UTKAL UNIVERSITY
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MASTER OF ARTS
IN SOCIOLOGY

SEMESTER-II

SOC-2.3: RESEARCH METHODOLOGY - II

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AUTHOR

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C.D.O.E

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SOC-2.3: RESEARCH METHODOLOGY-II
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SOC-2.3: RESEARCH METHODOLOGY-II

Content

Block-01 Application of Statistics in Social Research

Unit-01 Statistics in Social Research

Structure

1.1 Learning Objectives

After going through this unit, the learner will be able-

1. To know the application of statistics in social research

1.2 Introduction/ Assessment of Prior Knowledge

Social statistics is the use of statistics to study human behaviour and social environments. Social statistics data is information or knowledge on an individual, object or event.

1.3 Application of Statistics in social Research

In the field of social sciences, the researcher is faced with the problem of subjective and qualitative data relating to attitudes, values, skills, utility etc. Unless the qualitative data are quantified, they can neither be objectively measured nor be of scientific value. Although Cohen and Nagel are of the opinion that propositions affirming qualitative, differences are the first fruits of enquiry in sciences, in real terms it is not enough to cognize only the qualitative differences in day- to-day affairs or in sciences. Rather it becomes essential to know the magnitude of such differences accurately and exactly. This will enable the researcher to discover comprehensive principles, to have practical control over the subject and to formulate laws, which can make confirmation or refutation in an unambiguous and clear manner.

Due to theoretical and practical reasons, it is essential that the qualitative differences are to be substituted by the quantitative distinctions. The researcher should have sufficient knowledge regarding such substitution and should be able to cognize the leaning and justification. In order to avoid absurdity and errors, while indicating the qualitative distinction, the researcher should be capable of examining the use of numbers in a careful manner. However, while dealing with simple matters of our day to day life as well as in the field of different branches of science, the Searcher may not take recourse to complicated methods for showing the distinctions. Although it may so happen that a bare common sense method serves the purpose of measurement, calculation, and the often difficult deduction of consequences from premises, sometimes we use the more elaborate and intricate technique for collection and estimation of evidence. However, in the field of social research the investigators not only make the statistical and quantitative analysis, but also use the qualitative techniques. When the situation so demands and where it becomes essential to lay emphasis on the depth-understanding of the problem and the need for generalization is not great, the use of

qualitative methods is the only choice. Particularly when we embark upon studying a particular case in an intensive manner, we must have to go for qualitative analysis due to the obvious reason that the quantitative techniques only touch the generalizable aspects of a case or those aspects which are found commonly with others. In all depth studies of singular cases the method of case history is used. The case study method is used as a form of qualitative analysis of data involving the very careful and complete observation of a person, a situation o* an institution. In the qualitative analysis of data emphasis is laid on emotional aspects because of the presumption that the emotions and sentiments are the real foundation pillars of human beings as well as institutions. Therefore, without due emphasis on these qualitative aspects we cannot have insight into the workings of any social phenomenon. After completion of coding and tabulation etc., the help of statistics is taken for quantitative analysis of data. The decision regarding the relevant kind of analysis is taken on the basis of what the researcher wants to know. If, for example, the researcher is interested in knowing about the causal relationship between the independent and dependent variables involved in the study, it will be required to demonstrate the degree of association between both the variables. Thus, to establish such a causal relationship, the researcher must have to show that changes in the independent variable leads to change in the dependent variable.

While examining whether or not changes in the independent variable are accompanied by changes in the dependent variable the researcher should not embark upon testing the raw data collected from the respondent as it is a herculean task. That apart, it may lack in reliability and feasibility. Therefore, what is really needed by the investigators is an appropriate summarization of the association between variables for the entire sample of respondents. That is why the statistical analysis appears to be important in social research.

Statistics has most often been construed as a method of research alongwith or in opposition to some such methods like case studies, the historical approach and the experimental method. However, such a classification frequently leads to incorrect thinking and confusion. Therefore, it is wise to regard statistics as supplying a kit of tools that can be very much useful in various situations arising in scientific research The science of statistics is extremely valuable for the research worker in planning, analyzing and interpreting the results of his investigations.

The term 'statistics' may be used in any of the following

three senses:

1. Simple data or quantitative information about facts.
2. Statistical methods for handling numerical data.
3. Measures based on observations on some of the units selected from the whole lot.

A layman accepts the first meaning of the term statistics, so as to denote the word in a plural sense, such as, columns of figures, tables, zig zag graphs or charts in newspapers relating to population, production, national income, consumption expenditure, demand and supply, sales, imports, exports, births, deaths, accidents etc. However, the statistician recognizes another meaning of the term 'statistics', which refers to a quantity calculated from sample observations. In the singular sense statistics is a science. According to Horace Secrist, "statistics are aggregates of facts affected to a marked extent by multiplicity * causes, numerically expressed, enumerated or estimated [ac]cording to reasonable standard of accuracy, collected in a systematic manner or a pre-determined purpose and placed in Elation to each other". The science of statistics deals with:

1. Collection and summarization of data
2. Design of experiments and surveys
3. Measurement of the magnitude of variation in both experimental and survey data.
4. Estimation of population parameters and provision of various measures of the accuracy and precision of these estimates.
5. Testing of hypotheses about populations.
6. Study of the relationships among two or more variables.

The quantitative data, in order to be called statistics much possesses the following characteristics,

Statistics are aggregate of facts: A single figure relating to facts such as, birth or death, even though expressed numerically cannot be called statistics, whereas the aggregates of such figures would be called statistics. For example, a single death in a town or a single birth in a

village fails to reveal anything unless such information is collected for a particular time period or for different towns or villages. By means of such information, we can compare deaths or births over time or over different towns or villages.

1. **Statistics are affected to a considerable extent by a number of causes**: The causation of any phenomenon may be attributed to a multiplicity of factors, both internal as well as external. By the help of statistics, we are able to find out the most proximate cause that affects the phenomenon. For example, the statistics of result of a college, is influenced by many factors like quality of students, level of teaching, library facilities, completion of courses etc. If data on all the relevant factors are collected and analysed then it may be possible to hold the causes responsible for greater success of students in examination.

2. Statistics are expressed in numerical figures :

4. Statistics are numerically expressed. They are related to quantitative information, Unless the qualitative characteristics are assigned certain scales or ranks, they are not amenable to quantitative measures of assessment. For example, if we say that the rate of success of students in university examination is high, it is expressed in qualitative terms.Hence, it does not
5. Make statistics. On the contrary, if we say that the rate of success of students has increased by ten percent in this year, it wil1 constitute a statistical statement.

6. **Statistical data are collected or estimated**: Statistics are enumerated or estimated. In other words, data concerning any phenomenon can be gathered by actual enumeration measurement. But when enumeration **is** not actually feasible or it appears to be very expensive, data may be statistically estimated. por example, we can enumerate the pattern of food habit, say the number of vegetarians in a family by actual counting. But in order to know this number in

the country, it will have to be estimated on the basis of sampling procedure.

7. **Statistics are estimated**

8. **with reasonable standards of accuracy**: Since the statistical estimations are based on sample surveys, these cannot maintain the precision and accuracy based on actual counts or measurements. In the foregoing example, the number of vegetarians in a family can be known with cent per cent accuracy. On the contrary, as regards the national scenario, the accuracy can never be maintained to the tune of cent per cent. The nature and object of any investigation determines the degree of accuracy. Statistics is not a deterministic phenomenon. Rather it is probabilistic and hence mathematical accuracy is difficult to be achieved. Simultaneously, for purposeful decisions, statistics are with reasonable standard of accuracy.

9. **Statistics are systematically collected**: Statistical data are collected in a careful and systematic manner. Therefore, before the data are actually collected, the investigator makes a proper planning. A haphazard collection of data, without suitable plan, is very likely to lead to fallacious conclusions.

10. The purpose of collection of statistics is predetermined:

The purpose and scope of inquiry be well defined in advance so that the collection of data is predetermined. A general purpose of inquiry is not sufficient. For example data on physical appearance of a student may be irrelevant for considering his ability to get admission into a college nevertheless, this will be definitely relevant for determining his Physical personality.

11. The main objective of statistics is to facilitate a comparative or relative study.

Statistics are placed in relation to each other. Period-wise or region-wise comparisons of facts and figures may be done. For example, the rate of fertility may compared over different periods or with different countries. Significance of certain figures may be better appreciated when they are

compared with others of the same kind.

Keeping in view the objectives of data analysis, various statistical operations may be employed. But generally statistical analysis commences with separate inspection of each variable, called as single variable analysis or univariate analysis. As a part of a basic descriptive study and as a preclude to more complex analyses, the objective of single variable analysis is to get an accurate profile of the data by examining only a single variably at a time. The main purpose of the single variable analysis is to determine the nature of variation in the variables involved in the study and also to ascertain whether there is sufficient variation in response? so as to enable the investigator to incorporate the variable in the analysis. The investigator reveals the variations in responses by organizing the data statistically, in terms of frequency distribution and percentage distribution. When all the response categories are listed and thereafter all the cases falling into each category are summed up, a frequency distribution comes into being. It serves the purpose of a preliminary organization of data and presents **a** clear-cut picture than case by case listing of responses. For further clarification of data the researcher may also present the percentage of respondents along with frequency in respect of each category. Percentage along with the frequencies enables the readers as well as the researchers to embark upon comparison and interpretation of responses in an easier manner. The size of a particular category is also made clearly visible with reference to the sample in terms of percentage. Statistics also helps to examine the notable properties of univariate distributions in terms of central tendency, dispersion and shape.

Averages occupy a very significant place in statistical analysis. The general characteristics of the whole group can be easily expressed in the form of averages. In this context the 'central tendency' is taken into consideration. It is a device to know the position of different groups, characterizing what is typical in the data. The three main measures of central tendency are the mean, the median and the mode.

Mean is also known as Arithmatic average, calculated by adding up all the responses and dividing the sum total by the total number of respondents. As the most popular and the best form of average, mean is required in all types of calculations and analyses. The following are the characteristics of mean or arithmatic average.

(i) It is calculated by dividing the sum of measurements by total number of items.

{ii) While calculating mean, all the items are taken into account. Therefore, when we know the total number of items and the average, the total values can be found
out.

(iii) Mean can also be calculated when the total of the measurements and the total number of items are known.

(iv) Mean or arithmatic average does not depend upon frequency as in case of median or mode.

(v) Mean or arithmatic average is based on the area formed
by the frequency curve.

(vi) The sum of the differences of all the values from the mean is exactly equal to zero.

Median, another measure of central tendency, is the mid point in a distribution. It is a measurement of the size in which middle items are arranged in ascending or descending order. In the words of Bowley "the magnitude appertaining to the item half way up the series is equal the median". In other words, it is the value of the middle response, *i.e.* half of the responses are placed above it and the other half below it, when the items are arranged in ascending or descending order. It has the following characteristics:

(i) It is the size of the middle item

(ii) The arrangement of the items are to be made in ascending
or descending order of magnitude

(iii) It is based on the pre-supposition that extreme shall be excluded from it.

The mode is that figure which occurs for the maximum number of times in a series. In other words it is the value with the highest frequency.

Another property examined by statistical analysis is dispersion among a set of variables.

This is also called the degree of variability. The different measures of dispersion are: *(a)* range; '&) mean deviation; and (c) standard deviation.

Range is the simplest method of finding out the variability i" which the difference between the highest and lowest measurement is found out. The difference between the highest and the lowest limits is the range of dispersion or variability.

Mean deviation is the arithmatic average of deviation in which values of each item from any average is found out.

The most commonly used method of dispersion, standard deviation, is an improvement upon mean deviation. This is a measure of the 'average' spread observations around the mean.

The shape of univariate distribution is construed as the third statistical property, made apparent through a graphic presentation. Such a presentation is called a frequency or percentage polygon. Only when the three statistical properties as discussed above are combined, a good picture of the quantitative data is provided.

