas, in-depth and sharpness, but also we wish to rely on much less uncontrolled observation. In the field of education, psychology, management science, co-operation and physical education, etc., there is much scope for the application of this technique. In the early period of thirties some valuable and in-depth studies were conducted in the field of child's behaviour based on this technique.

In Recent years controlled observation has become a useful method for studying small groups. Controlled observation can be applied to describe the behaviour of conference leaders, behaviour of children in a variety of situation, the administrative efficiency of a social institution, the record of personal behaviour or the characteristics of social groups in a community etc. Similarly, studies can also be conducted to find out the effect of lighting upon production in factories.

**D. Non-controlled Observation:**

In social science research, most of the data that we derive are from non-controlled observation, whether participant or non-participant. We learn the social behaviour from the situations which we have witnessed or participated. The life situations are such as can hardly provide the chance of laboratory method of study. Therefore, they have to be observed in natural surroundings where they occur.

In non-controlled observation the investigator visits the place of occurrence of phenomena. The participant observer using non-controlled observation lives or shares the life of the group which he is studying. No attempt is made to measure anything but merely to obtain a spontaneous and unopposed picture of individuals. Data are collected without standardizing procedure and without resorting to a random sampling.

Non-controlled observation provides us valuable preliminary data, while helping in the development of mere precise observations which should occupy a later phase of investigation. But it is often said that non-controlled observation is not reliable, because one may be tempted to generalize from stray incidents without properly verifying them. Observation may also be biased by the view of the observer as there is no check upon him. Further, the investigator enters in the field situation thinking that he knows more than what he actually observes.

**E. Structured Observation:**

Structured observation takes into consideration a clear and specific definition of the units to be observed and data to be recorded. This is possible only when the problem is well formulated. However, in exploratory studies, the researcher does not know in advance which dimension of the problem will be relevant. Structured observations are mostly used in studies designed to describe a problem or to test causal hypothesis. The use of structured observation procedure presupposes that the researcher knows what aspects of the problem under study are relevant to his research objectives and he is in a position therefore to plan the recording of observations before he starts data collection.

The group can be observed in its natural behaviour.

The participant observer is much more closer to the group than the non-participant observer. He develops greater appreciation for various activities of the group.

When he actually participates with the group, he can talk it over to the people and learn its significance.

The participant observer is generally more welcome to the group than a non-participant one.

**Disadvantages of participant observation:**

Emotional participation of the observer kills objectivity.

Some times he sees things more from his own personal point of view than from purely scientific standpoint.

Generally a stranger is in a better position to observe things because he pays attention even to minute things, as they appear strange to him.

The range of experience is narrowed. He becomes a part of social hierarchy and loses contact with the other groups.

The original purpose of research is thus lost and the researcher finds himself entangled with situations that are most detrimental to his work.

In some cases active participation is not possible e.g. a criminal gang or prison inmates.

**B. Non-participant Observation:**

On the contrary, the non-participant observation is characterized by lack of participation by the observer in the life of the group that a researcher is observing. In other words, in Non-participant observation, the observer has detached role and records without any attempt on his part to participate in the interaction process with the group being observed.

**Advantages of non-participant observation:**

Objectivity and a purely scientific outlook can be maintained.

He maintains a purely impartial status

The researcher maintains the stranger value.

It helps him to observe even minute things which would otherwise have been left as a common things.

The researcher can maintain a detached view and keep himself aloof from petty factions and quarrels among the group.

**Disadvantages of non-participant observation:**

The researcher fails to appreciate the significance of a number of actions and activities as he cannot view them from the point of the persons who are doing them.

He cannot understand them in proper sequence unless he has actively participated and consulted people about them.

People generally feel more suspicious of a person who stands as a critic.

The researcher himself and the whole group may feel very uncomfortable due to this strange attitude of the researcher.



### Collection of Primary Data:

Observation method is such a method in which only primary data is to be collected. The data collected is the only source of information of the study and as such in this method question of secondary source of data does not arise

### Direct Cause-Effect Relationship:

It is a method which can be characterized for its direct cause-effect relationship. It also helps in establishing relationship between equalities and inequalities, which obviously is very useful in so far as study of any social problem is concerned.

### 9a.6 Choice of Observational Technique:

In social science, the choice of observational technique is a very important aspect to be considered. The choice naturally depends on the nature and purpose of the study. Whatever may be the purpose of the study, the observer must be sure about the following points:

What should be observed?

How observations should be conducted?

What are the aids to be used?

How should observations be recorded?

How to ensure reliability of data?

What relationship should exist between the ensure reliability of data?

### 9a.7 Types of Observation:

Several types of field observation have been found useful in social research. Here we shall discuss non-controlled and controlled field observation, in their participant and non-participant aspects.

*The concepts* of the both participant and non-participant observation date back to professor Eduard Lindeman's publication, *Social Discovery* (1924). He was sharply critical of the naivete exhibited in studies "Based upon schedules of questions for which the investigator found answers by making inquiries of persons. In the United States, Nels Anderson, through his study of *The Hobo* (1923), still remains the most dedicated follower of the principles of participant and non-participant observation.

#### A. Participant Observation:

In this observation, the observer is a part of the phenomenon or group which is observed and he acts as both an observer and a participant. For example, a study of tribal customs by an anthropologist by taking part in tribal activities like folk dance. The persons who are observed should not be aware of the researcher's purpose. Then only their behaviour will be natural. The concealment of research objective and researcher's identity is justified on the ground that it makes it possible to study certain aspects of the group's culture which are not revealed to outsiders.

#### Advantages of participant observation:

**9a.3 Definitions:**

*Oxford Dictionary:* "Accurate watching, noting of phenomena as they occur in nature with regard to cause and effect and mutual relationship."

*P.V.Young:* "Observation may be defined as systematic viewing, coupled with consideration of seen phenomenon."

**9a.4 Characteristics of Observation:**

The general characteristics of observation are given below:

Observation is a physical as well as mental activity.

Observation is always specific and selective.

Observation is purposive and not random.

Observation is systematic and scientific.

Observation is systematic that is done by a specially well-trained person for a distinct purpose.

A record is made of the observation as promptly as possible.

The results of all systematic observation are subjected to checks and verification.

**9a.5 Features of Observation:**

Observation method has certain peculiar features and characteristics of its own, which other methods either have not or in which these features do not occupy any important place. Some such features are:

It is an eye affair:

In observation maximum stress is on eye. The observer will of course, go to the field with the clear idea as to what he is going to observe. He is therefore, expected to see everything very closely and carefully. In the strict sense, observation implies the use of eyes rather than that of the ears and voice.

**Definite Aim:**

Observation without aim will be just useless, Purposeless and meaningless. It is therefore essential that the aim of the observation should be clearly determined before going to the field, unless that is clear nothing will be scientifically observed.

**Planning:**

Then the observer should go to the field with proper planning. It means that wherever necessary he should take necessary equipments and instruments with him.

**Direct Method of Study:**

It is a method under which the investigator is personally required to go to the field and also personally observe the situation and objects with his own eyes. There is no question of dependence on others.

**Lesson-9a****OBSERVATION****9a.0 Objectives:**

Science begins with observation and must ultimately return to observation for its final validation. The sociologist must, then, train himself to observe carefully. If he can become observer, he will start his investigation with more data at his disposal, be less likely to forget that his object of study social behaviour, and be able to maintain a continual check on his conclusions more easily.

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- 9a.1 Introduction.**
- 9a.2 What is observation?**
- 9a.3 Definitions:**
- 9a.4 Characteristics of Observation:**
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**9a.1 Introduction:**

Observation is a primary tool of scientific enquiry: It is increasingly employed in social science research as in physical or natural science researches. For instance the anthropologists observe the activities, folk ways, modes of tribal-people, psychologists observe the psychological behaviour of infants and adults; sociologists observe various aspects of a community. The list is not over. It could be extended to authentic coaches who observe the performance of the teams in inter-school competition and also co-operative experts who observe the democracy in action in general meetings.

**9a.2 What is observation:**

Observation method is a method, under which data from the field is collected with the help of observation by the observer or by personally going to the field. In observation the investigator must be present in the field and collect relevant data of his study. The observation technique is perhaps the only logical approach available for the study of complex social and authentic picture about the social phenomena. But it must be clearly understood that it is supplementary to other methods and techniques of scientific enquiries as it is sometimes only through direct observation certain types of data-information can be obtained.

### 9.3 Functions:

The tools of data collection translate the research objectives into specific questions/items, the responses to which will provide the data required to achieve the research objectives. In order to achieve this purpose, each question/item must convey to the respondent the idea or group of ideas required by the research objectives, and each item must obtain a response which can be analysed for fulfilling the research objectives.

Information gathered through the tools provide descriptions of characteristics of individuals, institutions or other phenomena under study. The characteristics may help to explain differences in behavioural pattern and performance of objects under study.

Information gathered through the tools serve another purpose also. It is useful for measuring the various variables pertaining to the study. The variables and their interrelationships are analysed for testing the hypothesis or for exploring the content areas set by the research objectives.

### 9.4 Summary:

One of the important stages in the research process is data collection. The two main sources of data in social science research are *people and paper*. The responses to questions put to people constitute the major sources of data in social research. The various methods of data gathering involve the use of appropriate recording forms. These are called tools or instruments of data collection. They consist of –Observation Schedule or Observationnaire, Interview Schedule, Mailed Questionnaire. The tools of data collection translate the research objectives into specific questions/items, the responses to which will provide the data required to achieve the research objectives. In order to achieve this purpose, each question/item must convey to the respondent the idea or group of ideas required by the research objectives, and each item must obtain a response which can be analysed for fulfilling the research objectives.

### 9.5 Key words:

1. Tools
2. Data

### 9.6. Exercises:

1. Examine the various methods of data collection.? Explain.
2. What are the types of tools for data collection.? Mention their use and limitations.

### 9.7. Reference Books:

1. S.R.Bajpai (1980) : *Methods of Social Survey and Research*, Kitab Ghar, Kanpur.
2. Wilkinson and Bhardarkar (1979) : *Methodology and Techniques of Social Research*, Himalaya Publishing House, Delhi.

*A brief description of some tools of data collection is given in next lessons. These are: Observation, Questionnaire, Interview Schedules.*

**Lesson - 9****Tools of Research - Observation****9.0 Objectives:**

One of the important stages in the research process is data collection. While the initial stages in a research project decide the ways in which data collection procedures have to be carried out, the remaining stages, i.e., data processing and analysis, mainly depend upon it. From which source do we gather information about the phenomenon under study? What means are used to collect data? In this unit we intend to answer these questions.

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**9.1 Introduction:**

The two main sources of data in social science research are *people and paper*. The responses to questions put to people constitute the major sources of data in social research. This source is labeled as the primary source of data. A large amount of data is already available in the form of paper sources. This includes documents, historical records, diaries, biographies, statistical records, and the like. The paper sources are commonly known as secondary sources of data or available data sources.

When a researcher decides to collect data through primary source, he has three options, namely, observation, interview and questionnaire. And, in case he opts for secondary source of data, he uses the method of content analysis.

**9.2 Tools:**

The various methods of data gathering involve the use of appropriate recording forms. These are called tools or instruments of data collection. They consist of –Observation Schedule or Observationnaire, Interview Schedule, Mailed Questionnaire, Rating Scale, Check List, Opinionnaire, Document Schedule/Data Sheet, Schedule for Institutions, Inventories.

Each of the above tools is used for a specific method of data gathering. Observation schedule for observation method, interview schedule and interview guide for interviewing, questionnaire and optionnaire for mail survey, and so on.

Theory is elaborate hypothesis according to William H. George. The hypothesis actually emerges from the theory. It is a generalization drawn from the theory itself and when it has been tested and found correct, it becomes a part of the theory itself. Theory itself in its early form is only hypothesis. According to Pauline young, "provisional central idea which become the basis for fruitful investigation is known as working theory". Malthus stated with the hypothesis that population increases faster than food supply, and formulated the famous theory of population. This theory was further tested and established, becoming the Malthosian Law of population.

#### 8.11. Summary:

Hypothesis is a tentative generalization which remains to be tested empirically. Its function is to direct our search for the order among the facts. There are three types of hypothesis. 1) It may affirm characteristics of object, persons and events. 2. It may deal with the association among variables; 3) It may assent causal relationship between two variables.

The sources of hypothesis include findings of earlier studies, past experiences, insights, existing theories. There are four criteria for testing hypothesis i.e., 1) Null hypothesis; 2) Defining concepts, 3) Definition of concepts; 4) Identifying variables, Often the hypothesis itself will be a reflection of the theory.

The sources of hypothesis include 1) general Culture; 2) scientific theory; 3) Analogies; 4) personal experience. There are certain qualities of a workable hypothesis i.e.: 1) specific; 2) conceptually clear; 3) Related to available technique; 4) Related to the body of theory; 5) capable of empirical test; 6) simple; there are advantages of hypothesis; 1) Hypothesis gives point to enquiry; 2) it gives direction; 3) it helps in selecting pertinent factors; 4) it helps in drawing specific conclusions. There is relation between theory and hypothesis. Theory is the source of hypothesis. If hypothesis is tested and proved correct, it becomes theory.

#### 8.12. Key Words:

- a) Null hypothesis
- b) Variables
- c) Concepts.

#### 8.13. Model Questions:

1. Discuss the Qualities of a good hypothesis?
2. Explain the advantages and functions of hypothesis?

#### 8.14. Reference books:

1. Goode and Hatt: Methods in social research. M.C Graw Hill, 1981 London,
2. Kerlinger, Fred: Foundations of Behavioural Research, 1983 Surject Publications, New Delhi.
3. Saravanavel: Research methodology, Kitab Mahal, 2004 Allahabad.
4. Wilkinson and Bhandarkar: Methodology and techniques of social research, Himalaya publishing house, 1986 Bombay.

"Without hypothesis, the research is unfocused, a random empirical wandering. The results cannot be stated/ studied as facts with clear meaning. Hypothesis is a necessary link between theory and investigations, which lead to discovery of addition to knowledge".

### 8.8. Functions of hypothesis:

#### 1. To test Theories:

The function of hypothesis is to state a specific relationship between phenomena in such a way that it can be empirically tested. It should be capable of being tested empirically. It should be empirically demonstrated as either probable or not probable. If the hypotheses are tested empirically and proved correct they become part of theory. Hypotheses are usually derived from theory in the form of propositions. If these propositions are tested empirically and proved correct, the theory is confirmed. If the hypothesis is not proved correct, we have to modify the theory.

#### 2. To suggest Theories:

Another function of hypothesis is to suggest theories. According to Goode and Hatt, "every worthwhile theory permits the formulation of additional hypothesis. These when tested are either proved or disproved and in turn constitute further tests of the original theory.

#### 3. To describe social phenomena:

When hypotheses are tested, they explain the social phenomena associated with them. The phenomena may be totally new or partly known earlier or not known earlier.

### 8.9. Difficulties in Formulation of Hypothesis:

The formulation of hypothesis has certain difficulties as pointed out by Goode & Hatt.

#### 1. Lack of clear theoretical Background.

If hypothesis is not related to definite theoretical background, one cannot arrive at certain conclusions.

#### 2. Lack of logical Background:

If hypothesis lacks the logical use of the theoretical background, it may not give useful conclusions.

#### 3. Lack of knowledge of scientific methods:

One should have knowledge of scientific methods for formulation of hypothesis. Lack of scientific knowledge presents difficulty in formulation hypothesis.

### 8.10. Relation between Theory and Hypothesis:

We cannot clearly demarcate boundaries between theory and hypothesis. Hypothesis is formed at the start of the research. Theory is one of the major source of hypothesis. We develop propositions and statements from out of the theory. At first stage of enquiry, a hypothesis is made, which is only a tentative supposition or guess. When a hypothesis is verified and found to be true, it becomes a theory. This theory when it works satisfactorily and is proved, is generally accepted. A science begins and ends in facts. As concrete experience, facts suggest hypothesis. The hypothesis ripens into a theory.

### 8.6. Qualities of A workable Hypothesis:

1. Specific:

The hypothesis should be specific but not general. A general hypothesis may be vague. A specific hypothesis can be of any real value.

2. Conceptually clear:

The terms used in a hypothesis should be defined in the light of existing concepts. The hypothesis must be fitted into conceptual framework.

3. Related to Available Techniques:

The hypothesis must be capable of being tested and verified. We must know whether the techniques are available to test our hypothesis.

4. Related to the Body of knowledge:

The hypothesis must be related to the theory already evolved. The hypothesis when it is proved correct, it becomes a part of broader theory. The hypothesis can be tested against the background of theory.

5. Capable of Empirical Test:

The hypothesis must be capable of being tested empirically.

6. Simple:

The hypothesis should be simple and to the point. It should be like Occam's razor. It means that it should be as sharp as razor's blade. William Occam was an English philosopher in 14<sup>th</sup> century. Insight into the phenomena is essential for simplicity.

### 8.7. Utility of hypothesis in scientific research:

Hypothesis is the very foundation of the scientific research. A well formulated hypothesis is half of the research work already done. Following are the advantages of the hypothesis.

1. Hypothesis give point to inquiry:

It makes the inquiry more specific and to the point.

2. Hypothesis helps in deciding the direction in which to proceed:

A person proceeding in the right direction can ultimately reach his destination. So also a scientist with proper hypothesis can arrive at right conclusions. Hypothesis gives direction to the enquiry.

3. Hypothesis helps in selecting pertinent facts:

We have to study the facts which are relevant to our problem. We have to deal with pertinent facts. A hypothesis is essential to determine the facts relevant for our study.

4. Hypothesis helps in drawing specific conclusions:

Hypothesis helps us in drawing proper conclusions. Goode and Hatt said;



**Identifying variables:**

After defining the concepts that enter a research study, one has to pick out the relevant factors that go to constitute the problem or effect it. These factors are called "Variables" because they are properties which vary from person to person, group to group, situation to situation and can also provide common traits to groups of phenomena. A variable can therefore be an object, an event or characteristic. Usually variables are classified into independent, dependent and intervening according to their relation to each other such as cause-effect or conditioning factor. The relationship between the variables will be causal or functional. The attribute is qualitative while a variable is quantitative.

**Criteria of relevance in choosing variables:**

The decision to include a factor or variable in a research should depend on two related considerations.

1. Does this factor have any effect on the efficiency of any of the possible solutions to the problem.
2. If it does, is its effect significantly large relative to the research objectives.

Suppose we want to test which of a set of alternative text books is best suited for teaching a certain subject.

Should the teacher be taken into account? Should the kind of students, their sex, their ability and previous background also be considered? It will depend on the knowledge of the whole situation and process by the researcher.

How can be sure that we have included all the pertinent factors in the study? Previous studies and literature on the subject will provide the student with ample guidance in the process of selection. Much will depend also on the insight the scholar possesses into the problem. Inter disciplinary and intra-disciplinary cooperation would be helpful and even necessary.

**Theoretical framework:**

The findings of research, however fragmented they may be, are not to remain isolated but should be related to the general body of knowledge that obtains in any particular field. For this purpose the researcher should take care to formulate his problem in the background and in the context of existing theories connected with his topic. Such a theoretical framework will throw much light in his own search for adequate explanations of the problem he is tackling and guide his method of enquiry along sound and scientific lines. Often the hypothesis itself will be a reflection of the theory that backs his study. This calls for continuous effort in maintaining a fairly a high degree of abstraction in his conceptual scheme so that later on generalizations based on his findings be easy and valid. Only such a theoretical approach will entitle the research to be counted among works of genuine scientific value as it will be able to contribute something original and substantial to the furthering of knowledge in that particular field through the testing, modification or formulation of new theories.

Sometimes the individual sees the facts in right perspective and formulates the hypothesis. The falling of an apple formed the basis for the force of gravitation. This was the personal experience of Newton.

#### Testing of Hypothesis:

A hypothesis must be evaluated in terms of agreement with and explanation of the observed facts, absence of conflict with satisfactorily proved generalizations, success for the purpose of prediction, simplicity and clarity of statement and logical consistency.

#### Four criteria for testing hypothesis:

1. The extent to which first hand observations which lead to testable hypothesis have been made.
2. The stage of theory –development –it may be non-existent, vague or specific.
3. If the problems are stated in scientific terms.
4. If the concepts and variables cover the area.

#### Null Hypothesis:

Null hypothesis is a negative form of enunciating the real research hypothesis by which one assumes that no significant relationship exists between two variables and seeks to ascertain the improbability of such a state of affairs. By disproving or rejecting the null hypothesis, the research thesis is established.

#### Defining concepts:

A concept is a mental representation of objective facts. It is abstracted from observed events. The degree of abstraction varies. Some concepts are directly represented e.g. mother, fire etc., others are not easily observable e.g. welfare, harmony. Attitude, etc. They are inferences from concrete events which cannot be pointed out in specific objects. These higher-level abstractions are also called "construct" since they are constructed from concepts at a lower level abstraction.

#### Types of Definition:

The greater the distance between one's concepts or constructs, and the empirical facts they refer to, the greater the chance of their being misunderstood or carelessly used.

Hence they should be defined very carefully both in abstract terms giving the general meaning they are intended to convey, and in terms of the operations by which they will be represented in the particular study. The former type of definition is necessary in order to link the study with the body of knowledge, using similar concepts or constructs. The latter called, operational definition is an essential step in carrying out any research, since data must be collected in terms of observable facts. E.g. terms like prestige, popularity, stigma, failure, friendship, happiness etc., hence the working definition should be evolved from the functions they perform in actual life situation.

A hypothesis is a tentative generalization, the validity of which remains to be tested. It may be a guess, imaginative idea which becomes the basis for investigation. It is a propositions which can be put to test to determine validity.

### 8.3. Definition of Hypothesis:

George A.Lund berg defines that, " a hypothesis is a tentative generalization, the validity of which remains to be tested. In its most elementary stage, the hypothesis may be every hunch, guess, imaginative idea, which becomes the basis for action or investigation".

According to Webster, " A hypothesis is a proposition, condition or principle which is assumed, perhaps without belief, in order to draw out its logical consequences and by this method to test its accord with facts which are known or may be determined.

Rummel and Baltine define that, "A hypothesis is a statement capable of being tested and there by verified or rejected".

William C. Emory says, " When propositions are formulated or empirically tested they are called hypotheses".

According to M.H.Gopal, "It has been defined as a tentative solution posed on a cursory observation of known and available data and adopted provisionally to explain certain events and to guide in the investigation of others. It is, in fact, a possible solution to the problem".

### 8.4. Types of Hypothesis:

1. A hypothesis may affirm characteristics of objects, persons, events or situation e.g. Darwin's " Survival of the fittest".
2. It may deal with the association among variables e.g. crime and poverty.
3. It may assert a causal relationship between two variables e.g. weekly test and performance.

### 8.5. Sources of Hypothesis:

The Hypothesis may be drawn from findings of earlier studies, from past experiences similar problems, from insights, from existing theories etc. A Hypothesis can also be the end product of a scientific study. As Maxweber said, " Every scientific fulfilment raises new questions; it asks to be surpassed and outdated". The following are some of the major sources.

#### 1. General Culture:

The general pattern of culture helps to formulate a hypothesis. Culture influences thinking process. Indian culture has a meta-physical bias. Metaphysical ideas may form the basis for hypothesis.

#### 2. Scientific theory:

Theory help us from further generations. These generalizations form part of hypothesis.

#### 3. Analogies:

Sometimes a hypothesis is formed from the analogy. Similarities are drawn from other subjects. Similarities between social phenomena and plant ecology are sometimes drawn.

#### 4. Personal experience:

**Lesson-8****HYPOTHESIS****8.0. Objectives:**

The objectives of this lesson are to explain the meaning, types and uses of hypothesis in research.

**Contents:**

- 8.1. Introduction
- 8.2. Meaning of Hypothesis
- 8.3. Definition of Hypothesis
- 8.4. Types of Hypothesis
- 8.5. Sources of Hypothesis
- 8.6. Qualities of a workable Hypothesis
- 8.7. Utility of hypothesis in scientific research
- 8.8. Function of Hypothesis
- 8.9. Difficulties in formulation of Hypothesis
- 8.10. Relation between Theory and Hypothesis
- 8.11. Summary
- 8.12. Key words
- 8.13. Model Questions
- 8.14. Reference Books

**8.1. Introduction:**

In formulating a problem, it is necessary to make explicit the alternative means which are involved. Once they are explicated, the next question is: "which one of a set of alternatives is most efficient?" the answer to this question constitutes the specification of conditions under which the means ought to be accepted. A set of acceptance condition should be formulated for each alternative means. The statements of these conditions are called "hypothesis". We do not know which of the alternative hypotheses is true. This is precisely what the research should be designed to determine.