So far, we were discussing about the univariate analysis. But the bivariate analysis, on the other hand, examines the nature of relationship between two variables and commences with the creation of cross-tabulations. Necessary comparisons and percentaging cross-tabulations are made as per rules. From the view point of statistics, generally in bivariate analysis the degree of association between variables are calculated. However, causal inference are not only drawn on the basis of the degree of association, but also on empirical evidence as well as theoretical assumptions. Both the theoretical assumptions and empirical evidence are instrumental in determining the direction of influence and non- spuriousness. But 'association' of two variables also has its importance. It is something more than 'correlation', which indicates a deeper type of relationship. In 'association', the relationship is already there or accepted. What we have to study is the effectiveness of this relationship.

Briefly speaking, in any statistical analysis, we describe adequately the mass of data and attempt on characterising what is typical in the group. That apart, we try to indicate the extent to which the individuals in the group vary; how they are distributed in respect of the variable being measured, moreover, we also try to exhibit the relationship of the different variables in the data to one another and the differences between two or more groups of individuals.

The researcher desires to draw generalizations on the basis of the samples taken for the

study. These generalizations are made applicable to the population or the research universe. The researcher also infers causal relationship among variables. While judging whether or not we will accept a hypothesis, we cannot solely rely on statistical evidence because statistical statements are statements of probability. Rather, along with statistical confidence in the reliability of the findings, we also need the evidence in the validity of the pre-suppositions of the study.

1.4 Summary

The most commonly used method of dispersion, standard deviation, is an improvement upon mean deviation. This is a measure of the 'average' spread observations around the mean. The shape of univariate distribution is construed as the third statistical property, made apparent through a graphic presentation. Such a presentation is called a frequency or percentage polygon. Only when the three statistical properties as discussed above are combined, a good picture of the quantitative data is provided.

1.5 Self Assessment Questions

1. What do you understand by statistics?
2. Discuss the relevance of statistics in social Research.

1.6 Key Words

Statistics: Statistics is the discipline that concerns the collection, organization, analysis, interpretation, and presentation of data. In applying statistics to a scientific, industrial, or social problem, it is conventional to begin with a statistical population or a statistical model to be studied.

1.7 Study Guide

1. Goode and Hatt,Methods of Social research 2.
2. Young, P.V.,Social Survey and Social Research
3. Wilkinson and Bhandarkar,Methodology and Techniques of Social Research

Unit-02 Mean

Structure

2.1 Learning Objectives

After going through this unit, the learner will be able-

1. To learn how to calculate mean.
2. To understand types of averages.

2.2 Introduction/ Assessment of Prior Knowledge

Mean is the average of the given numbers and is calculated by dividing the sum of given numbers by the total number of numbers. Mean = (Sum of all the observations/Total number of observations).

2.3 Measures of Central Tendency

In sociology usually individual data are not considered, rather we deal with a group of data. In order to describe the whole mass of unwieldy data a single value is required. Statistics provides us the tool to get a single value which can better describe the group of data *i.e.* central value or an average. In our day-to-day conversation we often use the word average. We talk about average monthly income, average size of family, average death rate or birth rate in a city. An average is a single value that represents a group of values. It depicts the characteristic of the whole group to the maximum possible extent. An average may not necessarily be a figure, it can also be a qualitative expression. But in statistics usually average as a qualitative expression is not used, rather we attempt to define the average numerically.

2.4 Definition of an Average

The word average has been defined in many ways by different authors. Some of them are:

1. According to Clark, "Average is an attempt to find one single figure to describe whole of figures."
2. According to A.E. Waugh, "An average is a single value selected from a group of values to represent them in some way—a value which is supposed to stand for whole group of which it is a part, as typical of all the values in a group."
3. Croxton and Cowden have defined an average as a

single value within the range of the data that is used to represent all of the values in a series. Since an average is somewhere within the range of the data it is something called a measure of central value."

From the above definitions, we may conclude that an average is any figure which describes the series of data. Since an average represents the entire data, it's value lie somewhere within the two extremes of the series. So the average is also often referred to as a measure of central tendency.

2.5 Objectives of an Average

Basically there are two main objectives of an average. These are:

(i) **It helps to get a single value which can describe the series of data.** An average can represent thousands, lakhs, millions of single values. It crystallizes the whole series and helps to get a birds eye view of the whole mass of data. For example, practically it is impossible to remember the household income of all households of a city but with the help of an average we can draw the conclusion about the standard of living of the city.

(ii) **It facilitates comparison. It** enables the researcher to compare two or more series. Comparison can also be made at a point of time or over a period of time. For example, standard of living of two cities of India can be compared by comparing the average household income of those cities. Similarly, the change in standard of living of a particular city can be known by comparing the average per capita income over a period of time *i.e.* at different periods of time. However, while making comparison the researcher should always consider the impact of multiplicity of forces which influences data.

- **Requisites of a Good Average**

(i) **It should be based on** all **items.** An average should be a good representative of the whole group. It should be based on each and every item of the series and if any item is changed the average itself is altered. The average should be such a measurement that any conclusion drawn on basis of it is bto whole of the series. If an avreage does not possess the of representativeness its use is virtually limited.

(ii) **It should be easy to understand.** Statistical **method** are used to simplify the

complex nature of the problem. So W^1 advantage should be very simple to use and understand so tn even common persons can be able to understand.

***(iii)* An average should be simple to calculate.** *P* average should not only be understandable, at the same should possess the quality of easy computation. So it should easy enough as to enable the researcher compute easily. But for the sake of simplicity, accuracy should not be sacrificed.

(iv) **The average should be capable of further algebraic treatment.** The researcher should prefer the average which **is** capable of further mathematical analysis so that its utility will be enhanced. For example, if we have computed average income and number of households of two **or** more cities then we should be able to compute the combined average.

(v) **The average should be rigidly defined.** An average should be definite and clearly ascertained and should be expressed in a single figure rather than a qualitative expression so that it has one and only one interpretation. It should preferably **be** defined by an algebraic formula, so that if different people will use the same it will give one and only one result. In this way, it should be free from personal prejudices and bias of the researcher.

(vi) **Average should not be unduly affected by extreme observations.** Though an average is based on each and every item, it should not be unduly affected by any one item. A very small item or very large item in the series may distort the value of the average. So the researcher should be very careful about it.

(vii) The average should possess quality of sampling stability.

It states that when we select a number of samples singly population we should expect approximately the same value from all samples by using an average.

2.6 Types of Averages

The various types of measures of *central* tendency can broadly classified into following two groups.

1. Mathematical Average 2.Location Average

Besides the above two groups there are some other averages like Moving Average, Progressive Average etc. But these averages have limited practical

application and are not so popular.

2.7 Arithmetic Mean

Arithmatic mean is the most popular, widely used and best form of average. It considers all the items of the series and capable of further algebraic treatment. It is obtained by adding together all the items and by dividing this total by the number of items. Arithmatic mean may either be simple arithmatic mean or weighted arithmatic mean.

- Calculation of Arithmatic Mean
- A. Mean from Individual Series (i)
  Direct Method

Mean from individual series (where frequencies are not given) can be calculated by adding all the values of the variable and by dividing total by the number of items.

Steps

(i) Add together all the values of variable and obtain the total.

ii) Divide this total by number of observations. Symbolically,

$$\bar{X} = \frac{X_1 + X_2 + X_3 + ... + X_n}{N}$$

$$\bar{X} = \frac{\Sigma X}{N}$$

or

Wh

ere

∑X = Sum of all values of variable X *i.e. X1,* X2 , X3 ... *Xn.*

Total N = Number of observations.

Illustration 1.

A researcher collects data of monthly income of 10 households of a

House No :	1	2	3	4	5	6	7	8	9	10
Income (in	80	88	70	45	50	68	72	93	66	750

village. Calculate the Arithmatic Mean.

Solution

House No.	Monthly Income (X) in
1	800
2	880
3	700
4	450
5	500
6	680
7	720
8	930
9	660
10	750
N = 10	∑X = 7070

Arithmatic Mean

$$\bar{X} = \frac{\Sigma X}{N}$$
$$= \frac{7070}{10} = 707$$

So average income in that village is **Rs. 707.**

(ii) Mean from Individual Series (Short-Cut Method)

Arithmatic Mean of Individual series can also be calculated by taking an arbitrary origin. The formula for calculating arithmatic mean is

$$\bar{X} = A + \frac{\Sigma d}{N}$$

Where A is the assumed mean, *d* denotes deviations of values taken from Assumed Mean *d* = (X—A)

Steps

1. Take any value, whether existing in data or not, as assumed mean.
2. Take deviations of items from assumed mean *i.e.* d = (X-A) of each item.
3. Obtain sum of deviations *i.e.* $\sum d$.
4. Apply the formula to calculate mean.

• Illustration

Arithmatic Mean for the previous question can also be calculated by short-cut method. (Let the Assumed Mean be 600)

House No.	Monthly Income (X)	d(X—A) {(X—600)}
01	800	200
02	880	280
03	700	100
04	**450**	—150
05	500	—100
06	680	80
07	720	120
		Id = 1070

Let the assumed Mean be 600

i.e. A = 600

$$\bar{X} = A + \frac{\Sigma d}{N}$$

$$= 600 + \frac{1070}{10}$$

= 600 + 107

= 707 (Ans).

The mean value of income is 707. Which is the same as calculated by direct method.

Though in ungrouped data short-cut method involves more calculations, for grouped data this method is time saving.

• B. Calculation of Arithmatic Mean from discrete series

• (i) Direct Method

In discrete series, Arithmatic Mean by direct method can be calculated by multiplying the values of the variables by their

respective frequencies. The products obtained are added and this sUni total is divided by number of items or observations. The formula is

$$\bar{X} = \frac{X_1 f_1 + X_2 f_2 + X_3 f_3 + \ + \ldots + X_n f_n}{N}$$

$$= \frac{\Sigma fX}{N}$$

Where X is Arithmetic Mean *f* is frequency X is variable.

• Steps

1. Multiply each value of the variable by its respective frequency *i.e. fx.*
2. Obtain the sum of the product of *f.x i.e.* $\sum fx$.
3. Divide the *Ifx* by total number of observations N, Where N = $\sum f$.

Illustration 3.

Marks of 50 students of a class are given. Find the mean marks.

Marks Secured	30	45	54	60	72	80
No. of Students	4	10	12	8	10	6

Solution

Let the marks be denoted by X and number of students

Mark(X)	**No. of Students *f***	*f.X*
30	**04**	120
45	10	450
54	12	648
60	08	480

72 8 0	**10** **06**	720 480
	N=∑f=50	∑fX=2898

$$\bar{X} = \frac{\Sigma fX}{N} = \frac{2898}{50}$$
$$= 57.96 \text{ (Ans.)}$$

{ii) Short-Cut Method

The mean from discrete series can also be calculated by short-cut method by taking an arbitrary origin.

The formula is $X = A + \frac{\Sigma fd}{N}$

Where A is the assumed mean of the series.

d is the deviation of each item from assumed mean *i.e.* (X—A) N is the total number of observations *i.e.* ∑*f.*

Steps

(i) Take any value as Assumed Mean.

(ii) Find out the deviations of each value from assumed mean and denote it as *d.*

(iii) Multiply the frequency of each value with respective deviations and find out the sum of the product *i.e.* ∑*fd.*

(iv) Apply the formula to calculate Mean by short-cut-method.

- Illustration

The previous illustration may also be solved by short-cut method.

- Solution

Let the assumed mean be 60. So A = 60

Marks **X1**	**No. of Students**	***d* = (X-A)** *i.e.* **(X-60)**	***fd***
30	04	—30	—120

45	10	—15	—150	—342
54	12	—06	—72	
60	8	00	00	
72	10	12	120	240
70	6	20	120	
	$\sum f$ =50		$\sum fd$ = —102	

$$\bar{X} = A + \frac{\Sigma fd}{N}$$
$$= 60 + \left(\frac{-102}{50}\right)$$
$$= 60 - 2.04$$
$$= 57.96 \text{ (Ans.)}$$

C. Arithmatic Mean from Continuous Series

In a continuous series also the same procedure will be adopted to calculate arithmatic mean. Here midpoints of various class intervals will be written down to replace class intervals. The following methods can be adopted to calculate mean from continuous series.

(i) Direct Method. *(ii)* Short-Cut Method. *(Hi)*
Step- deviation Method.

• Direct Method

Following steps are to be followed while calculating arithmatic mean from continuous series.

Steps

(i) Obtain mid points of each class and denote it as *m. (ii)* Multiply the mid-points by the respective frequencies

i.e. m.f. of each item. Get the total of *m.f, i.e.* $\sum mf$. *{Hi)* Apply the formula to get mean.

The formula to get mean of continuous series by direct method is

$$\bar{X} = \frac{\Sigma mf}{N}$$

N where X is the mean,

m is the mid point cf each class interval, *f* is the frequency °f each variable and N is the total number of observations *i.e.* $\sum f$.

. Illustration The weekly wages of 50 labourers are given. Calculate the Mean.

Weekly Wages	No. of Labourers
10—20	5
20—30	7
30- ;o	8
40—50	12
50—60	06
60—70	03
70—80	05
80—90	02
90—100	02

• **Solution**

Weekly Wages	d Point (m)	No. of (f) Labourers	m.f.
10—20	**15**	05	75
20—30	25	07	175
30—40	35	08	280
40—50	**45**	12	540
50—60	55	06	330
60—70	65	03	**195**
		$\sum f = 50$	$\sum mf = 2330$

Arithmatic **Mean**

$$\bar{X} = \frac{\Sigma mf}{N}$$

$$= \frac{2330}{50}$$

$$= 46.6. \textbf{ (Ans.)}$$

(ii) Short-Cut Method

In case of short-cut method in continuous series, the formula used is

$$\bar{X} = A + \frac{\Sigma fdm}{N}$$

Where X is the arithmatic mean.

A is the assumed mean, f "represents frequency, *dm* denotes deviations of mid-values from assumed mean, *i.e. (m*—A) and N the total is number of observations.

Steps

(i) Obtain the mid point of each class interval and are denoted by *m.*

iii) Take one assumed mean. *(iii)* Find the deviations of respective mid-points from the

assumed mean and denote it as *dm = (m*—A).

(iv) Multiply respective frequencies of each class with its ***dm*** and obtain ∑*fdm.*

(v) Put the formula to obtain mean.

• Illustration

Calculate the arithmatic mean by using the short-cut method of previous illustration.

Weekly Wages (X)	**No. of Labourer**	**Mid Point *(m)***	***dm(m*—A) *i.e.* (M—**	*fdm*
10—20	05	15	—40	—200 —
20—30	07	25	—30	210
30—40	08	35	—20	—160
40—50	12	45	—10	—120
50—60	06	55	0	0
60—70	03	65	10	30
	N = ∑*f* =50			-420

Mean of the above series can be calculated by the formula.

$$\bar{X} = A + \frac{\Sigma fdm}{N} \qquad d' = \frac{m - A}{C}$$

$A = 55$

$\Sigma fdm = -420$

$N = 50$

Substituting the values in the above formula, we get

$$\bar{X} = 55 + \left(\frac{-420}{50}\right)$$
$$= 55 - 8.4$$
$$= 46.6 \text{ (Ans.)}$$

(iii) Step Deviation Method

Mean from continuous series can also be calculated by step deviation formula, *i.e.*

Where A = Assumed Mean

f = frequency

$d' = \frac{(m - A)}{C}$

N = total number of observations.
m = mid-point of each class interval.
C = Class interval.

- Illustration

The same illustration can also be solved by step deviation method.

- Solution

Let the Assumed mean be 55 in this example.

Weekly Wages (X)	No. of Labourers *f*	**Mid Point** (m)	*d*(*m*-A) =(m 55)		***fdt'***

10—20	05	15	—40	—4	—20
20—30	07	25	—30	—3	—21
30—40	08	35	—20	—2	—16
40—50	12	45	—10	—1	—12
50—60	06	55	0	0	0
60—70	03	65	10	1	4
70—80	05	75	20	2	10
80—90	02	85	30	3	04
90—100	02	95	40	4	
	N = 50				$\sum fd' = -$

$$X = A + \frac{\Sigma fd'}{N} \times C \text{ (here C = 10)}$$
$$= 55 + \left(\frac{-42}{50} \times 10\right)$$
$$= 55 - 8.4$$
$$= 46.6 \text{ (Ans.)}$$

Out of above three methods of calculation of mean from continuous series, the step deviation method is the most widely used method, but where class intervals are unequal, this method can not be used.

- Calculation of Arithmatic mean from Open Ended Classes

Open ended classes are those in which lower limit of the first class and upper limit of the last class are not given. In such a series arithmatic mean can be calculated by making the assumption about unknown limits.

- Illustration

Monthly income of 25 households are given below. Find out the Arithmatic Mean. Solution

Monthly income (in Rs.)	***No. of Households***

0—100	03
100—200	02
200—300	05
300—400	07

In the above example, the lower limit of the first class and upper limit of the last class are missing. Arithmatic mean cannot calculated without making assumptions about unknown Inits. Here we can assume lower limit of first class 0 and upper limit of the last class 500. Then mean can be calculated

Monthly income (in Rs.)	**Mid Point (M)**	***f***	***f.m***
0—100	50	03	150
100—200	150	02	300
200—300	250	05	1250
300—400	350	07	2450
		N = 35	$\sum fm$ - 9950

$$\text{A.M.} = \bar{X} = \frac{\Sigma fm}{N} = \frac{9950}{25} = 310 \qquad \text{(Ans.)}$$

2.7.1 Merit of Arithmetic Mean

Arithmatic mean is the most popular, type of average. Its merits are :

(i) It is the simplest average to understand and it is also easy to calculate.

(ii) It is based on each and every item of the series.

(iii) Its value is always definite because it is rigidly defined by a formula. So everyone who computes the arithmetic mean gets the same answer.

(iv) It is capable of further algebraic treatment as it is defined by a rigid formula. *(v)* It has got sampling stability. The value of arithmetic mean does not vary so largely when different samples are taken from the same population.

(vi) It can be calculated even when the whole of the series is not given and only some values are given.

(vii) *(vii)* It is the average which balances the values on either side of it.

2.7.2 Demerit of Arithmetic Mean

(i) Since arithmatic mean is based on each and every iten[1] of the series, extreme or abnormal (very small and very large) items of the series unduly affect its value. For example, in a group, three students have secured 30, 40, 35 marks and 4th student has secured 95 marks, the average of group is $\frac{30+40+35+95}{4} = \frac{20}{4} = 50$.

But this figure is not the true representative of the group. Only single very large item

i.e. 95 has considerably inflated the average figure.

(ii) Arithmatic mean of a series can be calculated only if all the items of the series are given because it is based on all items. In a series of 100 items, if 99 items are given but one item is missing, then also the arithmatic mean can not be calculated.

(iii) In case of open ended classes, arithmatic mean can not be calculated without making assumptions regarding unknown limits. Sometimes assumption regarding unknown limits may give faulty conclusion. However it is not the case with median and mode.

(iv) Though arithmatic mean is easy to understand, in a relative sense it is time consuming. Unlike the cases of mode and median, it can't be known by mere observation.

(v) Sometimes the arithmatic mean gives absurd results. For example, if we are studying the average size of tribal households in a village, by using arithmatic mean we may get 5.6. This seems absurd as persons can't be divided into fractions.

(vi) It is useful in case of normal distribution only but in other distributions it may not give the correct result.

(vii) Arithmatic mean does not consider the distribution of the series. It may give

some value in two differently distributed series. For example, marks of two tutorial groups of students may be given.

Group A	**Group B**
40	**90**
45	**40**
50	**30**
55	25
$\sum \mathbf{X}$A=250	$\mathbf{X}\sum$**B** = 250

$$\bar{X}_A = \frac{250}{5} = 50 \qquad \bar{X}_B = \frac{250}{5} = 50$$

In the above two groups though mean marks are the same, *i.e.* 50, these groups are entirely different so far as their distribution is concerned.

So we can say that although arithmatic mean is most popular and widely used, nevertheless it should be used cautiously in order to avoid errorneous result.

Weighted Arithmatic Mean

The simple arithmatic mean gives equal weightage to all the items but usually all items don't have equal importance in the series, some may be more important and some may be less important. In that case simple arithmatic average will not fulfill the very purpose of the average *i.e.* it will not give a value which will truely represent the series. In that case an average is required which will give more importance to the important items and lesser importance to less important items, so that a true representative of the series can be find out. The weighted average can fulfill the requirement. As the name suggests weighted mean gives different weights to different items as per their importance in the series. Weighted mean can be calculated by both direct and short-cut method. The formulae are :

(i) For direct method

$$\bar{X}_W = \frac{\Sigma WX}{\Sigma W}$$

Where X_W is weighted mean.

X represents the variable items

W represents weights of each variable W:, W2 , W3 .... etc.

Steps to Calculate

1. Obtain the product of each variable and corresponding weights *i.e.* WX and find out sum of the product *i.e.* ∑WX.
2. Divide the total product by sum of weights. In case of **grouped data (i) Direct Method**

$$\bar{X}_W = \frac{\Sigma W\,(fX)}{\Sigma W}$$

Where /X is the product of each variable with its frequency.

Steps

1. Find out product of each value and its frequency *i.e.* /X.
2. Multiply each of the product with its corresponding weight *i.e.* W(/X) of each item and obtain ∑W(/X).
3. Apply the formula.

• *(it) Short-Cut Method*

(a) Individual series

$$\bar{X}_W = A_W + \frac{\Sigma W d_x}{\Sigma W}$$

Where A_W is Assumed mean, d_x is deviation of each value from assumed

mean. W is weight of each variable.

(6) In case of grouped data the formula is :

$$\bar{X}_W = A_W + \frac{\Sigma W (fdX)}{\Sigma W}$$

Steps

(i) Take a value as assumed mean A.

(ii) Obtain the deviations of each value from assumed mean and denote it *d.*

{Hi) Multiply the deviation of each item with it's weight and obtain end. In case of grouped data first obtain the product of deviation and corresponding frequency then multiply each of the product with its weight.

(iv) Apply the formula.

In case of weighted average the important problem is selection of weights. Weights can either be actual or be estimated. If weights are actual, there is no problem at all but when weights are, to be estimated the researcher has to be very careful while assigning the weight.

Illustration

From the survey of income of a company following data are collected. Find out weighted mean by using both direct and short-cut method and compare it with simple mean.

Designation/Cadre	**Monthly Salary**	**Strength of Cadre**
Managers	3,000	5
Deputy-Managers	2,000	10
Supervisors	1,500	30
[illegible]		

Solution

In case of simple arithmatic mean the strength of cadre will not be considered rather mean will be calculated by giving equal importance to all cadre whereas in weighted mean it will give more importance to most important items and lesser importance to less important items according to its strength.

- *Direct Method*

Designation	**Monthly salary (X)**	**Strength of Cadre (W)**	(WX)
Manager	3,000	5	15,000
Deputy-Manager	2,000	10	20,000
Supervisor	1,500	30	45,000
Labourer			
	∑*X*= 7,200	∑W-95	∑WX= 1,15,000

$$\bar{X}_W = \frac{\Sigma WX}{\Sigma X} = \frac{1,15,000}{95} = 1210.5$$

Whereas simple mean is $\bar{X} = \frac{\Sigma X}{N} = \frac{7,200}{4}$

$= 1,800$

Short-Cut Method

Formula is $\bar{X}_W = A_W + \frac{\Sigma W dx}{\Sigma W}$

Let the Assumed mean A_W be 2,000

Designation	**Monthl income (X)**	**Deviatio**	**Strength of Cadre (W)**	*Vtdx*
Manager	3,000	1,000	5	5,000
Deputy-Manager	2,000	0	10	0
Supervisor	100	—500	30	—15,000
Worker	700	—1,300	**50**	—65,000
			∑*Wdx*	—75,000

$$\Sigma W = 95$$

$$\bar{X}_W = A + \frac{\Sigma W dx}{\Sigma W}$$

$$= 2000 + \left(\frac{-75000}{95}\right)$$

$$= 2000 - 789.47$$

$$= 1210.5 \text{ (Ans.)}$$

- When to Use Weighted Arithmatic Average

Weighted arithmatic average gives a fair and unbiased measure of central tendency. Though simple arithmatic mean is usually used but there are certain case where weighted average should be used. These are :

(i) When importance of all items in a distribution is not equal.

(ii) When the classes of the same group contain widely varying frequencies.

(Hi) Where there is a change either in the proportion of values of items or in the proportion of their frequencies.