**8.2. Meaning:**

Hypothesis is a tentative solution provisionally suggested to explain observed facts or conditions and to guide in further investigation. Its function is to direct our search for the order among the facts. Hypothesis takes the place in research that is held by opinion in every day life. It is neither an assumption nor a theory which are both accepted and established. Columbus hypothesized that since the world is round, he could reach Asia by traveling west. A law represents an order or relation of phenomena that is invariable under the given conditions and permits of no exception in its operation. A hypothesis guides the researcher in his search for evidence by way of hinting the area of investigation, sensitizing the worker to relevant data and relationships and providing a unifying concept.

pertains. The formulation of the problem consists of various components of the problem i.e 1. Research consumer's objectives; 2. Researcher's objectives;

3. Objectives of those affected by research.

The factors affecting solution and formulation of the problem include; 1. Practicality; 2. Urgency; 3. Anticipation; 4. Resources; 5. Available information; 6. Field of specialization; 7. Administrative consideration; 8. Equipment; 9. Operational funds; 10. Time-cost Factor; 11. Administrative cooperation; 12. Readily available techniques. There are three determinants in the formulation and solution of the problem; 1. Subject; 2. The investigator; 3. Extensive and intensive coverage

Formulating of a research problem requires the following steps.

1. Choosing of an area of study.
2. Breaking down the area into specific field and sub-fields.
3. Picking up a particular issue which has scientific significance
4. Relating it to factors that are relevant
5. Stating the objective in a precise manner.

#### 7.9. Key words:

- (a) Value judgment
- (b) Selection of topic
- (c) Problem formulation

#### 7.10. Exercises:

1. Explain the factors and consideration in the selection of topic for research.
2. Discuss the factors affecting the formulation and solution of the problem.

#### 7.11. Reference books:

1. Saravanel, P. : Research methodology, Kitab Mahal, (2004) Allahabad.
2. Goode and Hatt : Methods in social research, MC Graw Hill (1981) Book company, London,
3. Kerlinger, Fred. : Foundations of Behavioural research, (1983) subject publications, Delhi.

**11. Administrative cooperation:**

Administrative cooperation is essential for the successful implementation of any research programme.

**12. Readily available Techniques:**

The problem formulated should fit into the readily available techniques and tools of research.

There are three determinants in the formulation and solution of the problem.

**1. Subject:**

The problem must have a purpose. It must be meaningful. Theoretically it must add to the knowledge. It must resolve the issue facing the community

**2. The investigator:**

The formulation and the solution of a problem depends upon the nature of the investigator. The investigator is a crucial factor in the conduct of the enquiry. His experience, resources and technical ability help a great deal in formulating and solving the problem.

**3. Extensive and Intensive coverage:**

Another determinant is the coverage of the subject. One of the common false steps in the research has been the choice of wider subject for research. For example unemployment in India. The wider the subject, the less depth of work. The essence of research is depth rather than breadth. When a subject is extensive, there is scope for vagueness and hasty generalization. There is hardly any time to do intensive data collection or to analyse and process the data accurately.

Formulating of a research problem requires the following steps:

1. Choosing of an area of study.
2. Breaking down the area into specific fields and sub-fields.
3. Picking up a particular issue which has scientific significance.
4. Relating it to factors that are considered relevant.
5. Stating the objective in a precise manner.

Thus when the research problem is clearly formulated, the scope of the study is also delimited. A problem well formulated is half solved.

**7.8. Summary:**

The selection of the topic for research involves several considerations. They include 1. Motivation of study; 2. Practical concern; 3. Intellectual interests; 4. Value judgement. Criteria for the selection of topics include, 1. Personal factors; 2. Training and personal qualifications; 3. Time- cost factor; The External factors include,

1. Novelty of the topic
2. Availability of the data
3. Sponsorship and administrative cooperation
4. Topic suggested by guide/choice by oneself
5. Preliminary survey of literature for topic selection.

There is need for restricting an overly broad topic. One should avoid argumentative topics. A problem well formulated is half solved. The problem has five components i.e 1. Research consumer and other participants 2. The objectives; 3. Alternative means for obtaining the objectives; 4. A State of doubt concerning the efficiency of the alternatives; 5. The environment to which the problem

Some problems may have different objectives e.g. housing

1. To replace inadequate housing facilities by adequate ones;
  2. To create community interest among neighbours;
  3. To educate the dwellers in cleanliness;
  4. To achieve economy of time, money and efforts;
  5. To beautify the city and bring prestige to the party in power etc.,
- A hierarchy should be set up among the values. 3

### 7.7. Factors affecting formulation and solution of the problem:

The scientific skill reveals itself in the choice of the problem. The formulation of the problem is an artistic gift. The solution of a problem requires technical brilliance, the solution and formulation of the problem involves the following considerations.

#### 1. Practicability:

The question whether it is practicable to carry out the various steps in research is to be considered before a problem is formulated.

#### 2. Urgency:

A second consideration is the urgency of the issue. Some problems need more urgent investigation than others.

#### 3. Anticipation:

The researcher must anticipate the problems needing solution in the immediate future.

#### 4. Resources:

Another consideration is the availability of research resources.

#### 5. Available information:

Another consideration is the availability of the information to the researcher.

#### 6. Field of specialization:

The researcher usually chooses a problem in the field of his specialization

#### 7. Administrative consideration:

Before a problem is formulated, the researcher must see whether the personnel are available for the administration of the project.

#### 8. Equipment:

Another type of resource relates to mechanical and other equipment for sorting, tabulating, processing etc.,

#### 9. Operational Funds:

Another factor is the working capital necessary for operational purposes.

#### 10. Time, Cost Factor:

The research student should estimate the time and cost at his disposal for carrying out the project before he formulates the problem.

- the problem, he or it is called the "research consumer". The researcher and collaborators are "participants"
2. The research-consumer must have something he wants, some end or objective he desires, some need to be satisfied.
  3. the research consumer should have alternative means for achieving his ends. "means" in any course of action which has efficiency in obtaining objectives. Objectives used in the course of action are "instruments" e.g., a concept, a formula, a definition, a language etc. a need becomes a problem only when a choice of means to achieve the goal is available.
  4. A research-consumer must have doubts concerning the alternative to be selected; he must question the relative efficiencies of the alternative means and want to answer it.
  5. There must be one or more environments to which the problem pertains. A change of environment may produce or remove a problem. The research consumer may have doubts as to which is the most efficient means in one environment and have no such doubt in another, e.g. to take an umbrella on a cloudy day (neither rainy, nor sunny day).

The five components of a problem are:

1. Research consumer and other participants
2. The objectives
3. Alternative means for obtaining the objectives.
4. a state of doubt concerning the efficiency of the alternatives.
5. The environment to which the problem pertains.

The formulation of the problem consists in making the various components of the problem explicit and in determining the seriousness of any possible mistakes which might be made.

### 7.6. Objectives of the problem:

#### 1. Research- consumer's objectives:

The research consumer is either the sponsoring agency like the town planning commission or panchayat or any institution to whom the results of the research are to be made available or others who would use the research findings such as even the readers of a journal in which the results are published. The research consumer should have clear objectives e.g. slum clearance, creation of employment opportunities, adult literacy campaign etc., if they cannot express these clearly, the research should formulate them.

#### 2. Researcher's objectives:

Personal motivation e.g. to get a Ph. D. degree, to make money etc., (b) his objective as a scientist e.g. to increase the knowledge in the field, to provide concrete solutions for pressing problems etc., the latter should always dominate the research though the former is inevitable.

#### 3. Objectives of those affected by research:

Workers, students, slum dwellers, passengers, consumers etc., are benefited by research. Even if this category is unaware of the problem, their interests should be taken into account while designing the project. Here the researcher has a grave moral responsibility

It is possible that the research and the research-consumer are identical or the research consumer and those affected by the research are the same. The research consumer may be immediate, intermediate and ultimate.



1. Too broad areas.
  2. Too narrow and local interests
  3. Too emotional or argumentative presentation.
7. Restricting an overly broad topic:  
When the topic is too extensive, it should be narrowed down to workable proportions avoiding vagueness and offering clarity and precision.

8. Examples of broad titles:

1. Learning of school children.
2. Adolescent delinquency
3. Student unrest
4. Voting pattern
5. Child psychology
6. Vocational Counselling
7. Marital problems
8. Family changes.

These areas have to be broken down to specific problems and precise topics

9. Broadening excessively localized issues:

1. Student union in a particular college.
2. Freedom of prisoners in a local prison
3. Causes of a recent strike among the workers of a factory.

10. Argumentative topics:

Examples:

1. A plea for right to employment.
2. Reasons against reservation of seats for backward classes.
3. a plea for equal representation of women in parliament and legislatures.

11. Examples of well defined topics:

1. Clothing and appearance their psychological implications for teenage girls.
2. A comparative study of psychological factors involved in the responses of mentally retarded and normal boys to arithmetic problems.
3. Attitudes of rural and urban high school students towards the values of rural living.

**7.5. Formulation of problem:**

A problem well formulated is half solved. In scientific research we must abandon the idea that we can phrase our problem in the form of simple common sense questions. Ask a friend "how many people live in your house" and you might get an easy answer. But you will hesitate to ask the same question to the same person while you are conducting a housing survey because it lacks precision. Would you include a son who is away in a college for most of the year? A boarder who comes home on weekends? a maid who goes home 3 or 4 days a week? if these cases are not clarified, the finding of the study would be utterly confusing. Hence the need to formulate the problem precisely.

What is problem:

1. It is an individual or a group who has a problem and if this party uses research to solve

**B. External Factors:**

1. Novelty of the topic and avoidance of unnecessary duplication.  
This calls for a close study of the related literature dealing with a particular problem and a careful and critical review of similar works done elsewhere and in the past. Each work should be a new contribution to the enrichment of the field of study.
2. Availability of data should be ascertained before starting a project. The data under consideration should meet certain standards of accuracy, objectivity and verifiability. Hence the material to be collected should be relevant and reliable.
3. Sponsorship and administrative cooperation are essential for successive implementation of any research programme. A competent guide who is interested in the field and has time for regular consultation is absolutely necessary to help the student. Cooperation of the agencies such as government officers, educational institutions, hospitals etc. where data collection is planned has to be secured if the work is to proceed effectively.

## 4. Topic suggested by guide/choice by oneself:

There are two types of choice of the topic. The guide may suggest a topic. Or the researcher by himself may select the topic. If the guide suggests a topic, it may be suitable for research. The guide with his rich experience may suggest such a topic which is researchable. But it is always better to choose the topic oneself. Even in the case of guide's choice, the ultimate responsibility rests with the researcher. He has to make the final decision. If one chooses the topic by himself, he develops interest in the subject. He will study the subject in depth. There are chances for the student to become a specialist in one's field.

## 5. Preliminary survey of literature for topic selection:

A Preliminary survey of literature is necessary for topic selection. The available literature will suggest the topics and point out the gaps in knowledge. The researcher should be familiar with the recent doctoral studies. For instance the Indian council of social science research is publishing the research abstracts of the doctoral theses. One may institute inquiries at all important research centres regarding the topics of research relating to one's proposed research. One may get the topic for his research, by referring the professional journals and the recent papers, discussions in workshops, conferences and seminars. Specialists or experts, and research guides provide clues to the area of research work.

The research student should think about feasibility of the topic by considering the questions:

1. Whether the topic can be completed in the required time.
2. The availability of literature.
3. Availability and accessibility of data.
4. Whether the subjects are available to experimental treatments and testing.

## 6. Framing a research topic:

As the purpose of research is to seek an impartial answer to the question proposed rather than proving something, the framing of the topic should be declarative and unbiased. Three defects should be avoided in deciding on the research topic.

patterns developed among nursery school children; the process of opinion formation among the rural folk; or it may be to test specific hypothesis such as 'deprivation in infancy leads to miserly behaviour in adulthood; external pressure intensifies the internal solidarity of a group' and such other theoretical predictions.

#### 4. Value judgement:

Selection of topic often involves value judgement. The personal preference of the social scientists will indicate the scale of values among a set of possible research topics. The importance one research scholar attaches to a particular topic will not have the same acceptance for another. Besides personal values, social conditions also act as a determinant in the selection of research topics. Interest of the research guide, availability of research funds, encouragement from government agencies etc., are often weighty considerations which no social scientist can easily ignore.

#### 7.3. Sources for the selection of topic:

1. Field of one's own professional work and specialization, taking up unstudied or unsolved problems. This might coincide with the worker's professional choice i.e., industrial relations, welfare schemes etc.
2. A teacher could come across critical problems in his lectures, seminars and discussions with stimulating students and colleagues pursuing the subjects he is personally handling.
3. Extensive reading will point out gaps in research fields and lead to new openings.
4. Analysis of an area of knowledge in which one is specially interested e.g. criminology, family etc.,
5. Extension of studies already under way from which put forth new offshoots" like Pasteur's discovery of the principle of immunization or Beverley's insight into the use of radium in the treatment of cancer.

#### 7.4. Criteria for the selection of Topics:

##### A. Personal factors:

1. Interest in human problems, intellectual curiosity and drive for persevering work. Examples of Galileo who gave up a \$2000 a year job of professor of medicine to become a professor of mathematics for only \$65 dollars a year because of his love of Mathematics, of Darwin who worked on the origin of species" for more than twenty years, of Newton who asked that his first paper on the solution to the problem in annuities be published without his name attached to it for fear of increasing the number of his admirers.
2. Training and personal qualifications especially in the methods and techniques of doing research, versatility in a wide range of related fields through background reading etc.,
3. Time-cost factor- the research student should make a realistic estimate of the financial resources at his disposal and the duration of time available to him so that he may not undertake projects which are beyond his competence and resources. At the same time, he should be prepared to face hazards, risks, and handicaps in the course of his studies. It is better to launch on a smaller project which can be thoroughly done and completed within a specified period than envisaged larger programmes which are very likely to be left unfinished.

## Lesson-7

**SELECTION OF TOPIC AND FORMULATION PROBLEM****7.0. Objectives:**

The objectives of this lesson are to explain the factors and considerations in the selection of Topic and formulation of research problem.

**Contents:**

- 7.1. Introduction
- 7.2. Factors involved in selection of Topic
- 7.3. Sources for the selection of Topic
- 7.4. Criteria for selection of Topics
- 7.5. Formulation of problem
- 7.6. Objectives of the problem
- 7.7. Factors affecting formulation and solution of the problem
- 7.8. Summary
- 7.9. Key Words
- 7.10. Exercises
- 7.11. Reference Books.

**7.1. Introduction:**

The selection of the topic for research is the most difficult task. For a beginner in research, it is not easy to select a topic for research. He has to keep in mind several considerations before selecting the topic. Some students fail to complete their research work, if their topic is not suitable for research. Extensive social research, covering large samples cannot be undertaken, since it becomes difficult for an inexperienced student to complete such research work. Some topics are not researchable because the sources of information may not be available. Time and cost factor is to be taken into consideration. We have to estimate the time and the cost involved in the proposed research work before selecting a topic. For a student of research, topics which require long period of study and involving huge expenses may not be suitable for research.

The range of topics for research is as broad as the range of human behaviour it self.

**7.2. Factors involved in the selection of topic:****1. Motivation of study:**

The topic of a study may be suggested by practical concerns or intellectual interests.

**2. Practical concern:**

The need for housing or recreational facilities in a community; the effects of literacy campaign; the impact of family planning propaganda; prediction of crime rate after removal of prohibition etc., are some of the topics which have practical concern.

**3. Intellectual interests:**

Intellectual interests lead to more basic research, irrespective of the practical utility in a given situation and therefore deal with general classes of phenomena; for example the friendship

Interpretation requires insights into relationships between variables. The preparation of the chapter outline is a necessary step. The findings are to be presented logically in the form of a report. It is necessary to estimate the time and cost involved in the research work. The research design or plan of study involves the above steps. It is the arrangement of conditions for collection and analysis of data. The plan is the overall scheme of programme of research.

**6.14. Key words:**

- a) Bibliography
- b) Population
- c) Sample

**6.15. Exercises:**

- 2. Discuss the major steps in research and plan of study
- 3. Explain the different stages in research and plan of study.

**6.16. Reference Books:**

- 1. Ackoff, R.L. (1953) : The design of social research university of Chicago press, Chicago.
- 2. Goode and Hatt(1952) : Methods in social research, Mcgraw Hill scies, New York.
- 3. Saravanavel, P. (2004) : Research methodology, kitab Mahal, Allahabad,
- 4. Wilkinson, and Bandankar(1982) : Methodology and Techniques of social research, Himalaya Publishing house, Bombay.

**M. Lakshmi pathi Raju**

## 12.7 Methods of Sampling:

From a given data the choice of sample is made by various methods. Which method will suit in a given problem will depend upon its nature, scope and the investigator. Therefore the choice of method in the selection of a sample must be made with utmost care. The main methods of selection of a sample must be made with utmost care. The main methods of selecting a sample are the following:-

- (1) Deliberate sampling or purposive sampling.
- (2) Random sampling.
- (3) Stratified sampling.
- (4) Quota sampling.
- (5) Multi-stage sampling.
- (6) Extensive sampling.
- (7) Convenient sampling.

**1. Deliberate or Purposive Sampling-** In this method the investigator has complete freedom in choosing his sample according to his wishes and desires. The investigator choose certain items from the whole data and studies them only. To choose or leave an item for the purpose of study depends entirely upon the wishes of an investigator and he will choose items or units which in his judgement are representative of the whole data.

This is a very simple technique of choosing the samples and is useful in cases where the whole data is homogeneous and the investigator has full knowledge of the various aspects of the problem. Though deliberate of purpose, this method does not imply arbitrary choice. In fact, it means that only those units which represent the whole will be selected.

### Criticism of Deliberate Sampling Technique:

In criticizing the deliberate sampling technique, it is pointed out that in this the selection is completely under the control of the investigator and his prejudices and predilections are liable to interfere with his sense of objectivity. If this happens, and there is no theoretical check against his possibility in this technique the selection of the sample will be unfair. For example, if a scientist is investigating the monthly expenditure of students living in a hostel and he has a preconception that students spend maximum amount on cinemas and other sources of entertainment, he may select only those students for study whose rooms are stacked with film magazines. This may be true only of 20% students but upon this basis of his sample he may conclude that 75% students spend more than 50% of their total expenditure on cinema and cinema literature. Another investigator who may have the preconception that students are much excited by sexual literature and other sources of sexual entertainment may come out with an unrealistic estimate about the amount spent by student on call girls, prostitutes and blue films.

For these reasons this technique is considered highly unsatisfactory and most statisticians have not a single word of praise for it. According to Parten, "Statisticians as a class, have nothing to say in favour of purposive selection." If very great care is taken and the investigator is an expert scientist, this technique may still be useful, otherwise, as a rule, it is inappropriate and unsuited to objective study, and its main draw back is lack in it of any inherent check.

**2. Random Sampling:** Of the methods of selecting the samples, Random Sampling technique is made maximum use of; and it is considered the best method of sample selection. In this technique every item or unit of the domain has an equal opportunity for selection and this selection is in no way influenced by personal bias and predilection of the investigator. No item is selected on account of likes or dislikes of the investigator and the selection is left entirely to chance. This provides every item fair and equal chance for selection; so it is not investigators whim but nature which determines the selection.

Random sampling is made in the following ways:-

**(1) Lottery Method:** This is the simplest way of making the selection. The numbers of items in a data are written on sheets of paper or cards and they are thrown into a box. Now a casual observer or the investigator blindfolding himself selects the number of item required in the sample. Here there is no partiality in favour of any item. The play of chances is allowed to determine the items selected in the sample.

For this method it is necessary that sheets of papers should be of equal dimensions and none should be bigger or smaller than the other.

**(2) By rotating the Drum:** This procedure is a slight modification of the lottery method. In it pieces of wood, tin or card board of equal length and breadth, with number 0, 1 or 2 printed on them, are used. Now a list of items in the domain are prepared and divided in 0, 1, or 5 categories. The pieces are rotated in the drum and then requisite numbers are drawn by an impartial person. Now, if the pieces drawn are 20 from zero list, 10 from list 1 and 15 from the list 2.

**(3) Selecting from sequential List:** In this procedure units are broken up in Numerical, Alphabetical or Geographical Sequence, Now, we may decide to choose 1,5,10,15 and so on, if the division is alphabetical we decide to choose every item starting a,e,m,o etc.

**(4) Tippet's Numbers:** On the basis of population statistics, Tippet has constructed a random list of four digits each of 10,400 institutions. These numbers are the result of combining 41,600 populations statistics reports.

The first forty numbers in Tippet's list are:

2952	6641	3992	9792	7969	5911	3170
5634	4167	9524	1545	1396	7203	5356
1300	2693	2370	7483	3408	2768	3563
1089	6913	7691	0560	5246	1112	6107
6008	8126	4423	8776	2754	9143	1405
9025	7002	6101	8816	6446		

Upon the basis of Tippet's numbers it is very easy to select samples. If a domain has 8000 items and we wish to select first 30, then we shall firstly arrange serially items 1 to 8000, and then select from the above schedule first thirty such items which do not exceed then number 8000. Tippet's numbers are widely used in making random selections.

**Precautions in the Choice of Samples:**

In random selection we should take care of the fact that the item chosen is representative and is sufficient also. Following points should be borne in mind in making the selection of samples.

1. The investigator should be well acquainted with the entire range of items or population out of which selection is to be made. What are the chief features of the domain, what is its scope and what is the number of items in it, all this should be known to the investigator; otherwise he would not be able to make a fair selection.

2. The different items of a domain should be alike and homogeneous. If there is too much of heterogeneity, the sample cannot be representative.

3. The various items of the domain should be independent of each other. If they are interlinked, random selection will not be possible. It is not possible in random selection to select other units having resemblances and dependent upon the selected units. Every unit should be easily accessible to the investigator and there should not be any item which is obscure to the investigator.

**3.Stratified Sampling:** This method of selecting samples is a mixture of the Deliberate and Random sampling technique. In this, first of all the data in a domain is split into various classes on the basis of their characteristics and immediately thereafter certain items are selected from these classes by the random sampling technique. That is why this is known as a mixed technique of sampling. This technique is suitable in those cases in which the data has sub data having special characteristics. The stratification is made on the basis of the special attributes and from these strata items are selected random. For example, if we wish to collect information regarding income-expenditure of the male population of a town, firstly we shall split the whole population in various strata on the basis of special professions pursued. We shall get the classes of service people, businessmen, shopkeepers, workers etc. From these we shall select random some units for study of income-expenditure statistics.

**Process of Stratifying:** The stratification of a domain or data should be done with great care, because upon successful stratification depends the success of this technique. Following points should be borne in mind:

- (i) We should possess extensive information of all the items included in a domain and should also know which item make a coherent whole on the basis of similar traits and which others are different from them and why?
- (ii) The size of each stratum should be large enough to enable use of random sampling technique.
- (iii) In stratifying it must be kept in mind that various strata should have similar relation to the domain and should by themselves be homogeneous.
- (iv) The various strata should differ from each other and be homogeneous by themselves. If two strata are alike, there is no need for stratification.



- (v) The proportion of random sample from each stratum should be the same as the proportion of stratum from the domain. Suppose a domain has four strata; accordingly the proportion of each stratum to domain is  $\frac{1}{4}$ . Now if the number of total item of the sample is 64, we shall select 16 items from each stratum and thus the proportion of selected items from each stratum will be of the total items. If the above mentioned precautions are taken we can get very good results from this method as it combines the virtues of deliberate sampling and random sampling methods.

**4. Quota Sampling:** This method of study is not much used. In it the entire data is split up into as many blocks as there are investigators and each investigator is asked to select certain items from this block and study. The success of this method depends upon the integrity and professional competence of investigators. If some investigators are competent and others not so competent, serious discrepancies will appear in the study. Therefore, as remarked above, it is method which is sparingly used.

**5. Multistage Sampling:** This again, is not a favoured procedure of sampling. In this items are selected in different stages at random. For example, if we wish to know per acre yield of various crops in U.P., we shall begin by making at random selection of 5 districts in the first instance, then of these 5 districts, 10 villages per district will be chosen in the same manner. Now in final stage we shall select again by random selection 5 fields out of every village. Thus we shall examine per acre yield in 250 farms all over U.P. This number can be increased or decreased depending upon the opinion of experts. Following table makes this procedure clear:-

Domain or Whole Data	
U.P.	
Districts	- First stage
Villages	- Second stage
Farms	- Third stage

**6. Extensive Sampling:** This method is virtually same as census except that irrelevant or inaccessible items are left out. Every other item is examined. For instance, if we are to study sexual behavior of Indians, we may leave foreigners living in India from our study. This method has all the merits and demerits of census survey and is very rarely used.

**7. Convenience Sampling:** This is hit or miss procedure of study. The investigator selects certain items from the domain as per his convenience. No planned effort is made to collect information. This is a method by which a tourist studies generally the country of this visit. He comes across certain people and things, has transaction with them, and then tries to generalize about the entire populace in his travelogue. This is essentially unscientific procedure and has no value as a research technique. But as is characterized by "hit or miss" method, at times clear hits are scored. That is why we discover profound truths expressed about a country by perceptive travelers.

The selection of a sample procedure from the above mentioned technique depends upon the nature, scope, number of units etc. in a domain. Also another factor determining our choice of

a method, therefore, is bound up with the nature of circumstances. However, mostly random and stratified sampling technique are used, rest are rarely preferred.

### 12.8 Merits of Sampling:

Sampling is a process by which a selected area of the 'universe' is chosen which is known as the representative of a larger area or Universe and which it is believed has all the characteristics in a miniature. Since the social researcher to take into account time, cost etc., a truly representative cross section of this larger whole is taken for data collection. Sampling is based on the probability theory leaving it to chance to decide the presence of universal characteristics in the selected sample.

There are various techniques in selecting 'Samples' for a study. They are purposive sampling, random sampling and stratified sampling and each of which have their own merits.

**1. Purposive Sampling or Quota Sampling:** It is likely that more respondents have been chosen by quota sampling than by any other type, since this has been the sampling procedure used in most public opinion polls. The technique varies from one researcher to another, but in general the pattern is to leave considerable choice, to the interviewer, with the restriction that certain characteristics of the respondents such as age, sex, race, socio-economic status, etc., be representative of the area such as city, country, state, nation or of the group of being polled. This process of leaving the choice of individuals to the interviewer has the fault of a human nature. Interviewers often ignore the slums and other areas difficult to reach. Also, it is not a satisfactory procedure of high precision .

However, sampling has been utilized because it is cheaper for a given study. Developing a good sampling design for a particular area or a city is expensive even though it may not be costly for the degree of accuracy achieved thereby.

In spite of the fact that quota sampling yields rough results, these may be satisfactory for the purpose desired. For Example, if public reaction to an advertising campaign, a particular commercial product, or a major public issue is to be the object to study, simple % differences may be sufficient. Quota sampling may therefore be successful for practical goals when quick, crude results will satisfy. Likewise when a 'key' city in a region is chosen for study due to 'purposive' reasons, Quota sampling is the best method. However, this is not based on the probability theory as such because it carries our bias towards the so called key region.

**2. Random Sampling:** The random sample method is applicable to a homogenous universe. The selection of a sample at random from the given universe facilitates a purposeful study of the Universe through the selected unit. Thus the researcher is freed of the laborious task of carrying out his research on the larger whole. Instead an analysis of the sample is enough to produce adequate, reliable and valid results.

**3. Stratified Sampling:** The stratified sampling method is the best alternative when the researcher is faced with the task of a heterogeneous 'whole'. His job is mainly to stratify this large whole into more or less homogenous sub units. Basically, this type of sampling results in varied results in so far as the some-units are representative of the whole universe as such. Thus all the methods of sampling are 'Unique' in particular instances and bear their own merits at large.

### 12.9 Summary:

Sampling technique also has very high value in day-to-day activities. In making our daily purchases of food-stuff, vegetables, fruits, etc., It is not considered necessary to examine each and every piece of the commodity; only a handful of goods are examined and the idea about the whole is formed and this usually proves a justified procedure, in education, sampling is a widely used technique. Sampling is a process by which a selected area of the 'universe' is chosen which is know as the representative of a larger area or Universe and which it is believed has all the characteristics in a miniature. Since the social researcher has to take into account time, cost etc., a truly representative cross section of this larger whole is taken for data collection. Sampling is based on the probability theory leaving it to chance to decide the presence of universal characteristics in the selected sample.

### 12.10 Key Words:

1. Random sampling.
2. Stratified sampling.
3. Quota sampling.

### 12.11 Model Questions:

1. Discuss the methods of Sampling and its significance?
2. Explain the types of Sampling and problems of Sampling?

### 12.12 Reference Books:

1. K.K Jacob(1965) Methods and fields of social work in India, Asia Publishing House, New Delhi
2. Misra.R.P (1989) Research methodology – A Hand Book, Concept Publishing House, New Delhi.

**Lesson-13****PRINCIPLES OF DATA ORGANISATION****13.0. Objectives:**

The objectives of this lesson are to explain the principles of data organisation.

**Contents:**

- 13.1. Introduction
- 13.2. Data Processing
- 13.3. Steps in Data Processing
- 13.4. Classification
- 13.5. Tabulation
- 13.6. Computer Data Processing
- 13.7. Forms of Organisation of Data
- 13.8. Preparation of Synopsis.
- 13.9. Summary
- 13.10. Key Words.
- 13.11. Model Questions
- 13.12. Reference Books

**13.1. Introduction:**

After data collection and analysis, the researcher has to order the parts and plan the writing. This requires organisation which forms the base for preparing the report. The researcher has to plan his work. He has to arrange his ideas in a logical order. This plan is the foundation and the structure of the report. The aim of the researcher will be made plain.

Organisation of the material and data will avoid jumbling of facts. Form and content are inseparable. Organisation of the report is essential to good communication. Since it is difficult, it requires careful planning. The researcher has to put every thing where it belongs. He has to make one thing follow another.

**13.2. Data Processing:**

The phrase "Data processing" is a modern term for an activity that is as old as history. Data is the plural of the 'Datum' which means facts. Data processing, therefore, is handling and using facts. Data processing consists of recording and reporting meaningful information manually, electromechanically, through the use of punched-card equipment, or by a computer. Everybody must process data, whether performing a decision-making function, as an individual, a student or researcher. Calculations can be performed quickly because, the sophisticated computer performs electronically the greater volume of such calculations today. As communities expanded, the basis of relationships changed from an intimate personal one to that of an impersonal relationship. This change required every one to record their activities in writing and to produce records for analysis and for future reference.

Information related to any activity required all the presently known steps of recording, classifying, calculating and summarizing. Much of the routine work necessitated specific processing

methods which started with the manual method and evolved into the mechanical and presently the electronic device i.e the use of computers. Executives need processing and recording of the data for various reasons. The burden of extensive handling of routine data involves a study of (1) the Physical factors that create large masses of data, (2) The costs involved, (3) The number of people available, (4) the necessity to reduce errors, and (5) The need for speed in preparing reports.

#### The Physical Factor:

There are pressures exerted from without and from within job of data processing. Internal factors, too create the need for a host of records. Pressures within a firm necessitate the processing of data and recording. Many activities in the firm require building a data processing system efficient enough to present all necessary reports accurately and economically with as little waste of time as possible.

#### The Cost Factor:

For many of the firms, there is cost competition. A business firm may be able to compete more successfully by reducing its operating costs. The "low cost" firms producing a quality product are those that are likely to command the markets for particular products. Business data processing can play a major role in this respect by reducing the amount of time taken to produce necessary records and reports accurately and quickly.

#### The Labour Factor:

The number of clerical workers in business has been more than four times the increase in factory help, and has been caused by the fact that, as the data have increased, more clerical workers have been required to analyze these data. The widespread use of manual methods of handling data has increased this need for clerical force. This, as well as the increase in the volume of data and the emphasis upon accuracy and economy, has prompted the search for better methods of processing data.

#### The Error Factor:

Because, it is man's nature to think and make decisions, there is wide margin for error. Consequently errors occur and perhaps multiply with prolonged work, because of carelessness, boredom and environmental conditions, such as pressure for deadlines and so forth.

#### The speed Factor:

The use of modern data-processing system results in communicating knowledge as it is needed. Without this kind of communication such knowledge has little practical use in the making of day-to-day, "on the spot" decisions. Hence, there is, need for data-processing and recording for taking speedy decisions.

#### Importance of Rapid Decisions:

Executive decisions have to be made rapidly and on a sound basis. Students of management recognize that decision making is the result sought by all techniques involved in the management process. Many "split second" decisions are required daily. These decisions require reliable and accurate information, presented in an understandable form at the time it is needed, if it is to be useful to the executive in his decision-making capacity. Because the slower manual approach is no longer considered satisfactory in meeting this demand. Machines that can do significant repetitive

jobs fast, with a high degree of accuracy, are needed. Once this is understood, the role of high-speed data-processing equipment becomes clear.

Provided the source data are prepared correctly, processing of them by a computer can be performed very fast and with a degree of accuracy. If source data is not prepared in an accurate form, the result, is inaccurate. The advanced preparation of instructions for use by the machine is called programming people who do it, called programmers, must be trained especially for the job.

### 13.3. Steps in Data Processing:

Raw data for processing information are found on original papers (hand written or typed) called source documents. All this information constitutes source data which are later used for verification and their manipulation for further action.

The facts and figures collected are to be processed with a view to reducing them to manageable proportions. Only by systematic processing, the data collected will lend itself for statistical treatment. Data processing comprises editing, coding, categorization and tabulation. It is an intermediary stage between collection of data and their analysis and interpretation.

#### Editing:

Proper recording of data involves 1) Editing, that is deciding on the kind of data that require processing, and (2) Verifying and checking on the validity and accuracy of such data.

Editing is the first step in data processing. Editing is the process of examining the data collected in questionnaires/ schedules to see they are corrected and the schedules prepared for tabulation. Mildred B. Parten in his book points out that the editor is responsible for seeing that the data are : as accurate as possible, consistent with other facts secured, uniformly entered, as complete as possible, acceptable for tabulation and arranged to facilitate coding and tabulation.

While editing data, one should condense (code) as much information as possible. Coding reduces the amount of data to be recorded and processed and is a means of identifying different classes of data. It can be either alphabetic (using letters) or numeric (Using numbers).

#### Data Manipulation:

After data have been recorded, they are grouped into categories or classes. This precedes the sorting step if the need for classifying is anticipated at the time of recording of data.

Manipulation is related to the actual work performed on data and involves the following steps; (1) Sorting (2) Calculating, (3) Summarizing (4) Reporting and (5) Storage.

#### Sorting:

Manual sorting is time consuming. It is not an efficient way of manipulating data. Motivated by the factors of accuracy, economy, and speed, we may use more efficient and sophisticated mechanical, electromechanical or electronic sorting techniques.

#### Calculating and recording:

The step of calculating and recording involves reconstruction of data through the arithmetic processes of addition, subtraction, multiplication and / or division. It is the most crucial phase of data manipulation since it is at this step that most of the work is done to achieve the solution to the problem.

**Summarizing:**

Summarizing is compressing a mass of data into a meaningful and useful form. It involves listing (tabulating) related information and figuring out its total. Management finds summarized lists or reports extremely helpful and time saving and uses them to make decisions more quickly than could be possible if every detail had to be looked after.

**Data reporting and communicating:**

Once summaries of data have been prepared, they represent output information and are reported to the user (s). No output is useful unless communicated promptly and effectively to the people involved.

**Data Storage:**

The reporting and communicating of output data terminates the data-processing cycle. This step is followed by the storage of existing data for future retrieval. Data storage can be made manually, electromechanically or in an electronic computer memory.

**Guidelines to Editors:**

Editing is the first step in data collection.

- 1) Each Editor should be familiar with Editing instructions.
- 2) He should not destroy, erase or make illegible the original entry of the interviewer.
- 3) Make all entries on a schedule in a standardized form.
- 4) All answers changed by the editor should be initialed.

**Editing for quality:**

To determine quality, the accepted procedure is to sub sample all the completed data forms.

**Editing for Tabulation:**

The preparation of the data forms for tabulation must include an operational procedure for accepting, modifying or rejecting individual questionnaires.

**Incorrect answers should usually be discarded:**

It is common to find several innocently answered questions in the data form. Only the study director will recognize this. In all doubtful cases the incorrect reply should be eliminated.

Answers should be allocated to the proper category of response. The study director or investigator should indicate which of the replies are worth verbatim reproduction.

**Coding:**

Coding is the process/ operation by which data/ responses are organised into classes/ categories and numerals or other symbols are given to each item according to the class in which it falls.

**Rules of coding:**

- a) Give code numbers for each respondent for identification
- b) Give code numbers for each question
- c) Give code numbers for each response
- d) Give numbers for qualitative responses also.

**Coding of open questions:**

Coding of the responses to open questions is always very difficult. Sometimes the responses are recorded verbatim. We have to note the basic aspect of the possible responses and give a number to each aspect.

**Coding of Don't know/ No opinion responses:**

These answers themselves become significant meaning something. No opinion means neutrality we have to give a number for each response.

**13.4. Classification:**

Classification or categorization is the process of grouping the statistical data under various homogeneous groups for the purpose of convenient interpretation. A good classification should have the characteristics of clarity, homogeneity, purposefulness and accuracy.

**Objectives of classification:**

- a) Through classification, the haphazard data is organised into concise, logical and intelligible form.
- b) Through classification, comparative study is possible.
- c) Data is so arranged that analysis and generalization becomes possible.

**Types of classification:**

Classification is of two types viz quantitative classification, which is on the basis of variables or quantity and qualitative classification (classification according to attributes). Again it may be multiple classification or dichotomous classification. The tabular form of such classification is known as statistical series, which may be inclusive or exclusive.

**Classification on Periodical Basis:**

In this classification, the data belonging to a particular time or period is put under one class. This type of classification is based on period. The rise in income in two years shall be classed in the groups on the basis of years.

**Classification on geographical Basis:**

In this type of classification, the data has been collected from different places and placed in different classes. The income for different states may be classed under different heads.

**Transcription:**

If the number of respondents are large the number of tables are large, direct tabulation is extremely difficult. Now transcription makes tabulation easier.

Transcription means posting the data from questionnaire/ Schedules on an intermediary material in a summarised form. Transcription is "the dockyard between the ship of the table and the carrier of data i.e schedules/ questionnaire.

**13.5. Tabulation:**

Tabulation is the process of summarizing raw data and displaying it in compact form for further analysis. Analysis of data is made possible through tables. So preparing a table is a very important step. Tabulation may be by hand, mechanical or electronic. The choice is made largely on the basis of the size and type of study, alternative costs, time pressures, and the availability of



computers and computer programmes. If the number of questionnaires is small and their length short, hand tabulation is quite satisfactory.

**Types of Tabulations:**

Tables have been classified as follows.

**a) Simple table:**

This is made on the basis of just one quality or characteristic. Hence it is called one-way table i.e (classification of states on the basis of population).

**b) Complex Table:**

This is formed on the basis of more than one quality or characteristic e.g. distribution of students on the basis of sex and marks obtained. If complex table is based on two qualities, it is called a two-way table. If it is based on three qualities, it is named three-way table. If there are more than three qualities, it is called manifold-table.

**Methods of Tabulation:****Hand Tabulation:**

When the survey is a small sample survey and a few questionnaires are filled in, it is simple to sort them out manually. Generally cards are used in collecting information. The questionnaires or cards are put in different lots, for example, we can sort them out (1) Male workers and 2) Female workers.

**Mechanical Tabulation:**

It is used when there are a large number of questionnaires involved in a survey. Mechanical sorting and tabulation help us to organise the work speedily and accurately. But the system is very costly. It can be used when the study is very extensive.

**Electronic Data Processing:**

In many involved tabulations where a number of multiple correlations must be determined, it is sometimes more efficient to put survey data on a computer. This does not save money or time if the tabulation involves a "one shot" study.

**Advantages of Machine tabulation:**

- 1) Tabulation is done with greater speed
- 2) Cross tabulation of interrelationship is possible in an easy way.
- 3) There is hundred percent accuracy in the mechanical tabulation.

**Disadvantages:**

- 1) The cost of Machines is high
- 2) The machines are rigid in their operation.

**13.6. Computer data Processing:**

Computer designed to process data differ from other machines in three respects. First they perform at very high speeds the data processing operations. Second, computers can accept, in advance of their operation, a series of instructions telling them what to do and how to do it. The third distinctive characteristic of a computer is its capability of handling data recorded in a very miniature size that is invisible to the human eye.

**Advantages of computer data processing:**

The three characteristics that distinguish computers from other machines are 1) High speed, 2) The ability to accept instructions before operating, 3) and the use of data in the miniaturized form. These machines offer three advantages. These are.

1. Faster processing of data
2. More automatic processing of data
3. Reduction in the size of records.

**Automatic data Processing:**

Processing data computer requires less human effort than is needed in manual, mechanical, or punched card data processing. Data processing is more automatic because of two factors, the first of which is its capability to accept in advance a series of instructions. Following these instructions just like a robot, the computer will perform automatically and sequentially a number of different operations such as recording and storing certain data, then retrieving the data from storage, using it for calculating, and finally, printing the results of its processing. This ability to perform a large number of different operations sequentially and automatically is not available in punched-card data processing. A computer usually sorts, classifies, and communicates data in separate operations; it can automatically record, calculate, store, retrieve data from storage, and reproduce data in a single machine run.

The other factor that makes computer data processing more automatic is its ability to handle data in a miniature form.

Programming, the task of preparing instructions for a computer, is difficult work, but not complex. It is difficult because it requires very careful and detailed planning and analysis; it takes a lot of time. Computers do nothing unless they are told exactly what to do. Programming cannot be considered complex, because the rules to be followed do not require any advanced training in mathematics, electronics or other subjects. Actually students studying in undergraduate courses have been taught to program satisfactorily.

**13.7. Forms Organisation of Data:**

There are three forms of organisation. They are topical, the chronological and the mixed. In topical approach, topics are given more emphasis than the time. The topical form loses historical perspective. The chronological form sometimes takes small events. Hence it is better to combine the two approaches and have the mixed form.

**Popular report:**

In writing the popular report, the form is important. The report should be simple, clear, and attractive. It should have minimum of technical details.

**Technical Report:**

A technical report is written for the fellow researcher. The report depends on the techniques utilised. The report should contain the method employed.

The following steps are to be taken in organizing the material and data collected and analysed.

- 1) The first step is the formulation of the research problem.
- 2) Second stage of organisation relates to methodology of the investigation.
- 3) The next step is to describe in brief the sources of the data.
- 4) The next step is to comment on the hypothesis,
- 5) The next step is the presentation and analysis of the data leading to interpretation. The more interesting part of the effort are the

findings. It is essential to make the findings plain and understandable. 7) The implications pinpoint the real significance of the facts and findings.

Facts are what the researcher found. Findings are derived from the facts. The researcher draws implications from the findings. Both of these represent successive stages. The next stage is to draw the conclusions and make recommendations. The conclusions are the researcher's final assessment of what the data and the findings mean. The same data and findings may lead to different conclusions and different recommendations. The recommendations are the personal preferences of the researcher. Recommendations may or may not be acceptable. They may not even be correct. A summary of the investigation would be highly useful. The researcher may get a quick overall view of the work. The summary is a brief form of major findings, conclusions and recommendations.

Steps facilitating a good organisation:

A Good organisation is necessary for proper communication of research results. The organisation of the report has three essential steps.

1. Full acquaintance with research notes
2. Adequate thought about the structure of the report.
3. Formation of a satisfactory outline.

Organisation of the material and data for writing the report takes place after the collection of the data and analysis of data and before the preparation of the report. Preparation of a good report depends on the way in which it is organised. Proper organisation of the report will facilitate the communication of research results.

### **13.8. Preparation of synopsis:**

Synopsis is an abstract form of research which underlines the research procedure followed. It is presented before the guide for evaluating its potentiality. It is condensation of the final report. The structure of the synopsis depends on the guide's choice. However a common structure may be framed as under.

#### **1. Defining the Problem:**

The research objective, definition of key terms, general background information, limitations of the study and order of presentation should be mentioned in brief.

#### **2. Review of Existing literature:**

The researcher should refer books, periodicals and research studies on the subject and present different points of view and the findings of the studies.

#### **3. Conceptual frame work and methodology:**

The researcher should make a statement of the hypothesis. He has to discuss the researcher methodology used, the objectives of the study, sources and means of obtaining data. He may also point out the limitations of the methodology.

#### **4. Analysis of data:**

Analysis of data involves testing of hypothesis from data collected and key conclusions arrived at.

#### **5. General conclusions:**

The researcher should draw the conclusions with respect to the acceptance or rejection of hypothesis, conclusion with regard to the stated objectives, suggested areas of further research, discussion of possible implications of the study.

Finally the researcher should mention about the bibliographies and appendices. A standard format for preparation of synopsis commonly used in research in India may be drawn as follows.

1. Introduction:

This includes definition of the problem and its review from a historical perspective.

2. Objectives of the study:

It defines the research purpose and its specialty form the existing research studies in the related field.

3. Literature Review:

It includes different sources of study, and the findings of various research studies on the subject.

4. Methodology:

The research design and the methodology adopted in the study will be briefly mentioned in the synopsis.

5. Hypothesis:

It is a formal statement relating to the research problem and it is to be tested based on the researcher's findings.

6. And finally the chapter outlines:

The chapter outline includes right from reviewing the research problem to the conclusions and suggestions part. The researcher has to submit a synopsis, presenting the research problem, following suitable norms. The research guide after checking the synopsis suggests necessary changes. In some universities, a seminar is arranged for the said research topic with some experts and the researcher is required to answer the different questions raised by those experts. The researcher will incorporate in his thesis as per the suggestions made by the experts. The researcher also needs to submit the details of books and journals he has consulted for satisfaction of the experts.

### 13.9. Summary:

After data collection and analysis, the researcher has to order the parts and plan the writing. This requires organisation which forms the base for preparing the report. The researcher has to plan his work. He has to arrange his ideas in a logical order. This plan is the foundation and the structure of the report. The aim of the researcher will be made plain.

Organisation of the material and data will avoid jumbling of facts. Form and content are inseparable. Organisation of the report is essential to good communication. Since it is difficult, it requires careful planning. The researcher has to put every thing where it belongs. He has to make one thing follow another.

Data processing is handling and using facts. Data processing consists of recording and reporting meaningful information manually, electro mechanically or by a computer. Information related to any activity required all the presently known steps of recording, classifying, calculating and summarizing. The handling of routine data involves a study of (1) the physical factors that create large masses of data, (2) the costs involved, (3) the number of people available, (4) the necessity to reduce errors, and (5) the need for speed in preparing the reports.

Data processing comprises editing, coding, categorization and tabulation. It is an intermediary stage between collection of data and their analysis and interpretation. Manipulation is

related to the actual work performed on data and involves the following steps, 1) sorting, 2) calculating, 3) summarizing, 4) reporting and 5) storage.

Classification or categorization is the process of grouping the statistical data under various homogenous groups for the purpose of convenient interpretation. A good classification should have the characteristics of clarity, homogeneity, purposefulness and accuracy. Classification is of two types viz, quantitative classification and qualitative classification. It may be multiple classification or dichotomous classification. The tabular form of such classification is known as statistical series, which may be inclusive or exclusive.

Tabulation is the process of summarizing raw data and displaying it in compact form for further analysis. Tables have been classified as 1) simple table, 2) complex table; Methods of tabulation include 1) Hand Tabulation, 2) Mechanical tabulation, 3) Electronic data processing.

Computer designed to process data differ from other machines. The three characteristics that distinguish computers from other machines are 1) high speed; 2) the ability to accept instructions before operating and 3) the use of data in the miniaturized form.

There are three forms of organisation. They are topical, the chronological and the mixed. There are two types of reports i.e 1) Popular report and 2) technical report.

The following steps are to be taken in organizing the material and data collected and analysed.

1) The first step is the formulation of the research problem. 2) the second stage of organisation relates to methodology of the investigation, 3) the next step is to describe in brief the sources of the data. 4) the next step is to comment on the hypothesis, 5) the next step is the presentation and analysis of the data leading to interpretation. The more interesting part of the effort are the findings. It is essential to make the findings plain and understandable. 7) the implications of research results are more helpful. Implications pinpoint the real significance of the facts and findings.

Facts are what the researcher found findings are derived from the facts. The researcher draws implications from the findings. Both of these represent successive stages. The next stage is to draw the conclusions and make recommendations. The conclusions are the researcher's final assessment of what the data and the findings mean. The same data and findings may lead to different conclusions and different recommendations. The recommendations are the personal preferences of the researcher.

Recommendations may or may not be acceptable. They may not even be correct. A summary of the investigation would be highly useful. The researcher may get a quick over all view of the work. The summary is a brief form of major findings, conclusions and recommendations.

Synopsis is an abstract form of research which underlines the research procedure followed. The structure of the synopsis includes, 1) Defining the problem, 2) Review of the existing literature, 3) Methodology, 4) Analysis of data, 5) General conclusions. A Standard format for preparation of synopsis includes, 1) Introduction, 2) Objectives of the study, 3) Literature review, 4) Methodology, 5) Hypothesis, 6) The chapter outlines.

**13.10. Key Words:**

- a) Data Processing
- b) Classification
- c) Tabulation

**13.11. Model Questions:**

- 1) Discuss the principles of data organisation
- 2) Explain data processing and the various steps to be taken in organising the material and data collected and analysed.

**13.12. Reference books:**

1. Bajpai, S.R : Methods of social survey and Research.
2. Saravanavel, P (2004) : Research methodology, kitab Mahal, Allahbad.

**M.Lakshmipathi Raju**

**LESSON – 14****ANALYSIS AND INTERPRETATION****14.0. Objectives :**

The objectives of this lesson are to explain Analysis and interpretation of data.