(iv) When average will be calculated from a series of ratios, percentages and rates etc. When average is calculated from the components of the series.

2.8 Geometric Mean

Geometric mean is the nth root of the product of *'n'* number of items of a series. If there are two items, geometric mean is the square root of the product of those 2 items. Similarly if there

are 3 items geometric mean is the cube root of the product of those items and so on. It is generally used in higher statistical analysis.

Symbolically Geometric mean is

$$G.M = \sqrt[n]{X_1 \cdot X_2 \cdot X_3 \ldots X_n}$$

i.e.

Where, G.M stands for Geometric Mean.

n is number of items and X stands for values of variables.

Suppose the Marks of 2 students are 50, 40. The geometric mean will be square root of 80, 50

$$GM = \sqrt{80 \times 50}$$

$$= \sqrt{4000}$$

$$= 63.35 \text{ (Ans.)}$$

If number of items are more than two, calculation of square root becomes very difficult. In such cases calculations have to be done with help of logs.

In terms of logs, Geometric Mean is

$$\log G.M = \frac{\log X_1 + \log X_2 + \log X_3 + \dots \log X_n}{N}$$

$$G.M = \text{Antilog}\left[\frac{\log X_1 + \log X_2 + \log X_3 + \dots \log X_n}{N}\right]$$

$$= \text{Antilog}\left[\frac{\Sigma \log X}{N}\right]$$

Steps

1. Find log of each item.
2. Find out sum of logs of all values of variables.
3. Divide the total by number of items.
4. Find the antilog of the value obtained in step 3.

• *Illustration*

Calculate simple geometric mean from following items.

131	143	125	170	185

Solution

Variables	**Logarithms**
131	2.1173
143	2.1553
125	2.0969
170	2.2304
N = 5	XlogX-10.8671

$$G.M = \text{Antilog}\left[\frac{\Sigma \log X}{N}\right]$$
$$= \text{Antilog}\left[\frac{10.8671}{5}\right]$$
$$= \text{Antilog } [2.1734]$$
$$= 149 \text{ (Nearer whole number)}$$

2.8.1 Merit of Geometric Mean

(i) It is rigidly defined.

(ii) It is based on all items of a series.

*(iii)*Further algebraic treatment is possible in case of geometric mean.

(iv) It has sampling stability.

2.8.2 Demerit of Geometric Mean

(i) It is difficult to calculate

(ii) If one value in the series is 0 then geometric mean of the series will also be zero. In that case this average will give absurd result.

*(iii)*It gives equal weight to all values.

2.9 Harmonic Mean

Harmonic Mean is defined as reciprocal of arithmetic mean the reciprocal of individual observations. Symbolically harmonic Mean is

$$H.M = \frac{N}{1/X_1 + 1/X_2 + 1/X_3 + \ldots + 1/X_n}$$
$$= \frac{N}{\Sigma 1/X}$$

Where, N is number of observations X represents variable.

Steps

(i) Find the reciprocal values of all items of the series. (ii) Find out sum of those reciprocal values. *{Hi)* Apply the formula to get harmonic mean. Harmonic mean can also be calculated in discrete and continuous series. But use of harmonic mean is quite restricted.

• Illustration

Calculate the Harmonic Mean of the following values.

20	250	15	300	5	150	100

• Solution

Values (X)	Reciprocal Values (1/X)
20	1/20 = 0.05
250	1/250 = 0.004
15	1/15 = 0.06
300	1/300 = 0.003
5	1/5 = 0.2
150	1/150 = 0.006
100	1/100 = 0.01
X = 7	∑1/x = 0.333

$$H.M = \frac{N}{\Sigma 1/X}$$

$$= \frac{7}{0.333}$$

$$= 21.02$$

2.9.1 Merit of Harmonic Mean

(i) It is rigidly defined and its value is precise.

(ii) It is based on all observations.

(iii)It is capable of further algebraic treatment.

(iv) It has sampling stability

2.9.2 Demerit of Harmonic Mean

(i) It is difficult to understand and calculate.

(ii) Harmonic mean gives more weightage to small items.

2.10 Summary

The simple arithmatic mean gives equal weightage to all the items but usually all items don't have equal importance in the series, some may be more important and some may be

less important. In that case simple arithmatic average will not fulfill the very purpose of the average *i.e.* it will not give a value which will truely represent the series.

2.11 Self Assessment Questions

1. What is mean?
2. What are the various types of average?

2.12 Key Words

Mean: In mathematics and statistics, the arithmetic mean, arithmetic average, or just the mean or average is the sum of a collection of numbers divided by the count of numbers in the collection. The collection is often a set of results from an experiment, an observational study, or a survey.

2.13 Study Guide

1. Goode and Hatt,Methods of Social research
2. Young, P.V.,Social Survey and Social Research
3. Wilkinson and Bhandarkar,Methodology and Techniques of Social Research

Unit-03 Median

Structure

3.1 Learning Objectives

After going through this unit, the learner will be able-

1. To learn how to calculate median.
2. To learn the demerits of median.

3.2 Introduction/ Assessment of Prior Knowledge

In statistics and probability theory, the median is the value separating the higher half from the lower half of a data sample, a population, or a probability distribution. For a data set, it may be thought of as "the middle" value.

3.3 Meaning of Median

By definition median refers to the middle item of the series which is arranged either in ascending on descending order. The median divides the series into two equal parts. One part contains the values less than the median value, other part contains the values more than the median value. Unlike arithmatic mean which is calculated from the value of every item in the series median is a positional measure. The term positions means place of the item. For example if here are 9 items in the series, the median is the 5th item of the series. Suppose a series consists of 5 items and these are 30, 50, 60, 80, and 90. In this series, median is 60 and in another series the items are 01, 10, 60, 65, 70. Here also the median is 60. In case of arithmatic mean, change in one item, changes the average value, where as in case of median if items other than central value change the median will not change. Thus median is the positional measure. In case of series having even no. of items, there is no exact item in the middle item. In such cases, median is arbitrarily taken as half way between 2 middle items. Suppose there are 20 items in a series, the median is 10.5th *i.e.* average of 10th and 11th item. So when no. of items N is even, median is a derived value.

- *Calculation of median : (Individual Observations)*

Steps

1. Arrange the data in ascending or descending order of magnitude.

l be

2. In a series of odd number of values, the median wil $\frac{N+1}{2}$ th item.

So in odd number series, add 1 to N and divide by 2.

In a series composed of even no. of items, median can be estimated by finding arithmatic mean of middle two values i.e. adding two values in the middle and dividing by two. Here also

median = size o $\frac{N+1}{2}$ th item.

Illustration 1.

In an I.Q Test, 7 students got scores like 45, 30, 50, 65, 55, 80 and 70. Find the median value.

- *Solution*

Serial No.	Data in ascending order
01	30
02	45
03	50
04	55
05	65
06	70
07	80

Median is size of $\frac{N+1}{2}$th item. *i.e.* $\frac{7+1}{2}$th item *i.e.* 4th item. In the above series, size of 4th item is 55. So median is 55.

(Ans)

- **Illustration 2.**

In an another I.Q. test 10 students secured scores like 30, 52, 54, 40, 60, 85, 65, 56, 70, 35.

Find the median.

• *Solution*

Serial No.	Data in ascending order
01	30
02	35
03	40
04	52
05	54
06	56
07	60
08	65
09	**70**
10	85

So median is size of th item.

- **(B) Computation of Median (Discrete Series) Steps**

1. Arrange the data in ascending or descending order of magnitude.
2. Find out cumulative frequencies.
3. Calculate $\frac{N+1}{2}$. Now in the cumulative frequency column find out the cumulative frequency either equal to $\frac{N+1}{2}$ or higher than that. The value corresponding to that cumulative frequency is median.

- *Illustration*

In a survey the researcher gets the following data. Find out Median.

Income (in Rs.)	No. of **Persons**
1100	2
800	7
1500	5
2500	10
2200	12
3000	6
4000	3
3800	5
4500	1
1000	5
	N = 56

Solution

Income in ascending order	**No. of Persons**	**Cumulative frequency**
800	**7**	7
1000	**5**	12
1100	**2**	14
1500	**5**	19
2200	12	31
2500	**10**	41
3000	**6**	47
3800	**5**	52
4000	**3**	55
4500	**1**	56

N + **1** -28.5 56+1

2 -2

Size of 28.5th item is 2200 **(Ans.)**

- C. Computation of Median (Continuous series) Steps

1. Arrange the data in ascending or descending order.
2. Calculate cumulative frequency of each class.
3. Determine the class where value of median lies. Median class is that class where N^th item lies.
4. After ascertaining the Median Class, the

following formula can be used to find out exact value of median.

$$\text{Med} = L + \frac{N/2 - C.f}{f} \times i$$

Where L = Lower limit of Median Class.

C.f - Cumulative frequency of the class preceeding the Median Class.

f = Simple frequency of Median Class.

i = Class interval of Median Class.

Illustration

A researcher collected the following data on weekly wage of 45 workers of a company. Find the Median.

Weekly Wages	No. of Workers
0—50	3
50—100	5
100—150	2
150—200	7
200—250	3
250—300	9
300—350	1
350—400	5
400—450	4
450—500	6
	N = 45

• Solution

Wages	No. of Workers	C.f
0—50	**3**	**3**
50—100	**5**	**8**
100—150	**2**	10
150—200	**7**	**17**
200—250	**3**	20
250—300	**9**	**29**
300—350	**1**	**30**
350—400	**5**	**35**
400—450	**4**	**39**

450—500	**6**	**45**
	N = 45	

Median class is that class where N/2th item lies N/2 = 45/2 = 22.5

So median class is 250—300

$$\text{Med} = L + \frac{N/2 - C.f}{f} \times i$$

$$= 250 + \frac{22.5 - 20}{9} \times 10$$

$$= 250 + \frac{2.5}{9} \times 10$$

=250+25/9

=250+2.77

252.77

3.3.1 Merit of Median

1. It is rigidly defined which satisfies the most important requirement of good average.
2. It is easy to locate and easy to understand without any difficulty.
3. It is not affected by magnitude of extreme deviations.
4. It is very useful in open ended classes.
5. It is very useful in skewed distribution.
6. While dealing qualitative data median is most appropriate average to use.
7. Median can also be determined graphically.

3.3.2 Demerit of Median

1. When there are wide variations in a series, the median may not be a good representative.
2. It is not suitable for further algebraic treatment.

3. Calculation of Median necessitates arrangement of data whereas other averages do not require. In case of large number of items, arrangement of data is quite tedious.
4. It is affected by sampling fluctuations than arithmetic mean.
5. Median is more likely to be affected by the fluctuations of sampling than the arithmatic average.

3.3.3 Use of Median

Median is useful in the open-ended distributions. It is used in social phenomenon and also in abstract phenomenon where mathematical expression is difficult.

3.3.4 Other related positional measures

Besides median, there are other measures which divide a series into equal parts like, quartile, deciles and percentiles.

The values which divide the given series into 4 equal parts are known as quartiles. There are 3 quartiles the first quartile (Q_1) also known as lower quartile covers 25% items of the series and 75% items have values are equal to the value of median. It covers 50% of items. In a series 50% of items have values less than Q_2 and 50% of items have values more than Q_2. Q_3 is third or upper quartile which covers first 75% of items. Only 25% of items of a series have values more than Q_3.

- Computation **of** Quartiles

The procedure for calculation of quartile is same as that of median. In ungrouped data whereas in grouped data we add 1 to N whereas in continuous series we donot add 1 to N.

- *Formulae*

Q_1 is size of $\frac{N+1}{4}$th item in ungrouped data and Q is size of N/4th item in continuous series.

Q2 is size of item in ungrouped series and N/2th item in continuous series. Q3 is size of item in individual and descrete series is Q3 is size of in continuous series.

$$\frac{N+1}{2}$$

$$\frac{3(N+1)}{4}\text{th}$$

$$\frac{3N}{4}\text{th}$$

Illustration

Calculate the value of *Q1* and Q3 quartiles from the following data.