**Contents:**

- 14.1. Introduction**
- 14.2. Meaning and definition**
- 14.3. Characteristics of Analysis of Data**
- 14.4. Interpretation.**
- 14.5. Forms of Interpretation**
- 14.6. Essentials and Prerequisites for interpretation**
- 14.7. Precautions in interpretations**
- 14.8. Methods of generalization**
- 14.9. Computers in research applications**
- 14.10. Sources of errors in interpretation**
- 14.11. Summary**
- 14.12. Key Words**
- 14.13. Model Questions**
- 14.14. Reference Books**

**14.1. Introduction:**

Ideas, facts and figures are to be put each in its place in a systematic way. Behind the accumulated data, there is something significant to convey the meaning of the figures. Figures do not speak for themselves unless they are put in their proper place in a systematic way. Analysis is a continuous process throughout the research process. In the beginning of research, determination of what types of data to gather, what techniques to use, what sources to tap requires analysis.

**14.2. Meaning and Definition:**

Analysis of data means studying the tabulated material in order to determine inherent facts or Meanings. It involves breaking down the existing complex factors into simpler parts and putting the parts together in new arrangements for purposes of interpretation. A plan of analysis should be prepared before the actual collection of material. A preliminary analysis on the skeleton plan will develop in to a complete, final analysis as the investigation proceeds. The final analysis would be enlarged and reworked as and when necessary. This process requires flexible and open mind. One should notice similarities, differences, trends and outstanding factors. Larger division of material should be broken into smaller units. They should be rearranged in new combinations to discover new factors and relationships. Data should be studied from as many angles as possible to find out new and newer facts.

To quote Prof. Wilkinso and Bandarkar, "Analysis of data involves a number of closely related operations that are performed with the purpose of summarizing the collected data and organizing these in such a manner that they will yield answer to the research questions or suggest

hypothesis or questions if no such questions or hypothesis had initiated the study". Some scholars opine that processing of data is done under analysis of data.

Prof. John Galtung had distinction between analysis of data and processing of data. Processing of data refers to concentrating, recasting and dealing with the data so that they are amenable to analysis. Analysis of data refers to seeing the data in the light of hypothesis of research questions and the prevailing theories and drawing conclusions that are amenable to theory formation.

Systematic analysis is used after the collection of data. Facts are never simple. They have many problems. They involve subjective elements. Hence analysis demands a thorough knowledge of one's data. Without knowledge of data, analysis becomes aimless.

A critical examination of assembled data, keeping in mind the purpose of the study is essential. The data may exhibit similarity. The comparative significance of big and little events must be understood by the researcher. The researcher must ask himself many questions and re-examining the gathered data is necessary in analysis. Accuracy of arithmetic without accuracy of knowledge of the subject will not help the researcher.

The data to be analysed should (1) be reproduceable, (2) be amenable for quantitative treatment, (3) Have significance for systematic theory. The data should serve as a basis for broader generalizations.

The process of analysis includes editing, coding and tabulation. By tabulation we mean entering the number of items in each category in the form of tables. Analysis requires calculating the various measures such as averages, deviation, correlations etc.

#### 14.3. Characteristics of Analysis of data:

Following are the main characteristics of analysis of data.

1. It is highly skilled and technical job. It should be carried out by the researcher himself. The researcher should have deep knowledge about the data to be analysed. The researcher should possess-judgement skill, ability of generalization. He should be familiar with the background of the subject and hypothesis of study.
2. Data, facts and figures are silent and they never speak for themselves. Through systematic analysis, the important characteristics which are hidden in the data are revealed and valid generalizations are drawn. It is by analyzing and interpreting the research data, that we can know their important features, interrelationship and cause-effect relationship.
3. According to P.V. Young "the function of systematic analysis is to build an intellectual edifice in which properly sorted and sifted facts and figures are placed in their appropriate settings and broader generalizations beyond the immediate contents of the facts under study, consistent relationships, so that general inferences can be drawn from them, the aim of a mature science".
4. The more specific the hypothesis, the more specific is the action and in such types of studies the analysis of data is almost completely a mechanical procedure.
5. If there is no specific hypothesis, the data are analysed inductively or invented during the process and not by means of any prescribed set of rules.



6. Analysis of data and interpretation of data are complementary to each other. The object of analysis is to arrive at certain general conclusions. Interpretation deals with what these conclusions really mean.
7. Since analysis and interpretation are inter-woven, interpretation should be conceived as special aspect of analysis. Interpretation establishes relationship between variables which are expressed in the findings. Interpretation explains why such relationship exists.
8. Analysis and interpretation should be designed before the data are actually collected.
9. When plan of analysis has not been made before hand, there are four helpful modes to start with the analysis of data.
  - (1) To think in terms of significant tables that the data permit.
  - (2) To examine carefully the statement of the problem.
  - (3) To actually discuss the problem with others.
  - (4) By making various simple statistical calculations.

#### 14.4. Interpretation:

The researcher has to be careful at every stage of research. The data are to be properly collected and analysed. Though the data is properly analysed, wrong interpretation would lead to inaccurate conclusions. The work of interpretation of data must be entrusted to persons who are impartial. Errors may arise in the process of interpretation of data.

Interpretation is the search for the broader meaning of research findings. The search has two major aspects, (1) to link the results of one study with those of another, (2) establishment of explanatory concepts.

Through interpretation, the meanings and implications of the study become clear. Interpretation cannot proceed without analysis. Both are interdependent. Interpretation connects the findings with the established theories.

Jahoda and cook have defined it. "Scientific interpretation seeks for relationship between the data of a study and between the study findings and other scientific knowledge".

Data do not interpret themselves. It is the investigator who must pass judgement of their meaning. Interpretation is not a mechanical process. It calls for a critical examination of the results of one's analysis. It is a very important step in the total procedure of research.

#### 14.5. Forms of Interpretation:

Statistical data and information may be interpreted in various forms.

Some of the common forms of interpretation may be described as follows.

##### 1. Relationship:

One of the fundamental basis of interpretation is to find out relationship. By comparative analysis, true form of relationship between the subject and the object can be determined. By interpretation, we can establish proper relationships amongst 'different aspects'.

##### 2. Proportion:

If the object of the study is too much variable over a period, then proportion are ascertained to interpret the data.

### 3. Percentages:

The method of percentage is used for making interpretation as the basis. Although the method of percentage is somewhat crude, it is often used in the sphere of absolute figures.

### 4. Averages or other measures of comparison:

The averages or other measures of comparisons are used to interpret statistical data. If a long statistical table is to be analysed, and interpreted, we have to use various forms of measuring central or other tendencies relating to them. Averages or other measures of comparisons are an essential and integral part of interpretation.

## 14.6. Essentials and pre-requisites for Interpretation:

To interpret the given tables in a perfect manner, certain preconditions are to be satisfied. Some of the essentials or preconditions are mentioned below.

### 1. Accurate Data:

One of the prerequisites of interpretation and analysis is the availability of accurate and reliable data. Accuracy of data provides all benefits of consistency and helps one to arrive at a true conclusion.

### 2. Sufficient data:

Another pre-requisite of accurate interpretation is the existence of sufficient and reliable data. Unless we have sufficient data, we may never achieve the objectives of proper interpretation. Biased, or unrepresentative results may be obtained if inferences are drawn based on unreliable or insufficient data.

### 3. Proper type of classification and Tabulation:

The investigators are required to base their calculations and judgements on data represented in a properly classified and tabulated form. One of the prerequisites is to base all types of interpretation on systematically classified and properly tabulated data and information.

### 4. Absence of Heterogeneous Data:

For a uniform and accurate result, the data must be homogeneous. A 'representative result' is dependent on the availability of homogeneous data. "It is suggested to all investigators to base their calculations on homogeneous data alone". If the basis of interpretation is uniform, accurate and homogeneous data, one can attain a better and representative result.

### 5. Possibility of statistical treatment:

Every data is not suited to statistical treatment. If the subject concerned is related to 'quality', or if the information is scanty, they may not be suitable for statistical treatment. We have to be careful about the availability of data conducive to statistical treatment.

### 6. Consistency of information:

Inconsistent information and data are always subject to inaccurate results. In statistical treatment, emphasis is always laid on stable and accurate results. For having better standard of interpretation, statistical treatment should be subjected to consistent data and information. In the absence of consistent data, statistical method might give different results at different occasions. Inconsistent data yield in consistent interpretations.

**14.7. Precautions in interpretation:**

One should recognize that errors can be made in interpretation. If one is careful and critical of his own thinking, he should be able to make satisfactory interpretation. The following are more common errors of interpretation which need to be avoided.

**1. Failure to see the problem in proper perspective:**

The investigator may have an inadequate grasp of the problem in its broad sense.

**2. Failure to appreciate the Relevance of various elements:**

The investigator may not see the relevance of the various elements of the situation due to inadequate understanding of the problem. He may have too rigid a mind-set or even a lack of imagination. He might have overlooked the operation of significant factors.

**3. Failure to recognize Limitations in the Research Evidence:**

There may be non-representativeness in sampling basis in the data, inadequacies in the research design, defective data gathering instruments and inaccurate statistical analysis.

**4. Misinterpretation due to unstudied factors:**

The factors which condition any result are innumerable. One's conclusions are always limited to the factors studied. A given result is composed of many factors, it is not produced simply by a single factor.

**5. Ignoring selective Factors:**

If one ignores the selective factors one is likely to reach unwarranted conclusions. If a selective group is made the subject of study (e.g., institutional delinquents), one should not draw unwarranted conclusions.

**6. Difficulties of interpretative Evaluation:**

Proper interpretation of data rests on proper evaluation of facts. Explanation of one's research findings in terms of their practical implications is fraught with the danger of misrepresentation. Factual interpretation and personal interpretation of their implications should never be confused.

**Comparison in interpretation:**

The element of comparison is fundamental to all research interpretations. Usually one's investigational findings are compared with the results of other comparable investigations, to know whether they agree or disagree with one another.

**Concluding remarks on Analysis and interpretation:**

The task of interpretation falls on to the shoulders of the researcher himself. Some research workers take the view that their job is merely to present their results. It is left to the readers to draw their own conclusions. Most readers of research report, fellow scientists or laymen lack the time and will power to go through the tables and pick out the crucial results. However, it would be wrong to leave the interpretation entirely to them. The researcher who cautiously confines his

conclusions to those justified by the data, is safe from criticism. There is surely room in every research report for the research worker's own ideas and speculations.

#### Conclusions and Generalizations:

The research workers should review carefully the evidence for and against each hypothesis. Each generalization must agree with the facts revealed by the investigation. The investigator should also check each generalization against the facts and experiences of other investigators. For verification of hypothesis, one must also return to the facts of previous studies.

#### 14.8. Methods of generalization:

Generally, two methods are used for generalization; (i) Logical method and (ii) statistical method. There are other methods also for generalization.

Scientists are not concerned with isolated events, but with commonality of a series of events. One should not generalize on insufficient or incomplete and unrelated data. This can be avoided by the accumulation of a large body of data.

#### Verifiability:

The conclusions arrived at by a scientist should be verifiable. He must show to others how he arrived at his conclusions. When his conclusion is tested by others, it is accepted as correct. Such verification by replication may confirm the conclusions or modify them or even invalidate them. For example, originally an atom was considered to be indivisible, but subsequent researches have proved that it is divisible and thus provided basis for developing atomic energy.

#### Logical Reasoning process:

The scientific method involves the logical process of reasoning. We use this reasoning process for drawing inference from the finding of a study or for arriving at conclusion. For example, survey of expenditure pattern on basic necessities forms a very high proportion of the total expenditure, it is concluded that lower the household income, the higher is the proportion spent on basic necessities.

#### 1. Logical Method:

The method was originally introduced by John Stuart Mill. He said that the generalization should be based on logical process. According to him the logical methods are:

#### 1. Method of Agreement:

When two events or phenomena have the same result they have something in common in them, that common element is called their cause. And the result of the conclusion is known as 'effect'.

#### 2. Method of difference:

It means that affirmative method + negative method of difference. All the characteristics or elements of a phenomena or incident are not the same and they are not stable. If all the elements or characteristics of a phenomena remain the same, it is easy to study them.

**3. Joint method:**

It is exactly the sum total of the 'methods of agreement' and method of 'difference'. Generally in this method conditions of two events or phenomena are the same and in two or more other incidents or phenomena, the conditions are different, but that special or specific situation is lacking.

**4. Method of Residue:**

If a particular event takes place under certain circumstances and one knows the extent of cause and effect relationship between the event and those circumstances, then it can be said that the remaining events are also related to those circumstances according to law of causation.

**5. Method of concomitant variations:**

If as a result of change in a particular phenomena, the simultaneous or consequent change takes place in some other phenomena or event, it is believed that there is a cause and effect relationship between the two.

**2. Statistical Method:**

This method is based on 'sampling' and is classified into (a) inductive method and (b) Deductive method

**(a) Inductive method:****Meaning:**

This method consists of studying several individual cases and drawing a generalization. Therefore, induction involves two processes – observation and generalization. Conclusion from induction are tentative inferences and they are subject to further confirmation based on more evidence.

**When followed:**

This method is followed when new facts are studied, new truths are uncovered and new generalizations are formulated from a research project.

**Essential conditions:**

Four conditions are essential to satisfactory induction. They are.

1. Observations must be correctly performed and recorded, data collected should be accurate: Mistakes should not be committed in conducting experiments or interviews. Faulty recording of the information can vitiate the value of any conclusions reached.
2. Observations must cover representative cases drawn from a specific universe: In a survey of job-satisfaction of bank executives, the universe should be defined exactly i.e officers of public sector Banks in a specific geographical area. All cadres of officers should be included in the sample. An appropriate sampling method like stratified random sampling has to be adopted.
3. Observations must cover an adequate number of cases: Conclusions must be confined to the inferences drawn from the findings only. They should not be generalized to apply to types of cases not covered in the sample.

**Types of Induction:**

Theodorson and Theodorson have identified two basic types of inductions, VIZ, numerative and analytic.

Enumerative induction:

This induction involves generalization from samples and the generalizations are usually derived through the analysis of data.

Analytic induction:

It involves case by –case analysis of specific features. Cressey outlined the step-by-step procedure of analytic induction.

1. Define the phenomena to be explained
2. Formulate the hypothesis to explain the phenomena.
3. Study a case to determine whether hypothesis fits in the case.
4. If the hypothesis does not fit the facts, reformulate hypothesis
5. When a negative case disapproving the explanation, is discovered, reformulate the hypothesis.
6. Continue this procedure of redefining phenomenon and reformulating the hypothesis until a universal relationship is established.
7. Examine cases out side the area to determine whether the final hypothesis applies to them.

Deduction:

Meaning:

Deduction is “ reasoning from the general to the particular”. This reasoning establishes a “ logical relationship between a major premise, a minor premise and a conclusion”. A major premise is a previously established generalization. A minor premise is a particular case related to the major premise. The logical relationship of these premises lead to conclusion, e.g.

Major Premise: All men are mortal

Minor Premise: A is a man

Conclusion : A is mortal.

Essential conditions:

The conditions necessary for valid deductions are:

1. The general rule or assumption must be correct.
2. The general rule must be applied only to the case which properly falls under it.

Relevance of induction and Deduction:

Both are “ inseparable parts of a system of reasoning. Both processes are often used simultaneously. When a puzzling condition occurs, one seeks inductively to explain by a hypothesis. In turn, the hypothesis is used in the deduction of further facts which can confirm or deny the truth of the hypothesis.

Common fallacies of Reasoning:

There are common fallacies of reasoning leading to erroneous generalizations. The following are some of the fallacies.

1. Argument from a single or limited number of instances.
2. Argument from positive instances to the neglect of negative cases.
3. The omission of evidence contrary to one’s opinion.
4. Erroneous conclusions due to pre-conceived ideas and prejudices.
5. Inaccurate instruments of measurements; dependence upon judgement estimates and guesses.

6. Argument from analogy
7. Mistaken inferences of various sorts.
8. Generalisations from insufficient data.
9. Fallacy of non-observation.
10. Errors commonly arising out of the use of inductive methods..

#### 14.9. Computers in Research Applications:

To day computers are mostly used for all purposes. The computer has become one of the most useful research tools. Computers are suited for data analysis. The researcher wants to store huge data and retrieve it whenever required. Computers process data. Computers reduce the human errors and provide quality to the research. The computer can perform many statistical calculations easily and quickly. Computers provide a package of statistical tests to a researcher. In brief software packages are readily available for various analytical and quantitative techniques. The researcher feeds in the data he/ she gathered and gets the output, within seconds or minutes. The researcher requires a lot calculation and work of repetitive nature. Computer is best suited for such techniques.

The computers provide storage facility. The computers provide results that are correct and reliable. The researcher has to organise the data and code it. After coding, the data has to be stored in the computer. Thus the computers are widely used in data analysis. Computers help the researchers to complete the task at faster speed and with greater reliability.

#### 14.10. Sources of errors in interpretation:

The following are some of the sources of errors in interpretation.

##### (i) Personal Bias:

Wrong interpretations are made due to deliberate bias in the mind of an interpreter. People suffer from several inhibitions, prejudices and hardened attitudes. Interpreter should be a fair minded person so that he inter prets any result objectively and not subjectively.

##### (ii) The type of Averages used:

Sometimes, the use of average leads to wrong interpretations. The interpreter has to take note of the type of average that has been used to arrive at the conclusion.

##### (iii) Drawing wrong inferences:

Sometimes wrong inferences may be drawn from lthe data. The population of a town has doubled in 10 years tempts an interpreter to draw the inference that the birth rate in the town has doubled. This is wrong inference as the population of the town can double in several ways other than the doubling of birth rate.

##### (iv) Drawing unwarranted conclusions:

Many a time we draw conclusions which are not warranted. Imports of chemical fertilizers have declined may be interpreted wrongly by saying that Indian farmers have reduced the use of chemical fertilizers. The fact may be that local production of fertilizers has increased to the extent imports have been reduced.

(v) Misuse of statistical concepts:

Coefficient of correlation is often wrongly interpreted. If co-efficient of correlation not properly interpreted, wrong conclusions will be arrived at. Coefficient of correlation also indicates a general tendency. We study the correlation between two series. It does not fully disclose the mutual dependence of two variables. It does not necessarily mean cause and effect relationship between two series. Suppose the proportion of child accidents are less in those localities, where there are parks and more in those where there are no parks. This mean there is a negative correlation between number of parks and number of child accidents. From this we do not conclude that to reduce the number of accidents, the number of parks must be increased. It is possible that those localities where there are parks, rich people live and the number of children are few. Unless the co-efficient of correlation is interpreted carefully, misleading conclusions are likely to be drawn.

(vi) Wrong interpretation of coefficient of Association:

Association between two attributes may be the result of their common association with a third attribute. There may not be, any direct association between the two attributes. If there is a positive association between inoculation and prevention of small pox, we should not conclude that inoculation is useful in preventing the disease. It may be that most of that inoculated people are rich and live in healthy surroundings. That is to say, there is a third attribute i.e the economic status of the people. The former two attributes have the common association with the third attribute.

The above examples show that interpretation of data is an extremely difficult task. Unless proper precautions are taken, misleading conclusions are likely to be drawn. Statistics generally do not reveal the entire story of a phenomenon. It is risky to draw generalizations from a study of a few factors. The research should realize the dangers of wrong interpretation of data. He should take adequate precaution in drawing inferences from the data collected and analyzed.

Interpretation of data is the most important task of the researcher. He has to bring out real findings of the study lying hidden under statistical measurements; only the conclusions that are warranted by the data should be drawn. This requires insight into the associations and relationships between the variables. An inexperienced researcher may not be able to know valuable findings that emerge from statistical tables. An expert would easily detect these findings. Interpretation means drawing out the most significant conclusions from the study as revealed by the data.

vii) False generalizations:

A lot of statistical work is based on sample estimates. Unless the interpreter is objective, unbiased and an expert in his job, there is danger that he may make a false generalization on the basis of a small sample finding. Suppose, in India, we take a sample of one village and investigate the incidence of malaria. If the incidence of malaria in the village has increased, we should not generalize that malaria infections in the country, as a whole, are on the increase. For such a generalization, we may have to take a number of samples from different parts of the country.



Suppose we know that the per capita income in India has increased, we cannot conclude that there is all round progress in the country. This may not be so any way. We have to examine the distribution of national income. If the gains of economic development are concentrated among the richer sections only, there has not been all round development. In similar fashion, there can be a large number of false generalizations and hence, the erroneous interpretations.

#### 1411. Summary:

Ideas, facts and figures are to be put each in its place in a systematic way. Behind the accumulated data, there is something significant to convey the meaning of the figures. Figures do not speak for themselves unless they are put in their proper place in a systematic way. Analysis is a continuous process throughout the research process.

Analysis of data means studying the tabulated material in order to determine inherent facts or meanings. Systematic analysis is used after the collection of data. The data to be analysed should (1) Be reproducible, (2) Be amenable for quantitative treatment; (3) Have significance for systematic theory. The data should serve as a basis for broader generalizations. The process of analysis includes editing, coding and tabulation. Analysis requires calculating the various measures such as averages, deviations, correlations etc.,

Though the data is properly analysed, wrong interpretation would lead to inaccurate conclusions. The work of interpretation of data must be entrusted to persons who are impartial. Errors may arise in the process of interpretation of data. Interpretation is a search for the broader meaning of research findings. The search has two major aspects, (1) To link the results of one study with those of another, (2) Establishment of explanatory concepts.

Through interpretation, the meanings and implications of the study become clear. Interpretation cannot proceed without analysis. Both are interdependent. Interpretation connects the findings with the established theories.

Statistical data and information may be interpreted in various forms. (1) by interpretation we can establish proper relationships amongst different aspects; (2) Proportions are ascertained to interpret the data. (3) The method of percentage is used for making interpretation as the basis. (4) The averages or other measures of comparisons are used to interpret statistical data.

Some of the essentials and preconditions for interpretation include (1) accurate data, (2) sufficient data, (3) Proper type of classification and tabulation, (4) Absence of heterogeneous data, (5) Possibility of statistical treatment, (6) consistency of information.

The following are more common errors of interpretation which need to be avoided, (1) Failure to see the problem in proper perspective, (2) Failure to appreciate the relevance of various elements, (3) Failure to recognize limitations in the research evidence, (4) misinterpretation due to unstudied factors, (5), Ignoring selective factors, (6) difficulties of interpretative evaluation.

Generally, two methods are used for generalization; (1) logical method and (2) Statistical method. There are other methods also for generalization. According to John Stuart Mill, the logical methods are; (1) Method of agreement, (2) Method of difference, (3) Joint method, (4) Method of residue, (5) Method of concomitant variations.

Statistical method is based on 'sampling' and is classified into (a) Inductive method and (b) Deductive method.

The inductive method consists of studying several individual cases and drawing a generalization. Four conditions are essential to satisfactory induction. They are: (1) Observations must be correctly performed and recorded, data collected should be accurate. (2) Observations must cover representative cases drawn from a specific universe, (3) Observations must cover an adequate number of cases, (4) conclusions must be confined to inferences drawn from the findings.

Theodorson and Theodorson have identified two basic types of induction, v12, enumerative and analytic. Deduction is reasoning from the general to the particular.

The following are some of the sources of errors in interpretation. (1) Personal bias; (2) the type of averages used, (3) Drawing Wrong inferences, (4) Drawing Unwarranted conclusions, (5) Misuse of statistical concepts, (6) Wrong interpretation of co-efficient of Association, (7) False generalizations.

**14.12. Key Words:**

- a) Analysis
- b) Interpretation
- c) Logical Method
- d) Induction
- e) Deduction

**14.10. Model Questions:**

- 1) Discuss the importance of analysis and interpretation in social work Research
- 2) Explain the sources of errors in interpretation.

**14.11. Reference Books:**

1. Baj Pai, S.R. : Methods of Social Survey and Research.
2. Saravanavel, P (2004).: Research methodology, Kitab Mahal, Allahabad.

**Prof. M. Lakshmipathi Raju**

**Lesson –15****REPORT PREPARATION-CHARACTERISTICS  
OF SCIENTIFIC REPORT****15.0. Objectives:**

The objectives of this lesson are to explain report preparation and characteristics of scientific report.

**Contents:**

- 15.1. Introduction**
- 15.2. Characteristics of scientific report**
- 15.3. Contents of report**
- 15.4. Categories of Reports**
- 15.5. Stages in preparing the research report**
- 15.6. Steps in drafting reports**
- 15.7. Summary**
- 15.8. Key words**
- 15.9. Model Questions**
- 15.10. Reference Books**

**15.1. Introduction:**

The first things that must be decided in preparing the report are for whom it is to be written, whether it is to be published and if so in what form. The audience will affect the manner and order of presentation. The old adage of the teacher " Proceed from the known to the unknown" is a good guide in the presentation of any new findings. It immediately shows the way in which relationship must be considered. What do the readers know? What information can be assumed? What is their starting point ? to communicate successfully one must therefore know something about the people whom one is addressing, understand what is their interest in the research and how much knowledge they have of the subject.

Thus a research report addressed to fellow academics can assume a completely different kind of knowledge from a research report addressed to lay persons. In the first case one can assume detailed knowledge of other findings and reference to these will suffice. This assumption would be inappropriate in the second case, but here one can assume a detailed knowledge of certain practical aspects of the subject.