Interval	*f*
0—5	2
5—10	3
10—15	5
15—20	7
20—25	1
25—30	4
30—35	4
	N = 26

Solution

Interval	*f*	C.f
		0
		7
		8
		2
		6

Q_1 is size of N/4th item.

$$N/2 = \frac{26}{4} = 6.5\text{th item.}$$

6.5th item lies in 10—15 class.

$$Q_1 = L + \frac{N/4 - C.f}{f} \times i$$

$$= 10 + \frac{6.5 - 5}{5} \times 5$$

$$= 10 + \frac{1.5}{5} \times 5$$

$$= 10 + 1.5 = 11.5$$

Q_3 is size of $\frac{3N}{4}$th item.

$$\frac{3N}{} = \frac{3 \times 26}{} = 19.5\text{th item}$$

Similarly Deciles and percentiles are other Partion Values. Peciles are the values which divide the series into two equal parts. Obviously there are 9 Deciles. These are denoted as p D2 , D3 ... D9. These can also be calculate d as that of Median and quartiles. For example

D1 is size of N/l0th item in continuous series.

D4 is the size of $\frac{4N}{10}$th item in continuous series. D8 is the size of $\frac{8N}{10}$th item in continuous series.

Percentiles are the values which divide the distribution into 100 equal parts. There are 99 percentiles. These are denoted as the value P1, p2…p99.The Values of P50 is equal to Median Value as it lies at the middle of series. These percentiles can also be calculated as that of other partition values. For example.

P1 is size of $\frac{N+1}{100}$th th item in individual and descrete series.

Whereas in continuous series P_1 is size of item.

Similarly, P_{35} is size of item in individual and descrete series and in continuous series P_{35} is

$\frac{35(N)}{100}$th th item and so on.

3.4 Summary

In statistics and probability theory, the median is the value separating the higher half from the lower half of a data sample, a population, or a probability distribution. For a data set, it may be thought of as "the middle" value.

3.5 Self Assessment Questions

1. Explain how the median is calculated.
2. What are the demerits of median?

3.6 Key Words

Median: In statistics and probability theory, the median is the value separating the higher half from the lower half of a data sample, a population, or a probability distribution. For a data set, it may be thought of as "the middle" value.

3.7 Study Guide

1. Goode and Hatt,Methods of Social research
2. Young, P.V.,Social Survey and Social Research
3. Wilkinson and Bhandarkar,Methodology and Techniques of Social Research

Unit-04 Mode

Structure

4.1 Learning Objectives

After going through this unit, the learner will be able-

1. To learn how to calculate mode.
2. To know the meaning of mode.
3. To understand the merits of mode.

4.2 Introduction/ Assessment of Prior Knowledge

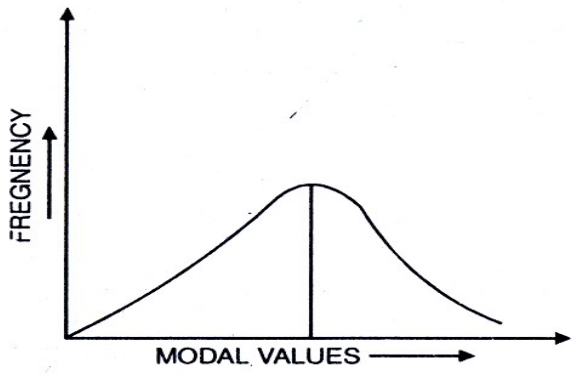
Mode is the most common item of the series. The mode or nodal value is that value in the distribution which occurs the largest number of times. It is the value which occurs more frequently

4.3 Meaning of Mode

Mode is the most common item of the series. The mode or nodal value is that value in the distribution which occurs the largest number of times. It is the value which occurs more frequently.

According to Croxton and Cowden, "The mode of the is the value at the 'stri point around which the items to be most heavily concentrated."

The word mode is derived from the french word (la mode) lch mean a popular phenomenon, mode is thus a most popular ni in the series. It is the value which has the greatest frequency Slty in its immediate neighbourhood. It is the most typical Lshionable value in the series. It is the value around which concentrate heavily in the series Diagramatically,.



- Computation of Mode

Though calculation of precise value of mode is not easy, however there are several elementary methods for calculation of mode.

- Calculation of Mode

A. Individual series/observations. In the individual series the mode can be calculated by counting the number of times, the various values repeat themselves and the value which occurs for maximum number of times is the modal value.

- Illustration

Calculate the mode from the following data regarding the marks of 10 students.

Sl. No.	**Marks Obtained**
01	30
2	22
3	24
4	45
5	30
6	55
7	70
8	45
9	45
10	75

Solutions:

Marks	**Number of times it occurs**
22	**01**
24	.01
30	02
45	03
55	01
70	01
75	**01**
	N = 10

The number 45 occurs for the largest number of times. So 45 is the mode of the above series.

- B. Calculation of Mode (Discrete Series)

In case of discrete series mode can be computed by seer observation as here data is

already grouped. In this series the value which has highest frequency can be known as mode. But sometimes the mode determined by inspection may not give right picture especially in those cases where frequency preceeding or succeeding modal frequency vary only by small magnitude. In those cases mode can be determined by grouping table.

- Illustration

  Monthly income of 50 employees of a factory is given. Find out mode.

Monthly Income	No. of Employees
1000	**2**
2000	**5**
3000	**4**
4000	**7**
5000	**06**
6000	**15**
7000	**03**
8000	**03**
9000	**04**
10000	**01**
	N = 50

Solution

Monthly Income	No. of Employees
1000	02
2000	05
3000	04
4000	07
5000	06
6000	15
7000	03
8000	03
9000	04
10000	**01**
	N = 50

In the above exercise, mode can be determined by seer inspection.

There are maximum of 15 employees who get Rs. 6000 as monthly income. The item 6000 has highest frequency and items preceeding/succeeding 6000 has very insignificant frequency. So here mode is 6000 **(Ans.)**

• Solution by grouping table

In the process of computation of mode, inspection method will give errorneous result where the difference between the maximum frequency and frequency preceeding it or succeeding it is very small. In such cases grouping table can be used to compute mode.

Steps

1. Arrange the values of ascending/descending order frequencies of each value are to be written down again corresponding values.
2. Add the frequencies in two's and total will be w: down in lines between values added. This can be in two ways, first add frequencies of values 1 &2 and 3 & 4 5&6 etc. secondly add frequencies of values 1 &2 and 3 & 4 5&6 etc 3. Add the

   frequencies in three's and values written down in lines between values added be done in 3 ways.

   (i) Add the frequencies of item number 1,2&3, etc

   (ii) Add the frequencies of item number 2,3&4, 5,6&7 etc.

   (ii) Lastly frequencies of item number 3,4 &5,6,7&8 should be added. If necessary frequencies will be added in four's and five's also.
4. After this the size of item containing maximum frequency is called as mode.

Illustration

Data regarding height of 135 adults of a tribal community has been collected and given below.

Height (in inches)	Number of Persons
130	**10**
135	15
140	17

145	18
150	20
155	**21**
160	15
165	10
170	5
175	4
	N = 135

Solution

Height (in inches)	Col 1	Frequency			Col 5	Col 6
		Col 2	Col 3	Col 4		
130	10	25				
135	15		32	42		
140	17	35			50	
145	18		(38)			(55)
150	20	(41)		(59)		
155	21		36		(56)	
160	15	25				46
165	10		15	30		
170	5	9			19	
175	4					

Analysis Table

Height in inches Col No.	130	135	140	145	150	155	160	165	170	175
1					1					
2					1	1				
3				1	1					
4				1	1	1				
5					1	1	1			
6						1	1	1		
				2	5	4	2	1		

From the analysis table we can conclude that 150 has occurred for maximum number of times so mode is 150.

Ans.

• (c) Continuous Series

In continuous series mode can be determined by the following steps :

(i) Arrange the data in ascending or descending order.

(ii) Determine the modal class either by inspection method or by grouping table method.

(iii) Determine the mode by applying the following formula.

Where L is the lower limit of modal class.

$$M_0 = L + \frac{\Delta_1}{\Delta_1 + \Delta_2} \times i$$

where L = Lower limit of modal class

Δ_1 = The difference between frequency of modal class and frequency of pre-modal class.

Δ_2 = The difference between frequency of modal class and frequency of post-modal class.

i = class interval of modal class.

The formula can also be written as

$$M_0 = L + \frac{f_1 - f_2}{2f_1 - f_0 - f_2} \times i$$

Where L is the lower limit of modal class.

f_x = Frequency of modal class

$f2$ = Frequency of pre-modal class $f2$ = Frequency of post-modal class i = class interval of modal class

While applying the formulae, it is necessary to see the class intervals uniform throughout if they are not uniform the first step is to make those uniform. Again when there are two or mOre values having the same maximum frequency, mode is said t0 be ill defined, such a series is also known as bimodal or multimodal

distribution. In that case mode can be ascertained by the following formula

Mode = 3 Median — 2 Mean.

• Illustration

Find the mode of the following distribution.

Marks	No. of students
0—10	01
10—20	**03**
20—30	05
30—40	**04**
40—50	**07**
50—60	**10**
60—70	15
70—80	**08**
80—90	05
90—100	**02**
	N = 40

Class Internal Marks	No. of students
0—10	**01**
10—20	03
20—30	05
30—40	04
40—50.	07
50—60	00
60-70	15
70-80	08
80-90	05
90-100	02

By inspection we can say, the modal class of above series has 60—70 because this series has highest frequency.

First **Formula**

First Formula

$$M_0 = L + \frac{\Delta_1}{\Delta_1 + \Delta_2} \times i$$

$$\Delta_1 = f_1 - f_0 = 15 - 10 = 05$$

$$\Delta_2 = f_1 - f_2 = 15 - 08 = 07$$

$$L = 60,\ i = 10$$

$$M_0 = 60 + \frac{05}{5+7} \times 10$$

$$= 60 + \frac{05}{12} \times 10$$

$$= 60 + 4.1 = 64.1 \text{ Ans.}$$

2nd Formula

$$M_0 = L + \frac{f_1 - f_0}{2f_1 - f_2 - f_0}$$

$$f_1 = 15,\ i = 10$$

$$f_0 = 10,\ i = 60$$

$$f_2 = 08$$

$$M_0 = L + \frac{f_1 - f_0}{2f_1 - f_2 - f_0} \times i$$

$$= 60 + \frac{15 - 10}{(2 \times 15) - 10 - 8}$$

$$= 60 + \frac{5}{30 - 18} \times 10$$

$$= 60 + \frac{5}{12} \times 10$$

$$= 60 + 4.1$$

$$= 64.1 \text{ Ans.}$$

4.3.1 Merit of Mode

(i) It is simple to determine without much mathematical calculation. In individual and even in discrete series mode can be determined by mere inspection method also.

(ii) It is commonly understood.

(iii) It is not affected by the values of extreme items.

(iv) Mode can be determined in open- ended class without ascertaining the class limits.

(v) Value of mode can also be determined graphically.

(vi) It can be used to describe qualitative phenomenone also. Ex : Opinion poll regarding demand for various products.

4.3.2 Demerit of Mode

1. Mode does ot consider all observations of the series.
2. Value of mode cannot always be determined accurately. It is so especially in bimodal and multimodal series.
3. It is not capable of further algebaric treatment for example if mode of two or more series given we cannot calculate combined mode.
4. It is not rigidly defined. It is the most unstable average-
5. It's use is limited. In case of multimodal series, mode can not be a good representative

4.4 Summary

Mode- is the most common item of the series. The mode or nodal value is that value in the distribution which occurs the largest number of times. It is the value which

occurs more frequently

4.5 Self Assessment Questions

1. **Explain the meaning of mode.**
2. **Discuss how mode is calculated.**
3. **Write the demerits of mode.**

4.6 Key Words

Mode: In statistics, the mode is the value that appears most often in a set of data values. If X is a discrete random variable, the mode is the value x at which the probability mass function takes its maximum value. In other words, it is the value that is most likely to be sampled

4.7 Study Guide

1. Goode and Hatt,Methods of Social research
2. Young, P.V.,Social Survey and Social Research
3. Wilkinson and Bhandarkar,Methodology and Techniques of Social Research

Unit-05 Standard Deviation

Structure

5.1 Learning Objectives

After going through this unit, the learner will be able-

- To learn how to calculate standard deviation.
- To learn the merits of standard deviation.