In some research studies, it may be necessary to make more than one report. It is essential to communicate research results, as selltiz et al, point out, and sometimes communication to more than one audience may be called for. This may be particularly true in applied research, where the brief only requires that there should be recommendation for action, but the research process may well have turned up findings which should be communicated to the profession through academic journals. These findings may be of no particular interest, or indeed relevance, to the applied problem and therefore should not be stressed in that report.

Although the style and emphasis of the presentation will vary according to the audience, the general principles which govern the presentation of any report remain the same. The general

principles are that the researcher should say what he set out to do (object), how he did it (method), what came out of it, both negative and positive (results), and what finally concluded from this.

### 15.2. Characteristics of scientific report:

The preparation of the report is final stage of the research. Its purpose is to convey to interested persons the whole result of the study in sufficient detail. It should be so arranged as to enable each reader to comprehend the data and to determine for himself the validity of conclusions.

The social science reports are difficult to read. It is not because of using abstract and technical terms. They do not use non-technical language. Hence the report is not understood or is not well received.

The basic quality of good scientific writing is accuracy and clarity. The first step is what information one wants to convey and to understand how the various bits of it are related to one another.

Inevitably a large proportion of any report will be in words and there can be easily misinterpreted. In the social science, words used in a technical sense also have lay uses. Technical language cannot be avoided: words must have a clearly defined and limited meaning, commonly accepted in the profession. This means that non-specialist must learn the definitions and should not expect to find an article in professional journal easy to understand on first reading. It also means that reports for lay consumption must be adequately translated. At the present moment there is not always complete consensus about the technical use of words, so that where they are being used in a special sense, it is necessary to make the definition clear. But the use of properly defined words in a technical sense does not necessarily mean that they should be long and complicated, or that sentences should be unnecessarily cumbersome and involved. Technical language should make the subject quicker and easier for the expert to understand or make something new intelligible. If it does neither of these things, it is inappropriate.

Whether using technical terms or not, clarity of style is essential. As selltiz et.al. put it. "little can be said about (style) except to stress the value of simplicity and grammatical structure". We may not have agreement on our own technical vocabulary, but there is consensus about grammatical rules, as selltiz et.al. point out, it aids successful communication if these are followed. They wisely advise against pretentiousness, saying that "there is no good reason for consistently using four-syllable words instead of one-syllable words with essentially the same meaning. Similarly, two or three relatively simple sentences may convey an idea more clearly than one complicated sentence with a number of entangled clauses". This is a case for the dictum "if you can't say it simply, don't say it". Long and entangled sentences and many multi-syllable words sometimes turn out to be a cover for a good deal of confusion.

#### Out line:

One should begin with preparing a detailed outline of his report. A sentence out line or paragraph outline rather than a topical out line is preferred. Before the researcher starts writing his report, he should have drawn up an outline of the way in which he proposes to do it. This would consist of headings and sub-headings and an indication of the way, under each of these, he proposes to gather his data. At this stage decisions, such as whether detailed descriptions of the method are to be put in an appendix or in the text, and so on, may be made. The outline should be carefully examined for relevance and for logic. Within each section, the relevance of the evidence

to the object must be tested. The conclusions must only be those which can be substantiated from the evidence presented.

The outline helps one to concentrate exclusively on what is to be said. Writing without outline affects the smooth flow and continuity of the thought. Once the outline is prepared, we have check whether anything important has been omitted. Some one else may read it and comment upon it. If changes need to be made, they can be effected. Once the outline is on paper, it is easy to write and rewrite sentences and paragraphs.

### 15.3. Contents of report:

The report should start with the object of the research and include the theoretical, specific and where relevant, practical aims. It should then describe the research procedure as it actually took place; that is the methods. In many pieces of research, more than one method will have been used, and to achieve the overall aims, the research will have probably been broken down into subsidiary objectives. This sometimes leads to problems at the report stage. If the report is organized round the methods used and their individual results, it may lack coherence. Clearly it is better organized round the objects of the research. A difficulty can arise as stated at the outset may have proved impossible of achievement, or proved to have been based upon a false assumption. In this case the research direction may have changed. If this occurs, it should be stated quite clearly why and how it was decided to make this change and how the objectives were modified.

Having thus set out the objects and the actual methods used, the next thing is to display the findings. The findings of social research can be displayed in words, in tables, in diagrams, in maps and sometimes even in three-dimensional models. Which form of presentation is used, or in what combinations they are used, depends on the nature of the research and also a good deal on the audience, not all of whom may be very great readers.

There is minimum number of items of information which should always be presented about the subjects of social research. They are:

1. By whom, for whom and with what financial backing the research was undertaken
2. The objects of the research.
3. The time at which the field work was undertaken and its duration.
4. The universe which was the subject of the research, including basic demographic details.
5. The details of any samples taken which should include: the size of the sample; the sample fraction; the method of sampling; the number of completed interviews related to the number of planned interviews.
6. Descriptions of the methods of data collection: whether from documents, observation, or interview and the type of each used.
7. Details of the staff employed and their supervision
8. A copy of any questionnaires, schedules, or interview guides used.
9. The facts found, including those contrary to the hypotheses.
10. Where data is presented in the form of percentages or other indices, tables should include the number of cases on which these were based.
11. The relation of the evidence collected to comparable information collected in other studies.
12. As appropriate, the implications of the findings for previously stated theoretical propositions and / or for action.

Most social research will have involved some statistical material. Usually one needs to know the total number, age, sex, marital status and occupation of the population that is under discussion. These can all best be presented in tabular form, although a descriptive summary in the text is also helpful. Thus one might say that, "This was largely a population of young married junior executives" in the text. In addition, this may be more precisely recorded in a table (Perhaps in an appendix). Other research results may depend almost exclusively on tabular presentation. The way a table is presented is important. It should always have a serial number and a descriptive title to identify it. It should indicate its source and to what denominations the figures relate: number in sample, percent; mean etc. columns down and rows across should all be clearly labeled and this should be consistently followed through out about the use of empty cells, dashes, etc, to avoid confusion between those where Zero value is indicated and those where there is no information

Data which are presented graphically or in maps should also always be clearly numbered and labeled, the key to symbols being given in each case, the values and subjects of ordinates being clearly expressed. Maps and diagrams should never try to say too much at once. As two or three sentences are always better than long and involved one, so are two or three maps better than one over crowded one.

However it is presented, in words or otherwise, it is a rule of the scientific method that all the evidence should be presented: that which fits with the thesis and, as well, that which is contrary to it. In the course of the work, it will have been the social scientist's business to look for the evidence that does not fit, to try, if he had a clear hypothesis, to disprove his case. It is now, at the report stage, his responsibility to report in full what he has discovered, even if it is contrary to his expectation. Negative findings are as important as positive ones, and may well turn out to be the basis upon which new discoveries are made.

It is also important to show how the findings relate to those of other studies, where they are in a accord and where they differ. Frequently this calls for statistical comparisons which may present difficulties. The categories used by other researchers may not be the same. The intervals in a continuum (eg. Age groups) may differ, as may be definitions. If there are differences, the researcher may have to make some adjustments. For this reason, it is important that, at least for much commonly collected data, there should be agreement on categories and definitions. It is desirable that all research workers should collect data on the basis of common categories, even if they wish to use others of their own invention as well. In the absence of any other agreed classifications, data should be classified according to the categories used by the official government statisticians of the countries where the research is being done. This ensures that each piece of work may be compared with official data, and also that each piece of research may be compared with each other. In presenting the report, the distribution for the research population should be shown against any relevant national distribution according to the same categories and definitions. They may also be shown according to any other categories which the research worker thinks are more appropriate to the immediate purpose of his report.

To show in the report, the ways in which the research can be used for comparative purposes is as important as communicating the results of the research itself. Generally speaking the development of social sciences must depend upon the application of the comparative method. In its turn this must depend on the secondary analysis of comparable data. Field research will only add its full measure to the sum total of the development of the subject if data can be presented in ways which make this easier.

#### 15.4. Categories of Reports:

The purpose of the report is communication with the audience. Communicability demands one to be clear about the persons for whom the given report is intended. There are three broad categories of readers.

1. The layman and the general public – The popular Report
2. The administrator and the project sponsor – The report for the administrator
3. The fellow researcher or the – The technical report  
technical expert.

#### Oral Report:

Reporting to any person, especially to the administrator may be oral or in writing. Oral report has an important place in U.S.A. in India it is still in its infancy. The oral report is a two-way process. There is a give- and –take discussion between the researcher and the audience. There is greater scope for explaining the findings and discussing the implications. The researcher can elaborate his work and convince the audience. To maintain a permanent record to the points discussed, it is helpful to prepare a written report also along with the oral presentation. Oral presentation at a conference or a seminar, really requires more preparation than the written report.

#### Written Report:

Written reports are of different types. Their planning and documentation vary with the types, purposes and readers.

#### i) The popular report:

It is necessary to disseminate the broad facts, findings and recommendations to the intelligent lay man. The report for the layman must be lucid and simple. It should avoid distortion, jargon and technical words. The researcher may produce summary report for the benefit of layman along with a full technical report. The summary report may be short, simple and lucid, covering facts findings and recommendations.

#### ii) The report for the administrator:

It is a general survey report for an administrator or the business executive. This would be of medium size, with some technical details and supporting data, followed by a summary and principal recommendations. It is like a memorandum and occasionally as a preliminary report.

#### iii) The Technical Report:

It is a report by a researcher for another researcher. The technical report may take the following forms.

1. A detailed report by a specialist
2. Each expert would make his report to the overall director of the survey. The director will utilise the specialists' reports in preparing his own economic report.
3. A monograph
4. An article for a professional journal
5. The full technical report

The basic data and the broad structure are the same for all these types. But there are differences in the selection of facts and the details regarding the method followed.

### 15.5. Stages in preparing the research report:

There are three stages in preparing the research report viz. organisation, write-up, and documentation. Documentation includes: 1) footnotes, 2) bibliography, 3) tables, charts and graphs, 4) quotations, 5) appendices and 6) preface

#### Organisation:

After data collection and analysis, the researcher's first concern is ordering the parts and planning the writing. This requires the organisation which is the basis for preparing the report. The research report as a whole and its parts should have unity, coherence and flow. One group of facts and each conclusions should follow another, through sequence. One should avoid jumbling of facts, throwing them pell-mell at the reader. Distraction of side issues and irrelevancies are to be avoided. The aim of the author should be made plain. Easy communication of research results is partly a matter of language but largely a matter of planning or organizing the report.

There are three form of organisation i.e the topical, the chronological and the mixed form. The topical approach, takes topics and sub-topics as basic to the writing. It is appropriate to research current problems, and where the descriptive, analytical and experimental methods dominate. The majority of investigations belongs to this category. The chronological organisation lays emphasis on the time and developmental aspects. The mixed form should be adopted. Since it enables movement forward within each topic, with a forward or backward glance in the report.

Satisfactory communication requires a good organisation of the report which has three essential steps.

#### 1) Full acquaintance with research notes:

It is desirable to make notes on separate cards or slips called form -fact. Accuracy and adequacy are required. The investigator should have complete control over the data. The notes are to be compared, criticized and revalued to enable the investigator to organise the data in his own way.

#### 2) The role of thought:

As research is not a mechanical process, thinking is necessary at every stage. It is more important at the stage of orgnisation. The researcher should depend as little as possible on his research guide or on his friends. This demands patience, deep and alert thinking. The process of thinking is a matter of habit and develops with practice.

#### Write-up:

The clarity in reporting is influenced by a few factors:

- a) The reader in view
- b) How the technical the problem is
- c) The researcher's hold over his facts and techniques
- d) His command over language
- e) The form and fullness of the notes i.e of the data and documentation.

If is easier to write to the technical man, for he understands the technical terms. Straight forward report is required in the case of administrator and the layman. For them, there is need for clarity and simplicity in presentation. The writer should have command over the language. Clarity alone is not enough. It is necessary to convince the audience of the ideas presented.



### 15.6. Steps in drafting reports:

There are three steps involved in drafting a report.

#### First Draft:

The first draft concentrates on substance i.e., fullness of facts. Accuracy of the facts incorporated into the text becomes necessary. Importance is to be given to the comprehensiveness of the report, but not to the language and form. For writing the first draft, the researcher should have control over his notes.

#### Objectives:

The objectives of the first draft or rough draft stage are four:

- 1) Comprehensiveness or fullness of facts,
- 2) Precision or accuracy of facts.
- 3) Coherence or logic of facts.
- 4) Movement or transition of facts and ideas.

There may be defects in the first draft. There would be gaps in facts, ideas and presentation. Conciseness and clarity may be absent. There may be repetitions. The researcher will have to correct these defects at this stage.

#### Steps in writing first Draft:

- 1) Shuffle the notes under each sub-topic and put them in a sequence.
- 2) Expand the notes and the outline and put-into writing all ideas.
- 3) Bring out the central point in each chapter, section and paragraph.
- 4) Repeatedly read and re-read your own notes to draw out their full significance.
- 5) Each chapter to begin with what the investigation indicates or what the reader may be presumed to know already.

The researcher should write the "body" first and the "introduction" at the end. Body is the crucial part. It is the substance of the investigation. All statistical tables, charts etc should be kept separate from the text. Every reader is interested in the conclusions. So conclusions are more important than the body. Hence, conclusions should be precise, clear and objective.

#### Second draft:

After completion of first draft, the second draft is to be prepared. While drafting the second one, the researcher should concentrate on form and language. The draft at this stage should be given a shape, so that it can be readable, clear and lucid. Editing will have to be done to make the writing precise, concise and brief. At this stage, critical evaluation will have to be made about all that has been written –facts, findings, conclusions and recommendations.

#### Tips in writing the second draft:

The following points may be kept in mind while drafting at the second stage.

1. Put human interest into the report by using illustrating cases
2. Make the research design plain to the reader.
3. Emphasise clearly important points in method, facts and findings.
4. Expand condensed writing –economy in words is desirable.
5. Use simple words and avoid complex sentences.
6. Use words which are in common usage.
7. Be strict with words. Words may look alike but have different shades of meaning.

8. Recognise what is wrong with each word and replace it by other words.
9. A void superfluous words.
10. Make clarity your first objective in writing

“Don'ts” in writing the second Draft:

1. Avoid the language which only few can understand.
2. Avoid complex sentences.
3. Avoid mass of facts, data and arguments.
4. Avoid awkward repetition, vagueness and unnecessary abstraction.
5. Avoid using words having same meaning.
6. Avoid words which do not mean anything specific. e.g trend, factor, forces and movement.
7. Avoid long and redundant words.

Tests to be applied:

At the end of the second draft, the researcher may ask himself and answer a few questions.

1. Does the title cover the scope of the subject?
2. Is the initial hypothesis tested adequately?
3. Are the divisions of the report logical?
4. Does the beginning begin and conclusion conclude?
5. Is there smooth development from the introduction to the recommendation?
6. Is the report as thorough as the writer can make it?
7. Is the conclusion effective?
8. Are the opening sentence, paragraphs, sections etc attractive?
9. Is the style smooth?
10. Has the audience been kept in mind ? or has the researcher written for himself?
11. Does the writing have too many “somewhat”, “perhaps”, “rather” indicating indecision?
12. Has the writing over emphasized by using too many “very”, “invariably”, “tremendous”, “extraordinary”, etc.?
13. Has too much of jargon and vague words been used?
14. Finally, is the researcher, as his own critic, satisfied with the report.

The third draft:

The final stage in drafting is the preparation of final report. The focus is on the finish and final touches i.e on documentation. The report should be weighty, authoritative, convincing and attractive. Documentation indicates references, other previous and current work, additional data and discussion, and suggested further reading on the specific problem. It indicates thoroughness of investigation and a guide to further work. A good research paper depends upon the accurate and thorough recording of the investigation.

The presentation of sampling Errors in the report:

The presentation of sampling errors sometimes causes awkwardness. To accompany each figure by its corresponding standard error satisfies the most rigorous requirement but hardly makes for easy reading. In the body of the table, approximate values of the standard error figures should be quoted ideally, standard error figures should be quoted for two or three confidence levels, so that the reader can make his choice.

**Presentation of inconclusive or negative results in the report:**

Researchers are reluctant to publish inconclusive or negative results. The negative results are as important as the positive ones. If the research results point clearly against the hypothesis, he must say so. If the results are inconclusive, it may be useful to future workers.

There are three problems in research report writing; how to begin, how to carry on and how to come to a close. A good writer must know where to end. One should carefully use proper adjectives. The more the adjectives, the higher is the emotional state, which is said to be the enemy of a scientific method. A passage may appear to be beautiful to the writer, but to others, the meaning may not be clear. In such a case, it is better to rewrite the whole thing once again.

### **15.7. Summary:**

the first things that must be decided in preparing the report are for whom it is to be written, whether it is to be published and if so in what form. The audience will affect the manner and order of presentation. A research report addressed to fellow academics can assume a completely different kind of knowledge from a research report addressed to lay persons.

Although the style and emphasis of the presentation will vary according to the audience, the general principles which govern the presentation of any report remain the same. The general principles are that the researcher should say what he set out to do (object), how he did it (method), what came out of it, both negative and positive (results) and what finally concluded from this.

The basic quality of good scientific writing is accuracy and clarity. Whether using technical terms or not, clarity of style is essential. There is no good reason for consistently using four-syllable words instead of one-syllable words with essentially the same meaning. Similarly, two or three relatively simple sentences may convey an idea more clearly than one complicated sentence with a number of entangled clauses".

One should begin with preparing a detailed outline of his report. A sentence outline or paragraph outline rather than a topical outline is preferred. Before the researcher starts writing his report, he should have drawn up an outline of the way in which he proposes to do it. This would consist of headings and sub-headings and an indication of the way, under each of these, he proposes to gather his data.

The research should start with the object of the research and include the theoretical, specific and where relevant, practical aims. It should then describe the research procedure as it actually took place, that is the methods. In many pieces of research, more than one method have been used.

Having set out the objects and the actual methods used, the next thing is to display the findings. The findings of social research can be displayed in words, in tables, in diagrams, in maps and some times even in three-dimensional models. Which form of presentation is used, or in what combinations they are used, depends on the nature of the research and also a good deal on the audience, not all of whom may be very great readers.

The oral report is a two-way process. There is a give-and-take discussion between the researcher and the audience. The researcher can elaborate his work and convince the audience.

Written reports are of different types. The popular report intended for the layman must be lucid, and simple. It should avoid distortion, jargon and technical words.

The report for the administrator is a general survey report. This would be of medium size, with some technical details and supporting data, followed by summary and principal recommendations.

The technical report is a detailed report by a specialist. It is a report by a researcher for another researcher. It can take the form of a monograph, or an article for a professional journal.

There are three stages in preparing the research report viz. organisation, write-up and documentation, documentation includes: 1) Footnotes, 2) Bibliography, 3) Tables, charts and graphs, 4) Quotations, 5) Appendices and, 6) Preface.

There are three steps involved in drafting a report. The first draft concentrates on substance i.e., fullness of facts. For writing the first draft, the researcher should have control over his notes.

After completion of first draft, the second draft is to be prepared. While drafting the second one, the researcher should concentrate on form and language. The draft at this stage should be given a shape, so that it can be readable, clear and lucid.

The final stage in drafting is the preparation of final report. The focus is on the finish and final touch i.e on documentation. The report should be weighty, authoritative, convincing and attractive.

#### 15.8. Key Words:

- a) Scientific Report
- b) Outline
- c) Sampling errors

#### 15.9. Model Questions:

1. Discuss the characteristics of scientific report
2. Explain the contents of a research report.

#### 15.10. Reference Books:

1. Bajpai, S.R : Methods of social survey and research.
2. Saravanavel (2004) : Research methodology, Kitab Mahal, Allahabad.

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**Prof. M. Lakshmipathi Raju**

**Lesson-16****STATISTICS****16.0. Objectives:**

The objectives of this lesson are to explain the uses, functions and limitations of statistics.

**Contents:**

- 16.1. Introduction
- 16.2. Definition
- 16.3. Uses of Statistics in Social Work Research
- 16.4. Limitations of Statistics
- 16.5. Distrust of Statistics
- 16.6. Functions of Statistics
- 16.7. Summary
- 16.8. Key words
- 16.9. Exercises
- 16.10. References

**16.1. Introduction:**

The term 'Statistics' appears to have been derived from the Latin phrase 'ratio status' and its Italian equivalent 'regione di stato' - both meaning the study of practical politics or the statesman's art.

Descriptive figures on various aspects of economic and social life of a political community were considered essential for the purpose of administration. Historical records reveal that the earlier states collected periodic figures on manpower and material strength for making military and fiscal policies. The record was made up-to-date once in five years. This method of recording began to be called 'census'. The very same name is given to the modern census operations, carried out once in ten years, which include much more than mere counting of adult male population.

Ancient kings used to keep regular records of adult male population which revealed military strength of their kingdom, taxable capacity of people, births and deaths etc., Since the purpose behind such collection of facts and figures by the ancient states was purely national, the science of statistics never crossed political boundaries. Therefore, statistics was then described as the **science of kings**.

Statistics, born of the practical needs of the state to register its population, are finding ever-increasing application in every day life. Infact statistical thinking is considered as the scientific form of every day thinking.

The growth of statistics in the present century is such that no branch of knowledge can move forward without the help of statistics. Infact, it affects every one, and touches life at many points. Statistics once regarded as the Science of Kings, can rightly be called the Science of Common man.

Is statistics a Science or an Art? The answer is that statistics is both an art and a science.

Statistics is a science: Science refers to a systematized body of knowledge. It studies the phenomena objectively and avoids vague judgments. Statistics is a science as it has a definite body of knowledge. It also adopts a system in arriving at the results.

Statistics is an art. An Art refers to the skill of handling facts so as to achieve a given objective. It is concerned with ways and means of presenting and handling data, making inferences logically and drawing relevant conclusions.

Statistics is not a body of substantive knowledge but a body of methods for obtaining knowledge. If the science is knowledge; then art is action. From that point of view statistics may also be regarded as an art.

The word statistics conveys different meaning to people. To some it is an applied branch of Mathematics and to others it refers to tables, graphs, and charts and figures which one finds in newspapers, journals, books, reports etc.

In statistics, figures (numbers) are the raw material. The figures are processed and brought in the form of useful information. Whenever numbers are collected, processed regardless of what they represent, they become statistics. In other words, statistics refers to collection and presentation of numerical data, making logical inferences and arriving at relevant conclusion.

The word statistics refers to quantitative information. In this context, it is used as a 'plural-noun' – the statistics of births and deaths, exports, imports, prevalence and incidence.

Statistics is a method of dealing with quantitative information. In this context where as it is used as a singular. Statistics deals with the collection, presentation, analysis and interpretation of the quantitative information.

In social sciences, statistics is not usually studied for its own sake. It is widely used as a tool in the analysis of problems.

Governmental, non-governmental and academic institutions use statistical methods as an important aid in forecasting, controlling and exploring.

Statistical methods range from a most elementary descriptive devices, which can be understood by any one to most technical and complicated mathematical procedures, which can be understood by an expert.

### 16.2. Definition:

There have been various definitions of statistics by different authors. Some authors have defined it from the point of view of numerical statement of facts and many others on the basis of statistical methods.

The scope of statistics is much wider than what it was sometimes back. Various writers and professors have differently defined the word statistics.

According to A. L. Bowley 'Statistics' are numerical statements of facts in any department of enquiry, placed in relation to each other'. Bowley called statistics as the 'science of averages' and 'science of counting'.

Yule states 'Statistics are quantitative data affected to a marked extent by multiplicity of causes'.

Waugh defined statistics as a body of methods, which are used when we wish to study masses of numerical data and to extract from them a few simple facts.

According to Connor 'Statistics is the study which deals with the collection, analysis and interpretation of figures'.

According to Croxton and Cowden 'Statistical methods range from most elementary descriptive devices which may be understood by any one to those extremely complicated mathematical procedures which are comprehended by only the most expert theoreticians'. According to them, statistics may be defined as the collection, presentation, analysis and interpretation of numerical data. The definition includes the stages of a statistical investigation i.e., collection, analysis, presentation and interpretation of numerical data.

We can give a simple definition of statistics as follows:

**"Statistics is the science which deals with the collection, organization, presentation, analysis and interpretation of quantitative data in any sphere of enquiry".**

The definition includes five stages of a statistical investigation.

- a) **Collection** of data is the first step in a statistical investigation. The data may be available either from primary sources or from secondary sources. Data are like the raw material that needs to be converted into a finished product.
- b) **Organization** of the data collected includes editing, coding and classification. The last step in organization is the tabulation. The purpose of tabulation is to arrange the data in columns and rows so that there is clarity in the data presented.
- c) The data are to be **presented** in an orderly manner. The data may be presented in the form of diagrams and graphs.
- d) The purpose of **analysis** is to explore the valuable information for decision-making.
- e) **Interpretation**, the last stage of an investigation, is to provide logical explanations for the data. This is the most difficult task and requires high degree of skill and experience on the part of the researcher.