5.2 Introduction/ Assessment of Prior Knowledge

Standard deviation is the most commonly used measure of dispersion. It is a measure of spread of data about the mean. SD is the square root of sum of squared deviation from the mean divided by the number of observations. This formula is a definitional one and for calculations, an easier formula is used.

5.3 Measures of Dispersion

In the chapter of "Measures of Central Tendency" we have discussed the necessity of one single value called as "Average. Though the average represents whole series of data, it has its own limitations. It can represent the whole lot of data "as best as a single figure can." No doubt averages have very great utility in research analysis, but they are not adequate enough to describe a set of observations, unless all observations are same. There may be many sets of observations whose averages may be same, but those series differ in hundred ways. So there is necessity of further statistical analysis to know the characteristics of the series. Measure of variability helps in this regard. An average will be more meaningful and more accurate if it is studied in light of measures of dispersion or variation. Let us explain it in the following example. The following table shows the daily income of a worker of 3 factories A,B,C.

Days	Wage of Worker of A	Wage of Worker of B	Wage of Worker of C
Monday	100	**110**	65
Tuesday	**100**	**100**	135
Wednesday	**100**	**90**	90
Thursday	100	105	100
Friday	**100**	110	**130**
Saturday	100	**85**	80
Total	600	600	600
Average	100	100	100

In the above table the average wage of worker of all factories are same. Since arithmetic

mean of wage of all three factories are same. One is likely to conclude that the weekly salary pattern of all factories are same. But after close examination, one can know there is wide variability among all the series. There is uniformity in the wage pattern of factory 'A'. All the items are perfectly represented by mean, i.e. none of the items deviate from arithmetic mean. So there is zero variation/dispersion among the items of factory A. In case of factory *'B',* only one item is perfectly represented by arithmetic mean,

salary on Tuesday, where as salary on other 5 days vary from arithmetic mean, but the variation is very small as compared to salary pattern of factory 'C. 'C's Income pattern is extremely irratic and uncertain. So we can conclude that only arithmetic mean is insufficient to explain the characteristic of the series. In order to have correct analysis of data we also have to find a measure of variability i.e. degree of deviation from central tendency. This measure is called as measure of dispersion or measure of variability.

5.4 Definition of Measure of Dispersion

Some important definitions are given below :

1. A.L. Bowley has defined "dispersion as" the measure of the variation of the items."

2. According to Spiegel, "The degree to which numerical data tend to spread about an average value is called the variation of dispersion of the data."

From the above definitions, it is clear that dispersion is degree of variation of the items from some average. In the study of dispersion, we have to average deviations of the values of various items, from their average. The measures of central tendency are known as averages of first order, whereas measures of dispersion are known as averages of second order as in calculation of dispersion we average the values derived by the use of the averages of first order.

5.5 Signification of Measures Dispersion

(i) It determines the reliability of an average. Measures of dispersion makes us able to know whether an average is really representative of the series. If the dispersion in the series is very large, the average may not be a good representative of the series and if it is small, the average may be a good representative.

(ii) It helps to make comparative study of two or more series with regard to variability.

Study of dispersion helps to determine uniformity or consistency of two or more series. High degree of variation means inconsistency and low degree of variation means uniformity in consistency.

(Hi) It enables to control variability. Study of dispersion helps to know the cause of variability and also enables to take control measures.

(iii) It facilitates further statistical analysis. Measures of dispersion act as a basis for analysis of correlation, hypothesis testing etc.

if *Features of Good Measures of Variability*

A good measure of variation should have following features : *(i)* It should be simple to understand and easy to compute. *(ii)* It should be rigidly defined.

(Hi) It should have the capability of further algebraic treatment.

(to) It should be based on each item of the series. *(v)* It should have sampling stability.

- Types of Measures of Dispersion

The following measures of dispersion are commonly used.

1. Range
2. Inter-Quartile Range.
3. Semi-Inter Quartile Range/Quartile Deviation
4. Mean Deviation or Average Deviation.
5. Standard Deviation.

The first three measures are known as methods of limits. Average deviation and standard deviation are known as methods of deviation.

5.6 Standard Deviation

The concept of standard deviation was first used by Karl Person in 1823 . It is the most commonly used measure of dispersion. It satisfies most of the characteristics of good measure of dispersion. It is free from the major defects suffered by the earlier three methods. In case of Mean deviation the greatest defect is it ignores the signs. This draw back is removed in calculation of standard deviation. In case of standard deviation, it squares the figures to do away with algebraic signs. Standard deviation is the square root

of arithmetic average of the squares of the deviations measured from mean. It is also known as square root mean deviation, and it is denoted by the Greek letter a (read as sigma).

- Calculation of Standard Deviation
- Individual Series

Standard Deviation from individual series can be calculated by using two methods.

(a) By taking deviation of item from actual mean. (6) By taking deviation of item from assumed mean.

- (a) From Actual Mean
- Steps

(i) Calculate actual mean of the series. *(ii)* Take deviations of each item from meam

Ifx= (X-X). *(Hi)* Square the deviations and obtain *Tx*

where *x* = (X-X) *Uv)* Apply the formula *i.e.*

$$\sigma = \sqrt{\frac{\Sigma x^2}{N}}$$ to find standard deviation.

- Example

The weights of 10 persons are given, find S.D. by using Mean method.

x:	45	55	58	60	65	72	75	78	80

- Solution

X	x(X-X)	x^2
45	-22	484
55	-12	144
58	-02	81
60	-7	49

65	-2	4
72	5	25
75	8	64
78	11	121
80	13	169
82	15	225
Ix=670		U^2=1366
N=10		

$$\bar{X} = \frac{\Sigma x}{N} = \frac{670}{10} = 67$$

$$\sigma = \sqrt{\frac{\Sigma x^2}{N}} = \sqrt{\frac{1366}{10}} = 11.68 \text{ Ans.}$$

(b) From Assumed Mean

When the actual mean is in fractions, it becomes tedious to calculate S.D. by using actual mean, in that case, assumed mean method is very easy.

When deviations are taken from assumed mean, S.D. will be computed by the following

Take deviation of each item from assumed mean denoted it as d where d = (X-A).

(iii) Obtain d^2 $\sum d^2$ and $\sum d^2$

(iii) Apply the formula.

Example

Solve the previous example by using assumed mean.

- *Solution*

Weight (X)	**d(X-A)**		d^2
45	-20		400
55	-10		**100**
58	-7	-42	49
60			25
65	0		0
72	7		45
75	**10**		100
78	13	62	169

80	15	225
82	17J	189
N = 10	∑d - 20	$\sum d^2$ =1302

Let Assumed Mean A = 65.

$$\sigma = \sqrt{\frac{\Sigma d^2}{N} - \left(\frac{\Sigma d}{N}\right)^2} = \sqrt{\frac{1302}{10} - \left(\frac{20}{10}\right)^2}$$
$$= \sqrt{130.2 - 4} = \sqrt{126.2} = 11.23 \textbf{ Ans.}$$

Calculation of Grouped Data Standard Deviation from

Standard deviation from the grouped data can be calculated by the following methods.

(a) Actual Mean Method

(b) Assumed Mean Method

(c) Step Deviation Method.

• ***(a)*** *Actual Mean Method*

In order to calculate standrd deviation by actual mean method, the deviations are to be calculated from actual mean. The formula to be used is :

$$\sigma = \sqrt{\frac{\Sigma f x^2}{N}}$$

where $x = (X - \bar{X})$

N = No. of observations

f = frequency

- Steps

(i) Calculate actual mean of the series by using direct or short-cut or step deviation method.

{ii) Find out deviations of each item from actual mean and denote it as x (X ~ X)

(iii) Square the deviations and find x .

(iv) Multiply *f* in respect of each x^2 to find fx^2.

(v) Apply the formula.

- Example

Calculate standard deviation from the following series :

Marks	
0-10	5
10-20	7
20-30	6
30-40	8
40-50	10
50-60	12
60-70	14
70-80	8
80-90	5
90-100	5
	N = 80

Solution

Marks	**Mid point**	**Frequency**	**m.f.**	***x* = (X-X)**	x^2	fx^2
0-10	**5**	05	25	-46 -	2116	10580
10-20	**15**	07	105	36	1296	9072
20-30	25	06	150	-26	676	4056
30-40	35	08	280	-16	256	2048
40-50	45	10	450	-06	36	360
50-60	55	12	660	+4	16	192
60-70	65	14	910	14	196	2744
70-80	75	08	600	24	576	4608
80-90	85	05	425	34	1156	5780
90-100	95	05	475	44	1936	9680
			$\sum mf$= 4080		$\sum d^2$ = 6360	$\sum fx^2$ = 49120

$$\bar{X} = \frac{\Sigma mf}{N} = \frac{4080}{N}$$

$$N = 80,\ \bar{X} = \frac{4080}{80} = 51$$

$$\text{S.D. } (\sigma) = \sqrt{\frac{\Sigma fx^2}{N}} = \sqrt{\frac{49120}{80}} = 24.77$$

(b) Assumed Mean Method

When this method is used to find out standard deviation, the following formula is used.

$$i.e. \quad \text{S.D. } (\sigma) = \sqrt{\frac{\Sigma fd^2}{N} - \left(\frac{\Sigma fd}{N}\right)^2}$$

Where d = (X-A)

(X-A) A is Assumed Mean

N is No. of observation.

Steps

(i) Take the deviations of each item/midpoint from an arbitrary average (i.e. Assumed Mean) and denote these as A.

(ii) Multiply these deviations with frequency and obtain *fd.*

(iii) Obtain the squares of the deviation and obtain fd^2 and $\sum fd^2$.

(iv) apply the formula.

Example

Find S.D. of the previous example by Assumed Mean Method.

• Solution

Marks	*f*	*m*	*d* = (m-A)	*fd*		*d*^{2}	*fd*^{2}
0-10	05	5	-40	-2001		1600	8000
10-20	07	15	-30	-210		900	6300
20-30	06	25	-20	-120	-610	400	2400
30-40	08	35	-10	-80-1		100	800
40-50	10	45	0	0		0	0
50-60	12	55	10	120"		100	1200
60-70	14	65	20	280		400	5600

70-80	08	75	30	240	1040	900	7200
80-90	05	85	40 -	200		1600	8000
90-100	05	95	50	250.		2500	12500
	N = 80			$\sum fd$ = 480			$\sum fd^2$ = 52000

Let assumed mean be 45.

$$\text{S.D. } (\sigma) = \sqrt{\frac{\Sigma fd^2}{N} - \left(\frac{\Sigma fd}{N}\right)^2} = \sqrt{\frac{52000}{80} - \left(\frac{480}{80}\right)^2}$$

$$= \sqrt{650 - 36} = \sqrt{614} = 24.77 \text{ Ans.}$$

Step Deviation Method

In order to simplify the calculation, in case of equal class interval in a series, step deviation method can be used. In this method, deviations of mid points from assumed mean is taken and these deviations are devided by width of equal class interval. The formula used is :

$$\text{S.D. } (\sigma) = \sqrt{\frac{\Sigma fd'^2}{N} - \left(\frac{\Sigma fd'}{N}\right)^2} \times i$$

- Steps

(i) Obtain the mid points of each class interval.

(ii) Take an arbitrary average i.e. Assumed Mean.

(iii) Obtain the deviations of each mid point from the assumed mean and denote these deviations as d.

(iv) Take common factor of *d* or divide *d* by with of equal class intervals and denote it as *d'*.

(v) Multiply *d'* with corresponding frequency (f) and obtain *fd'*, $\sum fd'$.

(vi) Square *d'* and multiply them with the respective frequencies Obtain $\sum fd'$.

(vii) Apply the formula.