Horace Secrist gives a comprehensive definition of statistics, which include all the essential characteristics of statistics except inferences.

He defines statistics as follows:

By statistics, we mean aggregate of facts, affected to a marked extent by multiplicity of causes, numerically expressed, enumerated or estimated according to some reasonable standards of accuracy, collected in a systematic manner for a predetermined purpose, and placed in relation to each other.

The Characteristics of statistics are:

- a) Statistics are aggregate of facts and an isolated figure would not constitute statistics.
- b) Statistics are affected to a marked extent by multiplicity of factors and only the combined effect of causes may be determined. Infact, the effect of various forces on a particular phenomenon cannot be separated.
- c) Statistics must be numerically expressed. The facts must be expressed in definite numerical qualities. A qualitative statement of fact is insignificant in the study of statistics.
- d) Statistics must be enumerated or estimated according to some reasonal standard of accuracy. In measuring the height of students for a medical test, perfect accuracy is required; where as measuring the distance between two cities, even a few yards may be ignored. In the latter instance only reasonable accuracy will arise out of a significantly large area.  
  
In many statistical studies perfect accuracy is not possible. It is essential to fix the desired standard of accuracy before hand.
- e) Statistics must be collected in a systematic manner for a predetermined purpose. The data must be collected keeping in view the purpose of the study. Otherwise, unnecessary data may be collected and necessary data may be ignored. The researcher must have a plan of data collection on the basis of the purpose of enquiry. This will pave way in the systematic collection of data that are free from bias and errors.
- f) Statistics must be placed in relation to each other. The ultimate goal of any statistical investigation is a comparative study. The collected data must be analyzed and compared with reference to time. When the per capita income of the Indian population in 2001 is given; the figure is not significant unless it is compared with that of an earlier period. The figure may also be compared with the figures of other countries. It is important to note that the figures to be compared belong to the same department of enquiry.
- g) The logic used in statistics is known as induction. In statistical method, inferences are drawn about the population from the information contained in a sample, which is only a part of the population (universe) and thus we pass from particular to the general.

### 16.3. Uses of Statistics in Social Work Research:

We are living in the age of statistics. All branches of knowledge require the use of the statistics. Today, statistics is considered as the scientific study of handling quantitative information



The essential purpose is to describe and draw inferences about the numerical properties of population.

Research develops qualitatively with statistics and hence, the profession of social work also develops. Research in social sciences in general, and social work in particular, will be poorer without the use of statistics.

The utility of statistics in social work research can be summarized as noted below:

- a) Statistical methods are applied in social work to analyze the crucial problems that adversely affect human welfare. For ex. With the help of statistics we can understand the relationship between alcoholism and crime; unemployment and poverty; standard of living and family size. In modern world, complex problems are solved to a greater extent with the help of statistical methods. We can understand the effectiveness of social work methods in dealing with different individual and familial problems
- b) For formulating research design, including selecting the sampling, the knowledge of statistics is essential.
- c) Statistics enables not only to predict and test hypothesis; but also to determine the accuracy of one's decisions.
- d) For construction of scales and understand the validity and reliability of scaling techniques, the knowledge of statistics is essential.
- e) For computer processing of data and analysis of data, knowledge of statistics is essential.
- f) Statistics disallows any vague conclusions and emphasizes arriving at definite ones. These techniques enable to present the results in a summarized, more meaningful and convenient form. It helps in drawing generalizations.
- g) The journals and technical report are full of statistical language. Students of social work cannot ignore statistics while carrying out empirical work.

#### **16.4. Limitations of Statistics:**

The utility of statistics in different fields does not always give the impression that it is a blessing. We need to see the other side of the coin. The limitations in the application of the statistics are as follows:

- a) Statistics deals only with the aggregate of facts and no importance is given to individual items. The study of individual measurement does not fall under the scope of statistics.

Ex. : A survey of the income of a particular village reveals that the average income is Rs. 10,000/- . This does not mean that all families in that village have similar income. There are some families whose income is more than Rs. 10,000/- and some other families whose income is less than the Rs. 10,000/-. The average indicates the aggregate of facts.

The average has statistical relevance but not the single measurement. The mark obtained by one student is not the subject matter of statistics. The average mark has the statistical relevance.

- b) Statistics studies qualitative phenomenon in indirect form. Some facts like honesty, culture cannot be studied quantitatively. It is essential that quantitative aspects be extracted from qualitative aspects.
- c) Statistical results are not universally true like physics and chemistry. They are true only under certain conditions.
- d) Statistics is not the only way of studying a phenomenon. For example when we want to study the economic set-up of a country statistically, it is to be supplemented by other evidence like the background of the country's culture and traditions. These issues do not come under the study of statistics.
- e) In the hands of an inexperienced person, statistics is liable to be misused. It is even more dangerous if it is used by a person who does not know how to use statistics.
- f) There are many misgivings among the general public about the reliability and utility of statistics. These misgivings have impaired the reputation of statistics.

The following are the examples:

- a) Statistics can prove any thing.
- b) There are three kinds of lies: lies, damned lies and statistics.
- c) Statistics are like clay of which one can make a god or devil as one likes.
- d) One ounce of truth will produce tons of statistics.
- e) If figures say so it cannot be otherwise.
- f) Statistics are like miniskirts. They cover up essentials but give you ideas.

There are many reasons that can be attributed to the growing unpopularity of statistics.

#### 16.5. Distrust of Statistics:

Since, figures are more convincing than mere statements, people can easily be misled. They can be manipulated in such a manner so as to establish foregone conclusions. Statistics neither proves nor disproves anything. It is only a tool. i.e., a method of approach.

As a tool, if it is properly used, statistics gives valuable results, if misused they do more harm than good. In the hands of a wrong person, even medicine, produces disaster. Then we should not blame the medicine.

Statistics will not tell lie, but it is the person who projects the figures so. Through statistics truth can be distorted.

However, one needs to understand that statistics is an important tool in research inspite of its inherent limitations.

#### 16.6. Functions of Statistics:

- a) It presents facts in a precise, definite and understandable form.

- b) Statistics simplifies the mass of data.
- c) Statistics facilitates comparison.
- d) Statistics helps in formulating and testing hypothesis.
- e) Statistics helps in predicting the future trends and tendencies.
- f) Statistics helps in the formulation of suitable policies.

Robert W. Burgess has summed up the functions of statistics as 'The fundamental gospel of statistics is to push back the domain of ignorance, rule of thumb, arbitrary or premature decision, traditions and dogmatism and to increase the domain in which decisions are made and principles are formulated on the basis of analyzed quantitative facts'.

#### 16.7. Summary:

Statistics, as a discipline, has a long- history. The growth of statistics in the present era is such that no branch of knowledge can move forward without the help of statistics. Once regarded as 'Science of Kings', statistics is now aptly called 'the Science of Common-man'.

The word statistics refers to a method dealing with quantitative information. In this context, it is used as a singular. It is a method that deals with the collection, presentation, analysis and interpretation of the quantitative information. The figures are processed and brought in the form of useful information. The word statistics also refers to quantitative information. In this context, it is used as a 'plural-noun'.

Statistics is both a science and an art. It can be defined as follows:

" Statistics is the science which deals with the collection, organisation, presentation, analysis and interpretation of quantitative data in any sphere of enquiry".

The characteristics of statistics are:

- a) Statistics are aggregate of facts
- b) Statistics are affected to a marked extent by the multiplicity of factors
- c) Statistics must be numerically expressed
- d) Statistics must be enumerated or estimated according to some reasonable standard of accuracy
- e) Statistics must be collected in a systematic manner for a pre- determined purpose
- f) Statistics must be placed in relation to each other, and
- g) The logic used in statistics is known as induction.

Statistics is extensively used in social science research in general and social work research in particular. The limitations in the application of statistics are to be noted carefully. In spite of the limitations, one can surely say that statistics is an important tool in research. The functions of statistics are varied. Every social worker must have the basic knowledge of statistics and apply the same with utmost care.

#### 16.8. Key words:

- 1) **Statistics:** It is concerned with collecting, organizing, analyzing and drawing conclusions from numerical data.

- 2) **Normal distribution:** A distribution of scores that produces a bell-shaped, symmetrical curve.
- 3) **Descriptive statistics:** The branch of statistics that provides a means of summarizing data or presenting the data in a usable and convenient form.

**16.9 Exercises:**

- 1) Bring out the uses of statistics in social work research.
- 2) What are the functions of statistics?
- 3) Mention the limitations of statistics.

**16.10 References:**

- 1) Gupta.S.P. 1984, Statistical Methods. Sultanchand and Sons, New Delhi, 2004.
- 2) Young, Pauline.V: Scientific Social Surveys and Research, Prentice - Hall of India Pvt Ltd., New Delhi, 1998.

**Prof. M. Lakshmipathi Raju**

**Lesson-17****MEASURES OF CENTRAL VALUE OR AVERAGE****17.0. Objectives:**

The objectives of this lesson are to explain functions and uses of an average and types of averages.

**Contents:**

- 17.1. Introduction
- 17.2. Functions and Uses of an Average
- 17.3. Essentials of an Ideal average
- 17.4. Types of Averages
  - ✓ Arithmetic Mean
  - ✓ Median
  - ✓ Mode
- 17.5. Summary
- 17.6. Key Words
- 17.7. Exercises
- 17.8. References

**17.1. Introduction:**

Statistics, as an art and science, centers around the use of the term average. The term 'Average' has so many popular associations. TV programmes, radio programmes and even budget is prepared keeping in view the average viewer / person in mind. In view of its popular usage in day-to-day life, many statisticians prefer to drop it from the technical term and refer to it as a measure of central tendency.

The numerical descriptions that can adequately describe the concentration of large numbers around a central value are known as measures of central tendency or average.

An average is used to summarize a mass of individual observations in a much more concise fashion that is accomplished by a frequency distribution. An average is the centre of gravity of the raw data or mass information.

**17.2. Functions and Uses of an Average:**

It is a shorthand description of mass of quantitative data. The average is a single figure, which is easy to understand and to interpret the data.

An average provides a common denomination for comparing two groups of data.

An average can provide a measure of typical size. For example, the average marks of group of students in a particular subject are 65 marks. We can say whether a given student falls above or below the average marks.

An average enables us to get a clear picture of the complete group. It is easy to remember the average rather than the total raw data. The use of Average is more economical and meaningful.

**17.3 Essentials of an Ideal average:**

There are several statistical measures that may be used as averages. We need to keep in mind the purpose at hand and use the right kind of average.

The properties of an Ideal Average are:

It is rigidly defined and it has only one interpretation to offer. The average so computed by different computers will be same.

All items in the distribution are taken into consideration for calculating the average.

The average should not be affected by extreme values.

The average must be easy to calculate and simple to understand.

If different samples are drawn from the population, however carefully they may be chosen, the average of one sample may not be the same of another. There may be differences. These differences are called fluctuations of sampling. Under such conditions those averages in which the differences are not marked are referred to as stable and representative.

#### 17.4. Types of Averages:

The average may be obtained by several ways. Generally, the following types are extensively used:

Arithmetic Mean

Median

Mode

Geometric Mean

Harmonic Mean.

#### ARITHMETIC MEAN:

Arithmetic mean is the most popular and suitable form of average. Its popularity is because of its easy understandability and utility.

It is popularly referred to as 'average par excellence'. Although there are several kinds of means, the arithmetic mean is used so often that a reference to mean invariably refers to arithmetic mean.

Where further analysis is required, arithmetic mean is commonly used. Placing a line over the symbol representing the variable indicates the mean of a variable.

For ex  $\bar{X}$  refers to mean of variable X:  $\bar{Y}$  refers to mean of variable Y.

The mean is calculated by dividing the sum of all the values of a variable with the number of cases.

In Algebraic Form  $\bar{X} = \frac{\sum X}{n}$

Where  $\sum$  refers to summation sign. It indicates the sum of whatever follows:

Calculation of Arithmetic Mean – individual observations:

The mean is calculated by dividing the sum of all values of variable by the number of cases. Placing a line over the symbol representing the variable indicates the mean of a variable.

For ex  $\bar{X}$  is the mean of the variable

$$\bar{X} = \frac{X_1 + X_2 + X_3 + X_4 + \dots}{N}$$

$$\bar{X} = \frac{\sum X}{N}$$

( $X_1 + X_2 + X_3 + X_4 + \dots$  are the given values of the variable) where  $\Sigma$  – Greek Capital S or Sigma is the conventional summation sign. It does not represent a separate quality but indicates the sum of whatever follows.

N stands for the number items in the series.

Ex: The marks obtained by 10 persons are mentioned below. Find out the Arithmetic Mean.

40, 45, 46, 35, 38, 42, 52, 62, 70, 41

Sl. No.	Marks Obtained(X)
1	40
2	45
3	46
4	35
5	38
6	42
7	52
8	62
9	70
10	41
$\Sigma X$	471

$$\text{Arithmetic Mean} = \frac{471}{10}$$

Arithmetic Mean: 47.10

Discrete Series:

Steps

Multiply each size of the variable X with its respective frequency and add the products so obtained  $\Sigma fx$

Divide the total by the total of frequencies. The resultant quotient is the Arithmetic Mean.

$$X = \frac{\Sigma fx}{N}$$

Illustration:

The wages of 100 workers are given below: Find out the mean wages

Wages (x)(Rs.)	No. of Workers(f)
50	15
60	16
70	21
80	24
90	18
100	06

Solution:

Wages (x)(Rs.)	No. of Workers(f)	fx
50	15	0750

60	16	0960
70	21	1470
80	24	1920
90	18	1620
100	06	0600
	Total: 100	•fx : 7320

$$X = \frac{\cdot fx}{N}$$

$$X = \frac{7320}{100}$$

Rs. 73.20

### Continuous Series :

Steps

Replace the classes with mid-values.

Multiply each mid-value by the respective class frequency and summate the products •fx.

Divide •fx by the total frequency.

Illustration: The marks obtained by 100 students are shown in tabular form. Compute the Arithmetic Mean.

Marks	No. of Students
30 - 40	02
40 - 50	16
50 - 60	10
60 - 70	28
70 - 80	14
80 - 90	16
90 - 100	14

Solution :

Marks	Mid-value(x)	No. of Students(f)	fx
30 - 40	35	02	0070
40 - 50	45	16	0720
50 - 60	55	10	0550
60 - 70	65	28	1820
70 - 80	75	14	1050
80 - 90	85	16	1360
90 - 100	95	14	1330
		N : 100	•fx : 6900

$$X = \frac{\cdot fx}{N}$$

$$X = \frac{6900}{100}$$



**Merits of Arithmetic Mean**

Even if different persons compute, the arithmetic mean of a series will be same. All will arrive at the same value.

Every item or value in a series is taken into account for calculation. Hence, it is a perfect average. Arithmetic average lend itself to further statistical calculations. It has wider coverage and scope in application.

The sampling fluctuation is minimal and hence, it is preferred over other measures of central tendency.

**Limitations:**

As mentioned earlier, all values in a series are taken into consideration while computing arithmetic mean. Sometimes this may be a liability when some values are extremely small while some values are extremely big. The result is the incorrect version of the situation.

For Ex. The mean of the 100, 120, 150, 110 and 1000 is 296. The average is much higher than four out of five items and hence does not convey the real situation.

It so happens in some occasions that the resultant average may not coincide with any of the actual item in the series. Hence, the average is not always a true representative of the whole series. For Ex. The arithmetic mean of 15, 12, 13, 20 and 10 is 14, a figure that is not the value of any item in the series included in its computation.

There are occasions when the arithmetic mean give false impression and misleading conclusions. For ex. The profits earned by two companies in three consecutive years are as follows:

	Company A	Company B
I Year	15 Crores	25 Crores
II Year	20 Crores	20 Crores
III Year	25 Crores	15 Crores

The average profit of both the companies is same i.e., 20 Crores ( $15 + 20 + 25 = 60/3 = 20$ ). But the reality is that company 'A' has performed better than company 'B' as there is a substantial increase in the profit over years. While, the profits of company 'B' have come down gradually over years. This only implies that arithmetic average conceal the vital aspects and reveals only the obvious.

**MEDIAN**

Median is the 'middle-most' or the 'most-central' value of a set numbers. Median is entirely the positional average. Here position refers to the location of the central value of the series. The position is such that equal numbers of the items are found on either side of the series.

According to Lincoln L Chao 'Median' is the value that divides a series of observations ordered with respect to magnitude of values, so that the number of items above it is equal to the number of items below it.

Median is a measure of central tendency that represents the midpoint in a distribution of ordered data. Median is the middle value when the data are arranged either in ascending or in descending order. If the set of data has an even number of scores, the median is the mean of the two middle values.

Calculation of Median -: Individual observations:

Steps

Arrange the data either in ascending or descending order of size.

count the items and locate the middle value. This is the median.

The position or size of the median can be located by the formula:

$$\text{Median} = \text{Size of } \frac{N + 1}{2} \text{ th item}$$

N refers to the number of items.

Illustration:

The daily wages ( in Rs.) of labourers in a market place are given below: Find out the median wages.

50, 75, 65, 45, 60, 70, 40, 45, 80, 70, 35

Solution:

Arrange the data in ascending or descending order.

35, 40, 45, 45, 50, 60, 65, 70, 70, 75, 80

$$\text{Median} = \text{Size of } \frac{N + 1}{2} \text{ th item}$$

$$\text{Median} = \text{Size of } \frac{11 + 1}{2} \text{ th item}$$

$$= 12/2 \text{ th item}$$

$$= 6 \text{ th item}$$

$$= 6 \text{ th item is } 60$$

$$\text{Median} = 60$$

Calculation of Median – Discrete Series:

Arrange the data either in ascending or descending order of size.

Convert the given frequencies into cumulative frequencies.

$$\text{Median} = \text{Size of } \frac{N + 1}{2} \text{ th item}$$

Apply the formula:

$$\frac{N + 1}{2}$$

2

Look at the cumulative frequency column and find that total which is either equal to or immediate next higher that and determine the value of the variable corresponding to this. This is the median value.

Illustration:

Find out Median for the following data

Annual Income( Rs.)	No. of Persons(f)
25,000	15

30,000	20
20,000	12
35,000	16
32,000	24
40,000	13

Solution : Rearrange the data as follows :

Annual Income	No. of Persons(f)	Cumulative Frequency
20,000	12	12
25,000	15	27
30,000	20	47
32,000	24	71
35,000	16	87
40,000	13	100

Median = Size of  $\frac{N + 1}{2}$  th item

$\frac{100 + 1}{2}$  th item

$\frac{101}{2}$  th item  
= 50.5 th item

Find out either equal to 50.5<sup>th</sup> item or next higher value in cumulative frequency column.

Since 50.5<sup>th</sup> item is not there in cumulative frequency, the next higher value is 71. The corresponding value of the variable is 32,000.

Hence Median is Rs. 32,000/-.

#### Calculation of Median – Continuous Series

Convert frequencies into cumulative frequencies for each one.

Median = Size of  $\frac{N}{2}$  th item

Apply the formula:

c) Look at the cumulative frequency column and identify the size either equal to  $N/2$  or next higher size. The corresponding class is the class where the median lies.

Median =  $L + \frac{N/2 - cf}{f} \times i$

Use the Formula

L : Lower limit of the class in which median lies.

$N/2$  : Median Item

cf : Cumulative frequency just above  $N/2$

f : frequency of the Median class.

i : class interval.

**Illustration:**

Compute Median for the following data

Class Group(IQ Score)	No. of Persons
80 – 90	10
90 – 100	13
100 – 110	28
110 – 120	59
120 – 130	68
130 – 140	22
	200

**Solution**

Class Group(IQ Score)	No. of Persons(f)	Cumulative frequency
80 – 90	10	10
90 – 100	13	23
100 – 110	28	51
110 – 120	59	110
120 – 130	68	178
130 – 140	22	200
	200	

Median = Size of  $\frac{N}{2}$  th item

= Size of  $\frac{200}{2}$  th item

100<sup>th</sup> item

Median lies in the column 110 – 120

Median =  $L + \frac{N/2 - cf}{f} \times i$

L = 110

N/2 = 100

cf = 51

f = 59

i = 10

Median =  $110 + \frac{100 - 51}{59} \times 10$

Median =  $110 + \frac{49}{59} \times 10$

=  $110 + 0.83 \times 10$

=  $110 + 8.3$

Median = 118.30

**Merits of Median:**

The median value can be identified directly and hence, it is representative of the actual data. It is easy to understand.

Median overcomes the problem of a few extremely high or low values in a series, as happens in case of calculating mean.

The value of median can be represented graphically too.

It can be used for further statistical analysis.

**Limitations:**

It is a locative average and not a computed average.

The data are to be arranged either in ascending or in descending order. Sometimes it may be tedious and consumes more time to rearrange the data.

It is affected more by sampling fluctuations than the arithmetic mean.

Median refers only to middle value, though the adjacent items may also be same. The median loses its importance if the number of items is small.

In some instances the median may not be the true representative, if wide gap is present between items. For ex. The median of 8, 10, 15, 45, 70 is 15 which is not the true representative of the group.

**Measures of location based on other partitioned values:**

Median divides the array into two parts, one part having half the values greater than the median and the other half having the values lower than the median. In the same way, when the series can be divided into four equal parts, it is called Quartile. The first Quartile or lower Quartile (Q1) is that value at or below which one-fourth of all the items in the series fall. The second Quartile (Q2) is identical with the median. The third quartile or upper quartile (Q3) is that value at or below which three fourths of the items fall.

The first quartile leaves 25% of the members of the group above it and 75% below it; and the third quartile leaves 75% above it.

Decile divides a series into 10 equal parts. A percentile divides a series into hundred equal parts.

The main purpose for which quartile, and percentile are computed is to know exactly the composition of a series.

**Illustration: Calculate Q1 and Q3 for the following series:**

Daily Wages	No. of Workers
40	15
50	18
60	20
70	35
80	32
90	19
100	11

Solution

Daily Wages	No. of Workers	Cumulative Frequency
40	15	15
50	18	33
60	20	53
70	35	88
80	32	120
90	19	139
100	11	150

$$Q1 = \text{Size of } \left( \frac{N}{4} \right)^{\text{th}} \text{ item}$$

$$= \frac{150}{4} \text{ 37.5}^{\text{th}} \text{ item}$$

The size of 37.5<sup>th</sup> item is in the cumulative frequency 53. The size against it is 60

$$Q3 = \text{Size of } 3 \left( \frac{N}{4} \right)^{\text{th}} \text{ item}$$

$$Q3 = 3 \left( \frac{150}{4} \right)^{\text{th}} \text{ item}$$

$$= 112.5^{\text{th}} \text{ item}$$

The size of 112.5 item lies in the cumulative frequency of 120. The size against it is 80.

$$\text{Hence, } Q1 = 60$$

$$Q3 = 80$$

### MODE

The mode is the frequently occurring score in a set of scores. It is also a measure of central tendency where maximum concentration of a value in a distribution is taken into consideration.

Mode is the position of greatest density. To find out the average shoe size, and average size of family, mode is the typical value.

In daily life, we hear the following:

The average height of an Indian is five feet and four inches

The average person is honest.

The average page contains 300 words.

Calculation of Mode – individual observations:

In an array, finding out the value of mode does not pose any problem. The most frequently repeated value can be easily inspected which forms the modal value of that series.

In a college election, the votes obtained by three persons are shown below:

Names	No. of Votes Obtained
-------	-----------------------

Gopal	545
Vivek	680
Ramesh	425

In the above illustration, Vivek is declared elected as he has got highest number of votes.

Further, it is wrong to conclude that he represents majority. The reasons that there is more number of votes (put together) in favour of other two candidates.

It also happens that in certain instances a given data may have more than one modal value. If there is only one mode in a series, it is referred to uni-modal; if there are two modes, it is referred to as bi-modal, if there are three, it is termed as tri-modal and if there are more than three, it is called multi-modal series.

#### Calculation of Mode – Discrete Series:

In discrete series, identification of modal value is easy and immediate. The value, which has the highest frequency in the modal value.

Family Size	No. of Families
2	10
3	15
4	25
5	08
6	09
7	04
8	03

For Ex.:

Family size 4 is the modal value as it has the maximum concentration.

#### Calculation of Mode – Continuous Series:

From the following data regarding the annual income of 100 families, find out the average income by means of Mode:

Annual Income (in Thousands)	No. of Families
10 – 20	08
20 – 30	10
30 – 40	12
40 – 50	25
50 – 60	16
60 – 70	15
70 – 80	09
80 – 90	04
	100

In this case, the highest frequency is 25. The modal group can be located as 40 – 50. But mode should always be a single figure and not a group.

The actual mode lies in the group of 40 – 50. This needs to be located by the process of interpolation according to frequencies before and after the modal group.

The formula generally used to locate mode is as follows:

$$Z = l_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

- $Z$  : Mode  
 $l_1$  : Lower limit of the modal group.  
 $f_1$  : Frequency of the modal group.  
 $f_0$  : Frequency of the group prior to modal group.  
 $f_2$  : Frequency of the group.  
 $i$  : Class interval

$$Z = 40 + \frac{25 - 12}{2 \times 25 - 12 - 16} \times 10$$

$$Z = 40 + \frac{13}{50 - 12 - 16} \times 10$$

$$Z = 40 + \frac{13}{22} \times 10$$

$$Z = 40 + 5.91$$

$$Z = 45.91$$

#### Merits of Mode:

Mode is an inspectional value, which represents the majority of cases. It can be ascertained without much mathematical calculations.

The point of maximum concentration is of prime importance in identifying mode. Further, it is not essential to know all the items in a series. The reason is that extreme item will have only less concentration of items. Hence, Mode is not affected by extreme values of a series.

Mode can be applied to both qualitative and quantitative data.

#### Limitations:

Mode is a locative and not a computed average. Mode becomes less useful if a series has more than one mode.

It cannot be rightly called representative as it is not based on all items of a series.

Often it requires grouping; which is a time consuming process.

The product of number of items and the mode does not give the correct total.

#### 17.5. Summary:

The numerical descriptions that can adequately describe the large numbers around a central value are known as measures of central tendency or average. An average is the centre of gravity of the raw data or mass information.

An average is a single value that represents a group of values. Since the average represents the entire data, its value lies somewhere in between the two extremes, i.e., the largest and the



smallest items. For this reason, an average is frequently referred to as a measure of central tendency.

The generally used types of averages are

- a) Arithmetic Mean
- b) Median
- c) Mode
- d) Geometric Mean
- e) Harmonic Mean.

Of all the types of averages, arithmetic mean is the most popular and suitable form of average. The arithmetic average is determined by adding up the quantities of each unit in a distribution and then dividing by the number of units. Median represents the midpoint in a distribution of ordered data. It is entirely a positional average. Mode represents the most frequent value in a distribution. Arithmetic mean is preferred to other measures because of less sampling fluctuations.

#### 17.6. Key words:

**Mean:** The arithmetic average is determined by adding up the quantities of each unit in a distribution and then dividing by the number of units.

**Median :** It is a measure of central tendency that represents the mid-point in a distribution of ordered data. Median is entirely an positional average.

**Mode:** A measure of central tendency that represents the most frequent value in a distribution. It is the most frequently occurring score in a set of scores.

#### References:

Blalock, H.M. Social Statistics, McGraw-Hill, New York, 1972

Coolidge, Frederick L: Statistics: A Gentle Introduction, Sage Publications, New Delhi

Jefferies, J and Diamons, I: Beginning Statistics: An Introduction for Social Scientists, Sage Publication, New Delhi, 2000.

4) Young, Pauline.V: Scientific Social Surveys and Research, Prentice-Hall of India Pvt Ltd., New Delhi, 1998.

5) Gupta.S.P. 1984, Statistical Methods. Sultanchand and sons, New Delhi, 2004.

#### 17.7. Exercises:

1) What is meant by Measures of Central Tendency?

2) The wages earned by 80 workers are shown in tabular form. Compute the Arithmetic Mean

Marks	No. of Students
50 – 60	04
60 – 70	12
70 – 80	10
80 – 90	18

90 – 100	13
100 – 110	08
110 – 120	15
<b>Total</b>	<b>80</b>

4) Compute Median for the following data

<b>Class (Performance Score)</b>	<b>No. of Persons</b>
00 – 10	10
10 – 20	15
20 – 30	18
30 – 40	43
40 – 50	56
50 – 60	38
<b>Total</b>	<b>180</b>

#### 17.8. References:

- 1) Blalock, H.M. Social Statistics, McGraw-Hill, New York, 1972
- 2) Coolidge, Frederick L: Statistics: A Gentle Introduction, Sage Publications, New Delhi
- 3) Gupta.S.P. 1984, Statistical Methods. Sultanchand and Sons, New Delhi, 2004.
- 4) Jefferies, J and Diamons, I: Beginning Statistics: An Introduction for Social Scientists, Sage Publication, New Delhi, 2000.
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**Prof. M.Lakshmipathi Raju**

**Lesson-18****MEASURES OF DISPERSION****18.0. Objectives:**

The objective of this lesson is to provide an understanding of the importance, merits and demerits of measures of dispersion and also the method to compute the same.

**Contents:****18.1. Introduction****18.2. Importance of Dispersion****18.3. Measures of Dispersion****18.4. Range****i) Introduction****ii) Merits****iii) Limitations****18.5. Mean Deviation****i) Introduction****ii) Illustrations****iii) Merits****iv) Limitations****18.6. Standard Deviation****i) Introduction****ii) Illustrations****iii) Merits****18.7. Summary****18.8. Key words****18.9. Exercises****18.10. References****18.1. Introduction:**

The average, however, carefully and accurately computed, fails to give a complete picture of whole data. It only gives a measure of central tendency, but fails to give the distribution or dispersion of items inside the group. The selection of a mean that is taken as a representative of a group of items implies a measurable degree of variability. Some of the items may be smaller while others may be larger than the central tendency though a majority usually clusters around it.

Measures of dispersion or variability refer to the study of scattering of items around an average. It is the study of the spread or dispersion of scores in a distribution.

What is more important to know is how representative is the mean? In other words, how much numerically, do the items spread around the mean? It so happens that describing a situation on the basis of a measure of central tendency yield misleading results.

For ex. The table mentioned below indicates the income of persons of three different groups.

Group I	Group II	Group III
Rs. 20000	Rs. 24000	Rs. 15000=
Rs. 22000	Rs. 24000	Rs. 28000
Rs. 24000	Rs. 24000	Rs. 31000
Rs. 26000	Rs. 24000	Rs. 38000
Rs. 28000	Rs. 24000	Rs. 08000
Rs. 120000	Rs. 120000	Rs.120000

Arithmetic mean:

$$\frac{120000}{5} = 24000 \quad \frac{120000}{5} = 24000 \quad \frac{120000}{5} = 24000$$

The arithmetic mean is same for all the groups. The median is also the same for group I and II. On the basis of the average income, it would be wrong to conclude that the data of all the three groups are similar. A close observation of data of all the three groups indicates that in group II all figures are equal to the arithmetic average and hence there is no variation between the average and each item in the group. There is no variability. In group I two items are smaller than the arithmetic average, while two are greater than the arithmetic average. It can be mentioned that the items are spread over or scattered on each side of the central value. In group III a wide gap is found between the average income and the individual income and infact no income is represented by the average income and the variation is much keenly felt compared to group I and II.

We can infer from the above illustration that differences between the average and the individual items are different in different groups of data. Measures of central tendency will not reveal this vital information. We need some other method to explain this. Measures of Dispersion or Variation fill-up this gap. They are the refined statistical summaries throwing light on the variation of items from one another and from a mean.

In addition to measure of central tendency, we have also to find a measure of variability, degree of deviation from the central tendency or scattering of items within the group. This measurement is known as Dispersion in statistical terminology.

Dispersion has generally been called the average of second order.

### 18.2. Importance of Dispersion:

Measures of Dispersion are important in testing the reliability of the measures of central tendency. They are also important in comparing two or more series on the basis of their variability and deciding the consistency of performance.

A measure of dispersion shows the degree of uniformity of items. If the dispersion is small, it indicates high uniformity of items in the distribution. On the other hand, a large dispersion shows little uniformity.

The following conditions should be followed in finding out measures of dispersion.  
It should be based on all the observations.  
It should be readily comprehensible.

It should be easy to calculate.

It should not grossly be affected by fluctuations of sampling.

It should be amenable to mathematical treatment.

### 18.3. Measures of Dispersion:

Dispersion may be measured by any one of the following:

a) Range      b) Inter-quartile Range or Semi-quartile Range or Quartile Deviation. c) Mean Deviation d) Standard Deviation e) Lorenz Curve.

While the first two are based on the limits; the third and fourth are based on differences and the fifth may be termed as a graphic measure.

### 18.4. Range:

The simplest measure of dispersion is the range. It is defined as the differences between the highest and the lowest measurement in the distribution.

In symbols: Range:  $L - S$ , where

'L' refers to the largest value and 'S' refers to the smallest value.

It is to be noted that larger the range, the greater is the variability of values in the given data, or individual values are more widely spread from the mean.

When we have to compare the range of two groups we have to find what is known as relative measure of Range or Coefficient of Range.

Symbolically the formula is Coefficient of Range =  $\frac{L - S}{L + S}$

For grouped data, the difference between the lower class limit of the lowest class and the upper class limit of the highest class is considered as Range.

#### Merits

Subtracting the lowest value from the highest value is so simple that even an inexperienced person will obtain quick and accurate results.

#### Demerits

The range completely depends on the two extreme values. The highest and the lowest values in the distribution determine the range, and all other values absolutely have no influence.

The dependence of the range on the two extreme values makes it a very unstable measure. The presence or absence of a single extreme score can exercise a marked influence on the range.

### 18.5. Mean Deviation:

The measures, which consider the whole data and the formation of items, but minimize the influence of extreme items, are considered necessary. Such measures are Mean or Average Deviation and Standard Deviation.

Mean Deviation is the arithmetic average of the deviation of each item value from any average. It is a mathematically calculated average and takes into consideration all the item values of the group. The deviation of every item from the average value is taken. The arithmetic average of all these deviations is the Mean Deviation.

Mean Deviation may be defined as the arithmetic mean of all deviations from the mean, median or mode. Any average - mean, mode or median - may be selected for the purpose of computing deviation but median is generally preferred for the reason that the sum of the deviations of items from median (ignoring + or - signs) is minimum.

$$\text{Calculation of Mean Deviation} = \frac{\sum |d|}{n}$$

Where  $|d|$  refers to the deviation from median disregarding signs (+ or -)

**Procedure:**

Calculate the median of the series.

Take deviations of various items from median disregarding signs and summate the deviations =  $\sum |d|$

Divide the sum i.e.  $\sum |d|$  by the number of items

Coefficient of Mean Deviation can be obtained by dividing Mean Deviation with the particular average selected in calculating deviations.

$$\text{Coefficient of Mean Deviation} = \frac{\text{Mean Deviation}}{\text{Median/Mode/Mean - whichever is used}}$$

**Calculation of Mean Deviation – Individual Observations**

**Procedure**

Calculate the Median of the series.

Take deviations of various items from Median disregarding signs and summate the deviations  $\sum |d|$

Divide the sum i.e.,  $\sum |d|$  by the number of items.

Coefficient of Mean Deviation can be obtained by dividing the Mean Deviation with the particular average selected in calculating deviations.

$$\text{Coefficient of Mean Deviation} = \frac{\text{Mean Deviation}}{\text{Mean / Median / Mode - what ever is used}}$$

**Illustration: Calculate Mean Deviation for the following Data**

Income of 10 families (in Rs.) : 15,000/-, 20,000/-, 12,000/-, 25,000/-, 30,000/-, 27,000/-, 16,000/-, 18,000/-, 23,000/-, 26,000/-.

Solution :

For finding out Median, arrange the data either in ascending or descending order

Income of families	Positive deviation from Median (21,500) disregarding signs /d/
12,000	9,500
15,000	6,500
16,000	5,500
18,000	3,500
20,000	1,500
23,000	1,500
25,000	3,500
26,000	4,500
27,000	5,500
30,000	8,500
	£ /d/ = 50,000

$$\begin{aligned} \text{Median} &= \text{Size of } \frac{N + 1}{2} \text{ th item} \\ &= \frac{10 + 1}{2} \\ \text{Median} &= \text{Size of } \frac{11}{2} = 5.5^{\text{th}} \text{ item} \end{aligned}$$

$$\begin{aligned} 5.5^{\text{th}} \text{ item means} &= \frac{5^{\text{th}} \text{ item} + 6^{\text{th}} \text{ item}}{2} \\ &= \frac{20,000 + 23,000}{2} \\ &= \frac{43,000}{2} = 21,500 \end{aligned}$$

$$\begin{aligned} \text{Mean Deviation from Median} &= \frac{\sum d}{n} \\ &= \frac{50,000}{10} \\ &= 5,000 \end{aligned}$$

$$\begin{aligned} \text{Coefficient of Mean Deviation} &= \frac{\text{Mean Deviation}}{\text{Median}} \\ &= \frac{5,000}{21,500} \\ &= 0.233 \end{aligned}$$

Calculation of Mean Deviation – Discrete Series

Steps

Calculate the Median of the series.

Take deviations of the items from Median ignoring the signs and denote them by /d/

Multiply these deviations by the respective frequencies and obtain the total  $\Sigma f /d/$

Divide the total obtained in step 2 by the observations. This gives us the value of Mean Deviation.

Illustration: Calculate Mean Deviation and its Coefficient for the following Data

Family Size (x)	No. of Families (N)
02	20
03	32
04	48
05	28
06	22
07	15
08	14
09	10
10	11
	200

Solution:

Family Size(x)	No. of Families(f) (N)	Cumulative Frequency (cf)	Positive Deviation from Median (/d/)X – M f /d/
02	20	20	3
03	32	52	2
04	48	100	1
05	28	128	0
06	22	150	1
07	15	165	2
08	14	179	3
09	10	189	4
10	11	200	5
	200		$\Sigma f /d/ 361$

$$\begin{aligned} \text{Median} &= \text{Size of } \frac{N + 1}{2} \text{ th item} \\ &= \text{Size of } \frac{200 + 1}{2} \text{ th item} \\ &= \frac{201}{2} \text{ th item} \\ &= 100.5^{\text{th}} \text{ item} \end{aligned}$$

Size of 100.5<sup>th</sup> item is Median: 5

(see in cumulative frequency column the figure either equal to 100.5<sup>th</sup> item, or next higher (128) in case equal figure is not there and the corresponding size is the median)



$$\begin{aligned} \text{Mean Deviation from Mean} &= \frac{\sum f/d}{N} \\ &= \frac{361}{200} \\ &= 1.805 \end{aligned}$$

$$\begin{aligned} \text{Coefficient of Mean Deviation} &= \frac{\text{Mean Deviation}}{\text{Median}} \\ &= \frac{1.805}{5} \\ &= 0.361 \end{aligned}$$

#### Calculation of Mean Deviation – Continuous Series

Illustration: Calculate Median and Mean Deviation for the following data

Size	f(N)
00 – 10	07
10 – 20	12
20 – 30	18
30 – 40	25
40 – 50	16
50 – 60	14
60 – 70	08

Solution:

Size	f(N)	Cumulative Frequency	mid-point m	m – Median	D
00 – 10	07	07	05	30.2	211.4
10 – 20	12	019	15	20.2	242.4
20 – 30	18	037	25	10.2	183.6
30 – 40	25	062	35	00.2	005.0
40 – 50	16	078	45	09.8	156.8
50 – 60	14	092	55	19.8	277.2
60 – 70	08	100	65	29.8	238.4
					∑ f / D / : 1314.8

$$\begin{aligned} \text{Median} &= \text{Size of } \frac{N}{2} \text{ th item} \\ &= \frac{100}{2} \text{ th item} \\ &= 50^{\text{th}} \text{ item} \end{aligned}$$

50<sup>th</sup> item (see cumulative frequency) lies in the class of 30 – 40

$$\text{Median} = L + \frac{N/2 - cf}{f} \times i$$

L : Lower limit of Median Group

N/2 : Median item

cf : Cumulative frequency of the group preceding the median group

i : Class interval

$$\begin{aligned} \text{Median} &= 30 + \frac{50 - 37}{25} \times 10 \\ &= 30 + \frac{13}{25} \times 10 \\ &= 30 + \frac{130}{25} \end{aligned}$$

$$= 30 + 5.2$$

$$= 35.2$$

$$\begin{aligned} \text{Mean Deviation} &= \frac{\sum f D}{N} \\ &= \frac{1314.8}{100} \end{aligned}$$

$$= 13.148$$

$$\begin{aligned} \text{Coefficient of Mean Deviation} &= \frac{\text{Mean Deviation}}{\text{Median}} \\ &= \frac{13.148}{35.2} \end{aligned}$$

$$= 0.3735$$

#### Mean Deviation - Merits

By showing the variations of every item in the distribution, the Mean Deviation is superior to Range.

It is a computed measure, as it is based on all the items of the series.

It can be computed from any measure of central tendency and as such is flexible too.

It is not distributed by the values of extreme items (the extreme values affect the range).

#### Mean Deviation – Limitations

Neglecting the signs of the deviations and expressing all deviations as positive, can not mathematically be justified.

It is not suitable for further mathematical processing.

On the basis of above mentioned limitations, the use of Mean Deviation is limited to academics only, and it has less practical value. Hence, Standard Deviation is generally preferred over Mean Deviation, as a measure of Dispersion.

### 18.6. STANDARD DEVIATION

Standard Deviation is a prominent member of the family of measures of dispersion. It is considered an excellent measure of variability.

Mean Deviation, though, mathematically more accurate than range, has its own limitations. It ignores the plus and minus signs in the computation of deviation. In order to overcome this drawback, another method known as Standard Deviation is used. Standard Deviation is termed so as it provides a standard unit for measuring the distance of various scores from their mean.

The chief objective of Standard Deviation is to overcome the zero total i.e.  $\Sigma (X - X)$ . Instead of ignoring the signs as in the calculation of Mean Deviation, all deviations are considered positive by squaring them. Standard Deviation is the square root of the mean of deviations squared. It is denoted by the small Greek letter Sigma ( $\sigma$ ).

In computing Standard Deviation, the deviations are always taken from the arithmetic mean, whereas in computing Mean Deviation, the deviations may be taken from the median also.

#### Calculation of Standard Deviation – Individual Observation

Procedure:

Calculate arithmetic mean.

Note down differences of various items from the arithmetic mean  $(X - \bar{X}) = d$

Square the deviations and take the total of squared deviations:  $\Sigma d^2$

Divide the total by the number of observations. The square root of the quotient is the Standard Deviation.

Illustration: The scores obtained by 10 persons in a training programme are stated below: Calculate the Standard Deviation.

Sl. No.	Training Score (X)
1	43
2	48
3	65
4	57
5	31
6	60
7	37
8	48
9	78
10	59
	$\Sigma X : 526$

Solution:

Sl. No.	Training Score (x)	d (X - X)	d <sup>2</sup>
1	43	-09.6	092.16
2	48	-04.6	021.16
3	65	+12.4	153.76
4	57	+04.4	019.36
5	31	-21.6	466.56
6	60	+07.4	054.76
7	37	-15.6	243.36
8	48	-04.6	021.16
9	78	+25.4	645.16
10	59	+06.4	040.96
	Σx : 526		Σd <sup>2</sup> : 1758.40

$$\begin{aligned} \text{Mean} &= \frac{\Sigma X}{N} \\ &= \frac{526}{10} \\ &= 52.6 \end{aligned}$$

$$\begin{aligned} \text{SD} &= \frac{\Sigma d^2}{N} \\ \text{SD} &= \frac{1758.40}{10} \\ \text{SD} &= 13.26 \end{aligned}$$

Standard Deviation is the square root of variance. In the above case, the variance can be calculated by using the formula :

$$\text{Variance} = \frac{\Sigma d^2}{N} = \frac{1758.40}{10} = 175.84$$

$$\text{SD} = \sqrt{\text{Variance}}$$

$$\begin{aligned} \text{SD} &= \sqrt{175.84} \\ &= 13.26 \end{aligned}$$

#### Calculation of Standard Deviation – Discrete Series

When actual Mean method is applied, deviations are taken from the actual mean i.e., we find (X - X) and denote these deviations by dx. These deviations are squared and multiplied by the respective frequencies. The following formula is applied :

$$\text{SD} = \frac{\Sigma f dx^2}{N} \quad (\text{where } dx \text{ is } X - X)$$

Illustration: Calculate the Standard Deviation from the data given below

X :	5	15	25	35	45	55	65	75
f :	3	7	9	23	15	8	6	4

X	f	fx	dx (deviation from X)Mean:39.4	dx <sup>2</sup>	f dx <sup>2</sup>
05	03	015	- 34.4	1183.36	3550.08
15	07	105	- 24.4	0595.36	4167.52
25	09	225	- 14.4	0207.36	1866.24
35	23	805	- 04.4	0019.36	0445.28
45	15	675	+ 05.6	0031.36	0470.40
55	08	440	+ 15.6	0243.36	1946.88
65	06	390	+ 25.6	0655.36	3932.16
75	04	300	+ 35.6	1267.36	5069.44
	75	2955			21448.00

$$\begin{aligned} \text{Mean} &= \frac{\sum fx}{N} \\ &= \frac{2955}{75} \\ &= 39.4 \end{aligned}$$

$$\text{SD} = \frac{\sum f dx^2}{N}$$

$$\begin{aligned} \text{SD} &= \frac{21448}{75} \\ &= 16.91 \end{aligned}$$

Calculation of Standard Deviation – Continuous Series

The only difference in the procedure of calculation of Standard Deviation is to find the mid-value of the various classes.

Procedure: step-deviation method is most commonly used.

Find the mid-value of various classes.

Record the deviations of the mid-values and divide each deviation from an assumed average, by either the class-interval or the common factor

$$d = \frac{(X - A)}{C}$$

Multiply the frequencies of each class with these deviations and obtain  $\sum fd$ .

Square the deviations and multiply them with the respective frequencies and get the total  $\sum fd^2$ .

Use the formula :

$$\text{SD} = \frac{\sum fd^2}{N} - \left( \frac{\sum fd}{N} \right)^2 \times C$$

Illustration: Calculate the Standard Deviation from the data given below

Age Group	No. of Persons (f)
00 – 10	18
10 – 20	16
20 – 30	15
30 – 40	12
40 – 50	10
50 – 60	07
60 – 70	03
70 – 80	01

Solution : Step I

Age Group	Mid-value(X)	d = X - A C	f (or N)	fd	fd <sup>2</sup>
00 – 10	05	-3	18	-54	162
10 – 20	15	-2	16	-32	064
20 – 30	25	-1	15	-15	015
30 – 40	35	0	12	00	000
40 – 50	45	+1	10	10	010
50 – 60	55	+2	07	14	028
60 – 70	65	+3	03	09	027
70 – 80	75	+4	01	04	016
			N : 82	£fd : -64	£fd <sup>2</sup> : 322

Step II

Assumed Average (A): 35, Class-interval: 10

(The assumed mean should be as nearer to the actual mean as possible to minimize calculations)

$$\text{Arithmetic Mean} = A + \frac{\sum fd}{N} \times C$$

$$= 35 + \frac{-64}{82} \times 10$$

$$= 35 + -7.804$$

$$= 27.196$$

Step III

$$\text{SD} = \sqrt{\frac{\sum fd^2}{N} - \left(\frac{\sum fd}{N}\right)^2 \times C}$$

$$= \sqrt{\frac{322}{82} - \left(\frac{-64}{82}\right)^2 \times 10}$$

$$= \sqrt{3.927 - (-0.780)^2 \times 10}$$

$$= \sqrt{3.927 - 0.608 \times 10}$$

$$= \sqrt{1.8218 \times 10}$$

$$= \sqrt{18.22}$$

**Standard Deviation – Merits**

The computation of Standard Deviation takes into consideration all observations of the series.

It is less affected by fluctuations of sampling and hence stable.

Mathematically, the Standard Deviation is more appropriate than Mean Deviation. The negative signs are removed by squaring the Deviations rather than ignoring the signs as is done in computing Mean Deviation.

Standard Deviation is suitable for further mathematical processing.

**18.7. Summary:**

Measures of Dispersion refer to the study of scattering of items around an average. It is the study of the spread or dispersion of scores in a distribution.

An important concept in Statistics is Variability or Dispersion. The mean, mode and median give only one essential characteristic of a frequency distribution - its typical size or central tendency.

In some distributions, the cases may cluster very closely around the average, and in others, they may be widely scattered. It is important to determine the spread of the individual values on either side of their central tendency.

The important Measures of Dispersion are

The Range

The Mean Deviation

The Standard Deviation and

The Inter-quartile Range or Semi-quartile Range or Quartile Deviation.

The simplest measure of variability is the range. A range is the difference between the highest score and the lowest score in a distribution.

The mean deviation is the mean of the sum of the deviations (irrespective of signs) from some measure of central tendency. In actual practice, it is found that the mean deviation is of little value and very seldom in use in social research.

Standard Deviation is the square root the mean of deviations squared. Standard Deviation is based on all deviations of a series. It is less affected by fluctuations of sampling and hence stable. Standard Deviation is more appropriate mathematically than Mean Deviation.

**18.8. Key words:**

**Mean Deviation:** the Mean Deviation is also known as the average deviation. It is the average difference between the items in a distribution and the median or mean of that series.

**Range:** The simplest measure of variability is the range. A range is the difference between the highest score and the lowest score in a distribution.

**Standard Deviation:** An index of the average deviation of a set of scores from the centre of the distribution.

**18.9. Exercises:**

1. Outline the measures of Dispersion.
2. Bring out the merits and limitations of Mean Deviation.
3. Calculate Standard Deviation from the following table.