- Example

Find S.D. of the following series by step deviation method

Class	/
0-10	5
10-20	7
20-30	18
30-40	17
40-50	18.
50-60	20
60-70	03
70-80	08
80-90	07
90-100	5
	N = 100

Solution

Class	m	*f*	*d* = (m-A)	*d'* (m-A)/i	*fd'*		d'^2	fd'^2
0-10	5	05	-50	-5	-25		25	125
10-20	15	07	-40	-4	-28		16	112
20-30	25	18	-30	-3	-54		9	162
30-40	35	17	-20	—2	-34	-159	4	68
40-50	45	18	-10	-1	-18 _		1	18
50-60	55	20	0	0			0	0
60-70	65	03	10	1	3		1	3
70-80	75	08	20	2	16		4	24
80-90	85	07	30	3	21	60	9	63
90-100	95	05 N-100	40	4	20 J $\sum fd'$= 99		16	80 $\sum fd'^2$ 635

Let the assumed mean be 55 A = 55

Class interval $i = 10$

$$\text{S.D. } (\sigma) = \sqrt{\frac{\Sigma fd'^2}{N} - \left(\frac{\Sigma fd'}{N}\right)^2} \times i$$

$$= \sqrt{\frac{655}{100} - \left(\frac{99}{100}\right)^2} \times 10$$

$$= \sqrt{6.55 - (.99)^2} \times 10$$

$$= \sqrt{6.55 - 0.98} \times 10 = \sqrt{5.57} \times 10 = 2.36 \times 10 = 23.\sigma \text{ Ans.}$$

Relation between Measurements of Dispersion

In a normal distribution, the various measures of dispersion bear a fixed relationship with each other. The Quartile Deviation is small, Mean Deviation is next and standard deviation has the largest value.

$$\text{Q.D.} = 2/3\,\sigma$$
$$\sigma = 3/2\ \text{Q.D.}$$
$$\text{M.D.} = 4/5\,\sigma\ ,\ \sigma = 5/4\ \text{M.D.},\ \text{Q.D.} = \frac{5}{\sigma}\ \text{M.D.}$$

Co-efficient of Variation

The relative measure corresponding to Standard Deviation is co-efficient of variation. This is developed by Karl Pearson. When the variability of 2 or more series are to be compared, co-efficient of variation is generally used. The series for which co-efficient of variation is greater, the series is said to be more variable or less consistent, or less uniform and vice versa.

Co-efficient of variation is denoted by C.V. and formula is :

In the last example $\sigma = 23$.

$$\bar{X} = A + \frac{\Sigma fd'}{N} \times i$$
$$= 55 + \frac{99}{100} \times 10$$
$$= 55 + .99 \times 10 = \mathbf{59.9}$$
$$\text{C.V.} = \frac{\sigma}{\bar{X}} \times 100$$
$$= \frac{23}{59.9} \times 100 = 38.39\ \mathbf{Ans.}$$

• *Variance*

The term variance is introduced by R.A. Fisher in 1913, It is highly important in advanced work. It is nothing but square of standard deviation.

So variance = σ^2

or variance = $\left\{\frac{\Sigma fd^2}{N} - \left(\frac{\Sigma fd}{N}\right)^2\right\} \times C^2$

In the previous example $\sigma = 23$

variance = $23^2 = \mathbf{529}$

5.7 Merit of Standard Deviation

(i)It is the best known measure of dispersion. It satisfies almost all features of good measure of variation.

(ii) It is based on each and every item of the series. As standard deviation is based on arithmetic mean, it considers all items of series.

(iii) It is capable of further algebraic treatment. Standard deviation can be computed.

(iv) Co-efficient of variation is the best measure for comparability of series, which is based on standard

Deviation.

(v) It has sampling stability. It is less affected by sampling fluctuations.

(vi) It has high degree of accuracy

5.8 Demerit of Standard Deviation

(i) As compared to other measures of dispersion, its calculation is very tedious and time consuming.

(ii) It is unduly affected by extreme items

In spite of the above limitations, it is very popular in comparison with other measures of dispersion.

5.9 Summary

The standard deviation is a measure of the amount of variation of a random variable expected about its mean. A low standard deviation indicates that the values tend to be close to the mean of the set, while a high standard deviation indicates that the values are spread out over a wider range.

5.10 Self Assessment Questions

1. Discuss how to calculate standard deviation.
2. Explain the merits of standard deviation.
3. Explain the demerits of standard deviation.

5.11 Key Words

Standard Deviation: The standard deviation is a measure of the amount of variation of a random variable expected about its mean. A low standard deviation indicates that the values tend to be close to the mean of the set, while a high standard deviation indicates that the values are spread out over a wider range.

5.12 Study Guide

1. Goode and Hatt, Methods of Social research
2. Young, P.V.,Social Survey and Social Research
3. Wilkinson and Bhandarkar,Methodology and Techniques of Social Research

Block-02 Qualitative Methods in Social Research:

Unit-06 Case study Method in Social Research

Structure

6.1 Learning Objectives

After going through this unit, the learner will be able-

1. To learn about case study method in social research.
2. To explain the characteristics of case study method.

6.2 Introduction/ Assessment of Prior Knowledge

A case study is an in-depth, detailed examination of a particular case within a real-world context. For example, case studies in medicine may focus on an individual patient or ailment.

6.3 Case study method in social research

Case Study Method: As a traditional method of qualitative analysis, case study is an intensive study through which the researcher recognizes precisely the factors and causes of a particular phenomenon. Developed particularly in the U.S.A., this tool of social investigation explores and analyses the "life of a social unit, be that a person a family, or institution, cultural group or even entire community"1. Despite the increased use of quantitative methods andtechniques, the case study method continues to play a stellar role in the fields of sociology, education, psychology, economics and political science.

Case study, intensive investigation of a particular unit, is often designated as a method, a technique and even an approach to social reality as well as a mode of organising data about an individual, a family or a group of persons. In order to identify the causal factors, case study not only examines the complex situation, but also the combination of factors operating within it.

Although the term 'case' has different implications in different disciplines or professions, the fact remains that it refers to a unit of study in their respective field. Accordingly in the field of social research unit may be a person, an episode in a person's life, a group of persons, a family, or a class comprising persons, a concrete shape of relationship, a specific process, a concrete shape of relationship, a specific process, on institution or even on entire culture. Even deviant cases, extreme cases, negative cases or typical cases may be selected for study, basing on the presumption that the usual quantitative methods fail to take into account the unique features and complex nature of each case alongwith its failure to yield non-additive and non-qualitative data. However, each case is non-comparable.

Evolution of the Case Study Method

First all, Fredrick Leplay introduced case study method into the field of social scientific investigation, although Herbert Spencer, the British social thinker, according to Burgers, was

first among those who used case materials in his comparative studies of different cultures. In the field of psychiatry, William Healy was first to adopt the case study method while dealing with juvenile delinquents. However, case study method in the field of sociological research was made by Thomas and Znaniecki in their monumental work 'Polish Peasant', They conducted case studies by using personal diaries, letters, autobiographies and the ales of social agencies. In their search for concrete and specific d ;tails about personal conduct and group behaviour in the context of culture, Thomas and Znanicki took recourse to case studies. They suggested that case study method is the most suitable alternative to life history method which always has the difficulty in obtaining adequate number of records covering the totality of a social problem.

As regards the standard for judging the adequacy of Case History, John Dollard has advanced the following six criteria :

Notwithstanding the possibility of being singled out as an individual study, the subject must be visualised in a cultural series, as a member of a community or a culture group.

Individual's behaviour must be viewed as socially relevant.

The subject's family, in the study, must be visualised in its role of submitting to the way of life of the group.

The social scientist must embark upon showing the specific method of elaboration of organic materials into social behaviour.

Continuous related character of experience from childhood through adulthood should be stressed.

The social scientist must study the social situation so as to learn kind and degree of social pressures.

Criteria for broadening the perspectives of case data Gorden AUport has proposed the following six criteria for broadening the perspectives of case data :

Life history, written in the first person, must be complete and coherent as far as practicable.

While writing the life history, the type of readers should always be kept in mind. For example, if the enquiry is sociological, the writer should presume that the readers are the knowledeable persons in the field of sociology.

The case material. Repeated interviews with the person

and personal interviews with the members of the subject's own group, well acquainted with him, is advised.

Attempt should be made to ensure the reliability of data concerning life-history through examining the internal consistency of the material, repeat interviews with the persons and personal interviews with the members of the subject's own group who are well-acquainted with him.

Culturally meaningful and scientifically significant data are to be secured. A judicious combination of techniques of data collection may be construed as its pre-requisite.

Case-history or life-history may serve as the adequate basis for generalization, being construed as the typical representatives of a particular group.

6.4 Definition of case study method

According to Biesanz and Biesenz "the case study is a form of qualitative analysis involving the very careful and complete observation of a person, a situation or an institution." In the words of Goode and Hatt, "Case study is a way of organising social data so as to preserve the unitary character of the social object being studied," P.V. young defines case study as a method of exploring and analying the life of a social unit, be that a person, a family, an institution, cultural group or even entire community." In the words of Giddings "the case under investigation may be one human individual only or only an episode in first life or it might conceivably be a Nation or an epoch of history." Ruth Strong maintains that "the case history or study is a synthesis and interpretation of information about a person and his relationship to his environment collected by means of many techniques." Shaw and Clifford hold that "case study method emphasizes the total situation or combination of factors, the description of the process or consequences of events in which behaviour occurs, the study of individual behaviour in its total setting and the analysis and comparison of cases leading to formulation of hypothesis."

6.5 Characteristics of case study method

Keeping in view the definitions cited above, the following characteristics of case study method may be given:

A method of exploring and analysing the life of a social unit—A social unit in the case study method may be a person, a family, institution or a community or even a cultural group. This method may incorporate within its fold even an abstract thing4ike a set of relationships or processes.

In this method of study, a large variety of units are selected. According to **Goode** and **Hatt,** it is an approach which views any social unit as a whole. Therefore, the size of the unit may be quite large to cover the entire community. The statistical method differs from the case study method in this respect, as the statistical method takes into account a certain aspect of the problem and gathers information about it, with the presumption that each individual set of behaviour is complete in itself and segregated from the life of the unit as a whole. In the words of **Stuart A. Queen** "Case study is the examination of a single situation, persons, groups or institutions as complex wholes in order to identify types and process".

Intensive study. Case study aims at deep and thorough study of a social unit. Unlike a case work., it refers to the intensive investigation. The case study approach is the intensive study of selected instances of the phenomenon in which one is interested. It deals with every aspect of a unit. Therefore James **A. Black** and **Deon J.** Ghampeon remark that "Case studies are usually characterised as thorough examination of specific social settings or particular aspects of social settings including varying detailed psychological descriptions of persons in these settings". Thus it is an intensive study through which one can know precisely the factors causing a particular phenomenon.

Qualitative in character. Although traditionally case study has been a method of qualitative analysis, it continues to be an important method in social sciences research despite the increased

use of quantitative methods and techniques. In this method' the researcher's power of observation and sense of logic assumes greater significance than the facts themselves.

Small number of units. Although there is no hard and fast rule regarding the number of units as well as the mode of their selection, the number has to be small, varying from a single unit to a few down or even a far hundred and are to be selected as the representative units as few as practicable. But in any case, it must be borne in mind that the least number of units and the most representative units are selected as the study is a more detailed one, extending over a wider expense of life.

% Basic Assumptions:

The following are the basic assumptions of Case Study : **1. Persistence of the identity of human nature**: Although the social units are different in some respects, they are also identical in some respects. In spite of the uniqueness of a particular unit, there is also similarity, Therefore, we may presume that there is an underlying unity amidst apparent diversity among different units, so much so that there may not be any difficulty on the part of a unit in representing group. This underlying unit enables us to study a representative unit as a type rather than a representative unit as a type rather than a pure individual. On the basis of this assumption, the inference is drawn from a single unit or a small number of units to the entire group, enabling the prediction and control of social phenomena. Psychologist **Allport** holds that some statements about human nature broadly apply to each individual or to each member of a broader group. Noted anthropologist, **Corn Dubois** also contends that because of certain basic homogeneity or similarity shown in the mankind, we are able to embark upon the comparative studies or personalities as determined by variations in culture.

Unit as an indivisible whole. Another fundamental assumption of case study is the acceptance of the totality of the being and difficulty of studying the unit in a piecemeal manner or by fragments. Even the study of a unit in this situation at any particular point

of time is inadequate. Rather his behaviour at a particular point of time can really be explained in the context of his background, his whole life history. On account of this assumption, case study involves the complete observation of a person, a situation or an institution.

Complex nature of social phenomena. The social observer finds it difficult to scientifically test the complex social data as human behaviour is influenced by a number of factors, such as, physical, social, temperamental, psychological etc. Man's life being largely subjective, the social scientist is incapable of observing those unknown aspects. Without having keen insight, a deeper proble necessitates a small, inclusive, intensive and a sympathetic study of an individual or any social unit.