X :	5	10	15	20	25	30	35	40
f :	5	9	11	25	17	10	8	15

**18.10. References:**

- 1) Bajpai, S. R: Methods of Social Survey and Research, Kitab Ghar, Kanpur.
- 2) Goode W.J and Hatt P.K: Methods in Social Research, McGraw-Hill, New York, 1962
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## Lesson-19

## COEFFICIENT OF CORRELATION AND CHI-SQUARE

### 19.0. Objectives:

The objective of this lesson is to introduce the students to the techniques of correlation, and Chi-Square.

### Contents:

- 19.1. Introduction
- 19.2. Definition and Meaning
- 19.3. Positive and negative correlation
- 19.4. Guidelines
- 19.5. Karl Pearson's Coefficient of Correlation- Illustration
- 19.6. Rank-difference method of Correlation - Illustration
- 19.7. Chi-Square test
  - i) Introduction
  - ii) Illustrations
- 19.8. Summary
- 9.9 Key words
- 9.10 Exercises
- 9.11 Reference Books

### 19.1. Introduction:

In Social Work Research, we often wish to know the relation among different variables with one another in the data. In other words, we are interested in ascertaining whether a change in one variable is associated with variation in another variable. The most frequently used measure of estimating association among variables is the Coefficient of Correlation ( $r$ ). Karl Pearson introduced the technique. Coefficient of Correlation is calculated to identify the extent or degree of correlation between two variables.

### 19.2. Definition and Meaning:

Whenever two measurements for the same individual can be paired for all the individuals in a group, the degree of relationship between the paired scores is called correlation.

A coefficient of correlation is a single number that tells us to what extent two variables or things are related and to what extent variations in one variable go with variations with the other.

An increase in one phenomenon is accompanied by a similar or opposite change in the other phenomenon. Such relationship is technically called correlation. Correlation means that between two series or groups of data there exists a casual connection. Correlation is said to be established when a change in one series is followed by change in the other series.

Correlation in two sets of data need not always be the result of mutual interdependence. Changes in one set of data may be cause of changes in the other set (of data) and there may be

cause and effect relationship between the two sets. But it is also equally possible that the changes in the two sets of data are the effects of some third factor, which affects both these sets of data.

Correlation does not imply causation. When we find that two variables are strongly correlated with one another, it is tempting to presume that one factor causes the other. Just because two factors occur together does not mean that one causes the other.

### 19.3. Positive and Negative Correlation:

Positive Correlation means that one variable tends to increase together with another variable, whereas negative correlation means that one variable decreases as the other one increased. The strength of a Correlation is measured using values between -1 and +1. A score of zero means that there is no relationship.

If two phenomenon change in the same direction, the Correlation is said to be positive.

Ex. Higher IQ score and higher level of performance.

Higher level medical problems and higher level of expenditure.

When two phenomenon change in the opposite direction, it is said to be negative Correlation.

Ex. Large size family and low standard of living.

Better healthcare facilities and lesser levels of morbidity.

Correlation may be marked or slight or may be zero. What is more important is the measurement of degree of correlation.

The commonly followed methods of Correlation are  
Karl Pearson's Coefficient of Correlation.  
Spearman's Correlation Coefficient

### 19.4. Guidelines

A Correlation must be as a rule is judged with regard to..  
The nature of variables under study  
The statistical significance of the coefficient  
The degree of reliability of the tests used  
The purpose for which 'r' has been computed and  
The extent of variability of the group.

### 19.5. Illustration:

The IQ scores of 10 mothers and their daughters are shown below. Compute Karl Pearson's Coefficient of Correlation value and explain the result:

IQ of Mothers    IQ of Daughters  
X                    Y

135	125
128	126
115	120
122	125
100	110
110	120
118	125
120	130
132	140
130	135

Solution:

IQ of Mothers		IQ of Daughters		
X	X <sup>2</sup>	Y	Y <sup>2</sup>	XY
135	18225	125	15625	16875
128	16384	126	15876	16128
115	13225	120	14400	13800
122	14884	125	15625	15250
100	10000	110	12100	11000
110	12100	120	14400	13200
118	13924	125	15625	14750
120	14400	130	16900	15600
132	17424	140	19600	18480
130	16900	135	18225	17550
1210	147466	1256	158376	152633

$$r = \frac{N \sum xy - (\sum x)(\sum y)}{[\sum x^2 - (\sum x)^2] [\sum y^2 - (\sum y)^2]}$$

$$r = \frac{10 \times 152633 - (1210)(1256)}{[10 \times 147466 - (1210)^2] [10 \times 158376 - (1256)^2]}$$

$$r = \frac{1526330 - 1519760}{[1474660 - 1464100] [1583760 - 1577536]}$$

$$r = \frac{6570}{10560 \times 6224}$$

$$r = \frac{6570}{65725440}$$

$$r = \frac{6570}{8107.12}$$

$$r = 0.810$$

Very high correlation is noticed between the IQ of Mothers and IQ of their daughters.

### 19.6. Rank – Difference Method of Correlation (Spearman's Rank Correlation Co-efficient)

When the direct qualitative measurement of the phenomena under study is not possible, for example honesty, efficiency, performance, Rank-difference Method of Correlation is applied for finding out the degree of Correlation. The formula for computing Rank Correlation is:

$$R = 1 - \frac{6 \sum D^2}{N(N^2 - 1)}$$

Where,

R denotes Coefficient of Rank Correlation

D denotes the difference between the paired ranks, and

N stands for the number of pairs.

Illustration: The efficiency of ten workers has been assessed by two different supervisors. The ranking given by the two supervisors for each worker is shown below. Compute Rank-difference Method of Correlation and explain the result.

Name of the Workers	Rank by Supervisor 'A'	Rank by Supervisor 'B'
A	3	4
B	9	7
C	6	6
D	5	8
E	1	1
F	2	3
G	4	2
H	7	5
I	8	10
J	10	9

Solution:

Name of the Workers	Rank by Supervisor A (R1)	Rank by Supervisor B (R2)	Difference D = R1 - R2	D <sup>2</sup>
A	3	4	-1	1
B	9	7	2	4
C	6	6	0	0
D	5	8	-3	9
E	1	1	0	0
F	2	3	-1	1
G	4	2	2	4
H	7	5	2	4
I	8	10	-2	4
J	10	9	1	1
				$\sum D^2: 28$

$$R = 1 - \frac{6 \sum D^2}{N(N^2 - 1)}$$

$$R = 1 - \frac{6 \times 28}{10(10^2 - 1)}$$

$$R = 1 - \frac{168}{10(100 - 1)}$$

$$R = 1 - \frac{168}{10 \times 99}$$

$$R = 1 - \frac{168}{990}$$

$$R = 1 - 0.169$$

$$R = 0.831$$

A high positive correlation is found between the rankings given by two supervisors

Note: When actual data are given and not the ranks, the ranks are to be assigned. Ranks are to be assigned either by taking the highest value as 1 or the lowest value as 1. But whether we start with the lowest value or the highest value, we must follow the same method in case of both the variables.

### 19.7. CHI-SQUARE TEST:

#### Introduction:

The  $\chi^2$  test (pronounced as chi-square test) is one of the simplest and most widely used non-parametric test in statistical work. The quantity  $\chi^2$  describes the magnitude of the discrepancy between theory and observation.

It is defined as 
$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Karl Pearson who for the first time gave the nature of chi-square distribution introduced the concept of chi-square and its application to the theory of statistical inference. Chi-square technique is perhaps the most suitable test to compare the obtained set of observed frequencies in given categories with a set of expected frequencies occurring within them.

Chi-square test provides us with a method to evaluate whether or not frequencies, which have been empirically observed, differ significantly from those, which would be expected under a certain set of theoretical assumptions.

Chi-square is used to evaluate whether the difference between observed and expected frequencies is due to some other reason and as such significant or whether the difference is due to sampling fluctuations and as such insignificant.

A null hypotheses, usually although not always, states that there is no difference between several groups or no relationship between variables. Whereas, a research hypotheses may predict either a positive or negative relationship.

The value of chi-square is always positive. Chi-square is based on the squares of the deviations  $(O - E)^2$  and hence does not take the direction of the distribution into account. This is a limitation of chi-square. The value of  $\chi^2$  ranges from '0' to infinite.

Usually the value of chi-square at 0.05 or 0.01 levels of significance from the given degrees of freedom is seen from the table and is compared with observed value of chi-square. If the observed value of  $X^2$  is more than table value at 0.05, it means that the difference is significant.

Steps:

State a null hypothesis.

State the level of significance and the sample size (n).

Determine the critical region based on df and state the decision rule.

[Critical value of Chi-square will be found from the Chi-square table.]

Compute the value of chi-square by using the formula

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Take a decision to reject or not to reject the null hypothesis.

Illustration: A sample survey undertaken to assess the relationship between alcohol consumption and heart ailments reveals following facts.

Respondents	Heart Ailments		Total	
	Heart Ailments Noticed		No Heart Ailment	N
Persons who consume alcohol	138	62	200	
Persons who do not consume alcohol	82	118	200	
Total	220	180	400	

On the basis of the above data, would it be possible to conclude that alcohol consumption and heart ailments are independent. Apply Chi-square test and answer. Table value of  $\chi^2$  for df 1 at 5% level of significance is 3.841

Solution:

Null hypothesis: Alcohol consumption and heart ailments are independent.

O	E	(O - E)	(O - E) <sup>2</sup>	(O - E) <sup>2</sup> E
138	$\frac{220 \times 200}{400} = 110$	28	784	$\frac{784}{110} = 7.127$
82	$\frac{220 \times 200}{400} = 110$	28	784	$\frac{784}{110} = 7.127$
62	$\frac{180 \times 200}{400} = 90$	28	784	$\frac{784}{90} = 8.711$
118	$\frac{180 \times 200}{400} = 90$	28	784	$\frac{784}{90} = 8.711$
				$\chi^2: 31.676$

Total of rows x Total of columns  
Total N

Note: Expected frequency (E)=

$$\chi^2 = 31.676$$

$$df = (\text{rows} - 1 \times \text{columns} - 1)$$

$$= 2 - 1 \times 2 - 1$$

$$= 1 \times 1$$

$$= 1$$

Table value of Chi-square at 5% level for df 1: 3.841

In the above case, the calculated value (31.676) is more than the table value (3.841) and hence it can be inferred that there is a significant difference between alcohol consumption and heart ailment. Heart ailments are more frequently found among those who consume alcohol. The null hypothesis is not tenable. The alternate hypothesis is that heart ailments are more frequently found among those who consume alcohol.

Illustration: The preference of Urban and Rural candidates to different courses of three faculties is given below:

Place of Residence	Faculty Total		
	Arts	Science	Commerce / Management
Urban	145	135	425
Rural	155	140	445
Total	300	275	870

Table value of Chi-square for df 2 at 5% level of significance is 5.991

Solution:

Null Hypothesis: Place of residence of candidates and their preference to different courses of three faculties are independent.

O	E	(O - E)	(O - E) <sup>2</sup>	(O - E) <sup>2</sup> E
145	$300 \times \frac{425}{870}$ = 146.5	-1.5	2.25	$\frac{2.25}{146.5} = 0.015$
155	$300 \times \frac{445}{870}$ = 153.5	1.5	2.25	$\frac{2.25}{153.5} = 0.015$
135	$275 \times \frac{425}{870}$ = 134.4	0.6	0.36	$\frac{0.36}{134.4} = 0.003$
140	$275 \times \frac{445}{870}$ = 140.6	-0.6	0.36	$\frac{0.36}{140.6} = 0.003$
145	$295 \times \frac{425}{870}$ = 144.1	0.9	0.81	$\frac{0.81}{144.1} = 0.005$
150	$295 \times \frac{445}{870}$ = 150.9	-0.9	0.81	$\frac{0.81}{150.9} = 0.005$

$\chi^2: 0.046$

Note : Expected Frequency (E) =  $\frac{\text{Total of rows} \times \text{Total of columns}}{\text{Total N}}$

$$\chi^2 = 0.046$$

$$df = (\text{rows} - 1 \times \text{columns} - 1)$$

$$= 2 - 1 \times 3 - 1$$

$$= 1 \times 2$$

$$= 2$$

Table value of Chi-square at 5% level for df 2: 5.991

Table value is higher than the computed Chi-square value and hence the null hypothesis is tenable.

Place of residence of candidates and their preference to different courses are independent.

### 19.8. Summary:

The Coefficient of Correlation was introduced by Karl Pearson and is often referred to as Product-moment Correlation. Coefficient of Correlation refers to the numerical measure that indicates the relationship between two variables. Positive Correlation means that one variable tends to increase together with another variable. Negative Correlation means that one variable decreases as the other one increases. The strength of a Correlation is measured using value between  $-1$  and  $+1$ . A score of zero means that there is no relationship. Correlation does not imply causation.

Chi-square test is an inferential statistic testing the null hypothesis of independence between two variables. It is one of the simplest and most widely used non-parametric test.

The concept of df is of key importance in inferential statistics. Almost all tests of significance require the calculation of df.

The table values of Chi-square are available at various probability levels. These levels are called levels of significance. One can find out from the table, the value of chi-square at certain levels of significance. Usually, the value of Chi-square at 0.05 and 0.01 levels of significance from the given degrees of freedom (df) is seen from the table and is compared with observed value of Chi-square. If the observed value is more than the table value at 0.05 level, it means the difference is significant.

### 19.9. Key words:

- 1) **Inferential Statistics:** The branch of Statistics that uses data from samples to make predictions about the larger population from which the sample is drawn.
- 2) **Correlation Coefficient:** A numerical measure that indicates the relationship between two variables.
- 3) **Correlation:** When two variables tend to vary together, they are said to be correlated.

When they tend to increase and decrease together, the correlation is labeled positive. An example is the relationship between IQ and grades in school.

When one variable increases while the other decreases and vice versa, the correlation is said to be negative.

Although useful predictions can often be made on the basis of a substantial correlation, a correlation does not imply any kind of casual relationship. Variables may change together because both are causally related to a third variable.



4) Degree of Freedom (df): The concept of degrees of freedom (df) is of key importance in inferential statistics. Almost all tests of significance require the calculation of degrees of freedom.

Ex.:

Set I	Set II	
6	10	
4	12	can vary in any way
15	13	
12	0	
13	9	
50	50	

In set I original scores have been presented. We can vary the first four scores (1 – 4) in any way we like. But the value of the fifth score gets fixed due to the restriction that  $\Sigma X$  in each case must be 50. In this situation, the four scores out of five scores are free to vary, and hence, the degrees of freedom is  $5 - 1 = 4$ .

5) Level of significance: This serves as the cut-off point, or critical point along the probability scale, to separate the significant difference from the non-significant difference between two means or standard deviations. Generally the 0.05 and 0.01 levels of significance are the most popular in social science research. The confidence with which an experimenter rejects or retains a null hypothesis depends upon the level of significance otherwise called level of confidence.

Meaning	Level	Amount of Confidence
95 %		
0.01	99 %	

0.01 level is more significant and higher a standard as compared to the 0.05 level. Hence, if an obtained value of Chi-square is significant at 0.01 level, it is automatically significant at 0.05 level but the reverse is not always true.

#### 19.10. Exercises:

1. What is correlation? Explain the terms 'positive Correlation' and 'Negative Correlation'.
2. Elucidate on the uses of Chi-Square test in social work research.
3. Following are the marks obtained by MSW students in 'Social Work Research' and Dissertation. Compute Karl Pearson's Coefficient of Correlation value and explain the result:

Sl. No	Marks in Social Work Research X	Marks in Dissertation Y
1	70	72
2	65	66
3	80	76
4	70	72
5	60	65
6	49	52

7	60	63
8	70	65
9	68	70
10	72	75

**19.11. References:**

- 1) Bajpai, S. R: Methods of Social Survey and Research, Kitab Ghar, Kanpur.
- 2) Goode W.J and Hatt P.K: Methods in Social Research, McGraw-Hill, New York, 1962
- 3) Gupta, S.P: Stastical Methods, Sultanchand and Sons, New Delhi, 2004.
- 4) Kothari, C. R: Research Methodology - Methodology and Techniques, Wishwa Prakashan, New Delhi, 1990.
- 5) Young, Pauline V: Scientific Social Surveys and Research, Prentice-Hall of India Pvt Ltd, New Delhi, 1998.

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by data should be drawn. Interpretation requires insights into relationships between variables. An inexperienced researcher cannot arrive at real findings. Only an expert would easily detect these findings. Interpretation means drawing significant conclusions from the study as revealed by the data.

#### 6.11. Chapter scheme and report- writing:

The preparation of a chapter outline is necessary step in writing the rough draft. One should determine the number of chapters and the name of each chapter. The basis for chapter scheme is the objectives of the research problem. The first chapter is usually an introductory one and the last chapter is for the findings, conclusions and suggestions.

The findings are to be presented logically in the form of a report. The report should contain the statement of the problem, the research procedures and the findings of the study. The research report should be a scientific one. It is at the same time a great art. It must be readable as a good piece of literature.

#### 6.12. Budgeting: (Time- cost analysis)

It is necessary to estimate the time that would be required to complete the research work. We must have a break-up of the different periods. In each of these periods, various stages such as pre-testing, data collection, analysis, report-writing etc, could be completed.

Budgeting is a complicated one. It requires financial experience. The over all cost of the research project can be calculated. Expenditure involved in each of these stages may be calculated. Expenses on every single item should be estimated in advance. Agencies sponsoring research require detailed financial statement.

The Research design or plan of study will involve the above major steps and procedures. It involves various phases. It is the arrangement of conditions for collection and analysis of data. A research design specifies the methods and procedures for acquiring the information. A good research design will ensure that the information obtained is relevant to research. It helps the scholar for collecting the data objectively with economical procedures it is a blue print for the collection, measurement and analysis of data. A research design is not a highly specific plan to be followed without deviations. It provides guidelines to the researcher to proceed with his work in the right direction. It is a tentative plan. Sometimes it may become necessary to change the plan as circumstances demand. The plan is the overall scheme or programme of research.

Research design is a plan that specifies the sources and types of information relevant to the research. It is a strategy or blueprint specifying the approach for gathering and analyzing the data. Since most of the research studies have time and economic constraints, both time and cost budgets are included.

#### 6.13. Summary:

In preparing research design or plan of study, certain steps are involved. The title of the research proposal is to name the topic. Statement of problem includes determining objectives of the study, definition of concepts and formulation of hypothesis. Review of earlier research is necessary. The sources of information are to be tapped. Bibliography is to be prepared. One should ascertain the nature of the study. The objectives of the study will have to be specified. The cultural context of the persons is to be ascertained. The geographical areas to be covered are to be delimited. In historical studies the time dimension is to be determined. It is necessary to make certain assumptions. We have to define the population and select the sample. The methods of data collection include observation, interview, and questionnaire. It is necessary to establish reliability and validity. The process of analysis includes editing, coding and tabulation.

**Development of Bibliography:**

Bibliography is to be prepared after consultation of the available sources. The books, journals, articles referred by the scholar should be included in the Bibliography with the name of the author, title of the reference, publisher's name and the date of publication.

**Nature of the study:**

One should ascertain the nature of the study, whether it is a case study, statistical study, or experimental study or a combination of these types. The specific nature of the study is to be decided and prepare the research design accordingly.

**6.7. Defining the population, selecting the sample:**

Population here means the total group. It is the category to which findings of the study can be applied. We ultimately aim at the population in the study. The population may be a political party, the working class families in a given area, the retired teachers of a state, science graduates in a university and so on. If the total group is studied, it is called census study. When the total group is too large, only a sample is taken from it. The sample would represent the whole group. The selection of the sample will depend on the nature of the problem. It also depends on the requirements of sample theory. The sample may be random, purposive or stratified. The sample should be closely representative of the universe.

Margaret Hagood suggests the following criteria as a guide in the choice of a sample.

1. The sample must represent the universe (that is, it must be unbiased);
2. The sample must be of an adequate size to produce reliable results.
3. The sample must be designed in such a way as to be efficient.

**6.8. Methods of data collection:**

If the study requires information from secondary sources, the researcher should refer literature and documentation. If the study requires primary data, methods like observation, interview, questionnaire may be used. The methods of data collection depend on the nature of the study. There are different methods of observation which include 1) Participant and non-participant observation, 2. Controlled observation and Non-controlled observation. If the data is to be collected from a wider area, the questionnaire method may be used. If the data is to be collected from a limited area, interview schedule may be used. Sometimes two or more methods of data collection may be used in research.

**Reliability and validity of Instruments:**

In empirical studies it is necessary to establish reliability and validity of test instruments. Tests should provide consistent measurements. They should measure what is claimed for them. Primary sources are always preferred to secondary sources of data to get more reliability.

**6.9. Analysis of data:**

The process of analysis includes editing and coding. By coding we mean giving each item a symbolic number. Analysis also includes tabulation. By tabulation, we mean entering items in each category in the form of tables. We also calculate statistically the various measures such as averages, deviations, correlations etc.,

Basic outlines of the analysis should be determined in advance.

**6.10. Interpretation:**

Statistical measures are only mathematical conclusions of living realities. The living realities are expressed in the form of numerical symbols. Real findings of the study are hidden under statistical measurements. The researcher has to bring out these findings. Only the conclusions that are warranted

**6.3. Statement of the problem:**

The statement of the problem is not the same as the title of the thesis. It is an attempt to focus on a clear goal. It includes determining objectives of the study, definition of concepts, identification of variables and formulation of hypothesis.

**6.4. Objectives of the study:**

The objectives of the study will have to be specified for gathering data depending upon the nature of studies and goals to be attained. According to the objectives of the study, the hypotheses may be formulated and tested. The objectives of the study will guide the researcher in the proper direction to proceed with his work. They would also help the researcher to gather relevant data.

**Socio-cultural context of study:**

If the problem under study is relating to human beings, the socio-economic conditions, the cultural context of the persons, their behaviour patterns are to be ascertained. It is necessary to understand whether the persons are adhering or deviating from the norms of the society. Other wise, it is not possible to draw useful conclusions.

**Geographical areas to be covered:**

The geographical areas are to be delimited and the boundaries of the geographical areas to be covered under the study are to be specified in the research design.

**Time dimension of the study:**

In historical studies, the period of time or the time dimension is to be determined. The researcher will attribute the conclusions to the particular period under study.

**Dimensions of the study:**

In every study, it is necessary to make certain assumptions. These assumptions should be stated clearly. There may be some limitations for the study. These limitations should be mentioned clearly in the research design. Definition of the concepts is necessary for obtaining precision in research. Operational definition of the terms used in research and definition of new concepts become necessary for interpretation of the findings.

**6.5. Review of earlier literature:**

Before attempting to plan the study, reviewing of the literature in the area of research is a preliminary step. One should review the relevant books, articles theories, research studies connected with the problem chosen. It is necessary to examine how the problem under study relates to previous research studies. It is also necessary to show how his work differs with the existing literature. After going through the relevant works, one will get an insight into the problem.

**6.6. Sources of information to be tapped:**

The sources of information to be gathered will depend upon the problem and the type of his study. There are two types of sources i.e documentary and field sources. The field sources include the living persons who can give information about the problem, the social conditions and changes taking place in the society. Field sources are direct sources. Documentary sources are published and unpublished documents, reports, statistics, letters, diaries, etc., primary sources include data gathered at first hand. The census reports are primary sources for the people who collect it. The statistics based on census reports are secondary sources. Primary sources may be collected by direct observation, personal interview and other devices.

## Lesson- 6

## Steps in Research and Plan of study

### 6.0. Objectives

The objectives of this lesson are to explain the steps in research and plan of study.

### Contents:

- 6.1. Introduction
- 6.2. The Title
- 6.3. Statement of the problem
- 6.4. Objectives of the study
- 6.5. Review of earlier literature
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- 6.10. Interpretation
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- 6.15. Exercises.
- 6.16. Reference Books.

### 6.1. Introduction:

Planning involves deciding things in advance. In research plan, we have to make appropriate decisions regarding the nature of the study, objectives of the study, propositions to be tested, major concepts to be defined operationally, time and place of the study, period of the study, typology of the design, sources of data, the universe and the sample, methods and tools to be used for data collection, processing of the data, techniques of the analysis to be adopted, the type of the report to be prepared, the time and cost involved in the study. Thus the considerations which enter into making decisions regarding what, where, when, how much, by what means constitute a plan of study or a study design.

The steps in research or plan of study are the guidelines to be followed by the scholar. These steps are the different stages involved in the research process. If these steps are pre-planned and the research design is prepared in advance, the research work becomes easy. These steps give the right direction for the study. It economises the time and resources of the researcher. If these steps are planned in advance, it would facilitate the research work.

In preparing research design or plan of study, the following steps are involved.

### 6.2. The Title:

The title of the research proposal is to name the topic. The title should suggest the theme of the study. One should not use pompous words and include unscientific terms. The title should not be lengthy. The title should give sufficient information about the nature of the study.