Importance of historical perspective. Case study is a method of exploring and analysing of life of a social unit in a detailed manner extending over a wider expense of time as social phenomena are subject to the influence of time. Unless a problem is studied in its historical perspective, the real motives behind any action cannot be traced out. The study of any social phenomenon would not be construed complete without knowing historical background because social phenomena are the consequences of a full cycle of time in respect of any social unit.

6.6 Sources of case data

There are two main sources of case data : *(a)* Personal documents (6) Life history

(a) Personal documents

Personal documents which relate to the personal life of the people include diaries, autobiographies, memories, letters etc. Such documents provide the researcher with adequate information regarding various events concerning the lives of the social units. An analysis of such personal documents not only reveals the occurrences of various stages or circumstances in the life of a social unit, but also helps in cognizing the attitudes and experiences of the social units concerned. Quite a good number of individuals maintain diaries or write their

autobiographies. Even some people write their memories.

All these personal documents throw ample light on their personal life, particularly on the remarkable events of the their own lives, which otherwise would remain unexplored. That apart, these records also provide psychological or mental aspects of the narrator, informa;′. regarding social relationship and placement of the individual in the social setting. These personal documents, if maintained frankly and fairly, unearth the secret aspects of the narrator and play a stellar role in providing the researcher with the most useful data. Therefore Allport has rightly described the personal documents as "Self revealing records which intentionally or unintentionally yield direct information regarding the structure, dynamics and functioning of author's mental life". Highlighting the significance of personal documents, P.V. Young has also held that, "personal documents represent continuity experience which helps to **illuminate** the writer's personality, social relations and philosophy of life often expressed in objective reality or subjective appreciation".

Although the writer's personal documents relate to his personal life, those may also represent the reactions to different circumstances of any typical member of the social group as the narrator himself is a part and parcel of that group.

(b) Life history

If the case study method, life histories appear to be significant mainly at least in a couple of ways ; first, as the narration of various events of the life of a social unit and secondly as revelation of the motives and significance .of each event to the social unit on the one hand and the society in its entirety on the other. The main difference between life history and the pure historical narrative is that whereas the former attempts in revealing the meaning and significance of these events in the context of motivating factors of social life, the latter endeavours to narrate tire facts only. Therefore, life history assumes greater significance because it not only incorporates various events of the life of a social unit, but also depicts their

significance to the society.

A good life history depicts detailed information about the entire range of life of the social unit, from his embryonic stage to his old age. Data relating to life history are collected through prolonged interviews with the social unit, from written documents available and the analysis of facts. Thus, preparation of a life history is dependent on both the written sources as well as interviewing books, journals, magazines, literature, previous studies, governmental documents and communication issued to the public at various points of time. As regards the coverage of data concerning case studies, P.V. Young holds that they may include periodical conferences, important conversations, dramatic productions, post- experimental interviews and observation in its simple verification and may also range to more complicated processes, such as experimental studies, hypnotic tests, social reaction to frustration, tests of imaginal productivity, psychological insight, aesthetic appreciation, emotional conditioning, tests of ability etc.

• **Advantages of Case Study Method**

Human thinking always covers a field larger than our measurements. The pre- conception shaping our ends, our first glimpses of new problems and our widest generalization always pave the way for qualitative measurement. Therefore, Mitchell has held that "even in the w.ork of the most statistically minded, qualitative analysis will keep a place". The case study, in the words of **Biesanz** and **Biesanz,** being a form of qualitative analysis involving the very careful and complete observation of a person, a situation or an institution" meets the requirement even in those sciences where quantitative measurement is sufficient in vogue.

6.7 Merit of case study method

(1) Possibility of an intensive study. Yang Hsin Pao has stated that case study method is a small inclusive and intensive study of an individual in which the investigator brings to bear all his skills and methods or as a systematic gathering of enough information about a person to permit one to understand how he or she functions as a unit of society.

Being intensive, this method becomes extremely helpful for deep probing, which is the hallmark of any standard research work.

(2) Helpful in the formulation of valid hypothesis. A thorough analysis of various cases, facilitated by case documents enables the researcher to arrive at various generalizations, and, thereby develop useful hypotheses. In this regard, **Goode** and **Hatt** have rightly held that "it is often true that the depth of insight afforded by case study will yield fruitful hypotheses for a later, **full** scale study".

(3) Coverage of subjective aspects. Social phenomena are cognized only symbolically through words, abstract things like tradition, custom, feeling, attitude, values etc. which remain in the realm of subjective world. Because of lack of objectivity the verification of social phenomena is not possible directly through senses. But since case study method stresses on the psychology of a social unit, his behavior, the circumstances and his response to different situations of life, the subjective aspects are easily covered to be studied under the gamut of this method.

(4) No need of sampling.. The social units are dissimilar in many respects, so much so that no two persons are alike. Because of this nature of social phenomena, characterized by lack of homogeneity, sampling may involve scores of problems. The sample may lack in representativeness and adequacy. There is also every possibility of bias and prejudices which are most likely to creep into the sample. But in the case study method there is no necessity of selecting any sample. The researcher makes himself free from the botheration of sampling. On the other hand, the individual unit is studied thoroughly so as to be placed in a definite stratum.

(5) Possibility of locating the deviant cases. Although generally the deviant cases are most likely to be ignored due to their behaviour against tentative generalization from the scientific analytical view point, they assume greater significance because such analysis may result in the clarification of theory. Case study method provides the researcher with such

a scope.

(6) Enlargement of the range of personal experience :

In the case study method, the investigator gets a chance to study all aspects of a social unit in the context of its past, present and the future, as against the **statistical** method which generally covers a harrow range of aspects, delimiting the researcher's intellect to some particular aspect only. The case study method provides the researcher with adequate knowledge not only to conduct his present investigation but also for all subsequent research work.

(7) Helpful in comparative analysis : This method also helps the researcher to undertake two different sets of cases for comparison, although in reality it becomes a herculean task to select two different types of cases. But once undertaken, such a comparative analysis becomes an easy task on the part of the researcher.

(8) Valid study of social problems : There are some social problems which do not occur as single incidents. Rather, they constitute a process and occur in a sequential manner. The nature of such problems can be suitably determined and analysed by case study method.

6.8 Demerit of case study method

The case study method, inspite of its utility as a qualitative method, also has certain disadvantages which must be taken care of, while employing this method. Some such limitations are given below:

Problem of generalization. Generalization based on findings of a few cases may not actually be construed as the common trait of human nature. Rather they may present the personal peculiarity of the individual social units under certain social circumstances. Therefore, the findings of case study and the generalization drawn there upon hardly indicate the common traits.

Problem of objectivity. The researcher may not be able to maintain objectivity in case study method because of his excessive association with the social unit under

investigation. The social unit itself may develop to provide the researcher with self-justifictory data which are far from being factual.

Difficulty in comparison. Because of wide variations among human beings in terms of their response and behaviour, attitudes and values, social setting and circumstances, etc., the researcher actually finds it difficult to trace out two social units which are identical in all respects. This hinders proper comparison of cases.

A loose and unsystematic method. The data collected in case study method may not stand the test of verification as no control is excercised upon the social unit under study. The researcher only spends his energy, money and time in collecting **the** required information without providing any scope to other investigator for working on the same case. This leaves the case data unchecked and accepted by the society.

A time, energy and money consuming method.

The preparation of a case history involves a lot of time and expenditure **.of** human energy, because the researcher incorporates in the study all aspects of the social unit in its past, present and future perspective. Therefore this method also entails huge financial expenditure. That apart, there is every possibility that most of the cases may get stray. Due to such difficulties, only a few researchers can afford to case study method.

Ad-hoc theorizing.

In this method the researcher does not follow any specific way of picking up the case. Rather, while picking up the case his own choice is taken into account, without any criteria, Moreover while explaining a particular phenomena, he advances some common sense explanation on the basis of the presumption that even his common sense explanations, devoid of any scientific touch, are the most scientific ones. Thus the investigator tends towards ad-hoc theorizing and the case study method is left with maximum

ad-hocism.

Scope for wrong conclusions. The case study is laden with inaccurate observation, wrong inferences, faulty reporting, memory failure, repression or omission of unpleasant facts in an unconscious manner, dramatization of facts, more imaginary description, and difficulty in choosing a case typical of the group. All these problems provide the researcher with every possibility of drawing wrong conclusions and errors.

Unreliable source material. The two major sources of case study are : Personal documents and life history. But in both these cases the records or the own experience of the social units may not present a true picture. On the contrary, the social unit may try to suppress his unpleasant facts or add colour to it. As a result, the conclusions drawn do not give a true picture and dependable findings.

Possibility of betrayal of memory. For cognizing the life history, the researcher depends too much on the memory of the social unit. But it may so happen that the social unit may not always[1] recollect his memory or his memory may betray him while describing the required facts or events or life.

Time span. Long time span may be another factor which is likely to distort the information provided by the social unit to the researcher.

6.9 Summary

Case study, intensive investigation of a particular unit, is often designated as a method, a technique and even an approach to social reality as well as a mode of organising data about an individual, a family or a group of persons. In order to identify the causal factors, case study not only examines the complex situation, but also the combination of factors operating within it.

6.10 Self Assessment Questions

1. Explain briefly the relevance of case study method in social research.
2. Discuss the characteristics of case study method.

6.11 Key Words

Case study: A case study is an in-depth, detailed examination of a particular case within a real-world context. For example, case studies in medicine may focus on an individual patient or ailment.

6.12 Study Guide

1. Goode and Hatt,Methods of Social research
2. Young, P.V.,Social Survey and Social Research
3. Wilkinson and Bhandarkar,Methodology and Techniques of Social Research

Unit-07 Qualitative Data Format and Processing

Structure

7.1 Learning Objectives

After going through this unit, the learner will be able-

1. To know about qualitative data format and processing.
2. To major types of qualitative data.

7.2 Introduction/ Assessment of Prior Knowledge

Qualitative research is a type of research that aims to gather and analyse non-numerical data in order to gain an understanding of individuals' social reality, including understanding their attitudes, beliefs, and motivation.

7.3 Qualitative data processing

The way datasets are processed usually can be split into two main activities: checking and converting the dataset and generating metadata. Checking the dataset consists of carrying out activities such as checking the completeness and quality of data, the relationships between data items (e g. interviews, fields and audio recordings), and anonymisation. Converting data consists of transferring data to a format suitable for both preservation and dissemination.

The level of processing assigned by Qualitative data governs the thoroughness and complexity of the checking, converting and metadata creation activities. Category 'A*' and 'A' receive the same stringent standards of checking, but A requires additional work to prepare them data for dissemination. Category 'B' datasets receive intermediate checks and conversion work, and Category 'C' receive only basic checks and no conversion.

The second main processing activity, generating metadata, refers to the contextual information generated during processing, such as the creation of Data Listing of interviewee biographical details that enables transcripts to be identified, or ensuring that speaker and interviewer tags and questions or topic guide headers are added. A key function of the output generated during processing is to enable users to locate transcripts or specific items in a data collection most relevant to their research.

To understand how data are processed, it is necessary to understand the principal types of data that Qualitative data receives. This topic is covered in the following section.

7.4 Definitions of data types

Qualitative data is concerned with research data arising from the range of social science

disciplines, including sociology, social policy, anthropology, social and economic history, political science, social and human geography and social psychology. Qualitative data are data collected using a qualitative methodology - defined by openness and inclusiveness, aiming to capture participants' lived experiences of the world and the meanings they attach to these experiences from their own perspectives. Moreover, a qualitative perspective encompasses a diversity of methods and tools rather than a single one. As a result data types extend to: in-depth or unstructured interviews, field and observation notes, unstructured diaries, personal documents, photographs and so on. The methods chosen depend on aim of the study, the nature of the sample, and the discipline. Finally, qualitative research often involves producing a large amount of raw data (audio, text, photographs for example) although the methods typically employ relatively small sample sizes.

Qualitative data deals with all formats of data: in digital format, paper format (typed and hand- written), audio, video and photographic. Much qualitative data nowadays is 'born' digital in the sense that the text is word-processed and audio-visual material is in a digitally recorded form.

7.5 Major types of qualitative data

1. In-depth/unstructured interviews (audio/videorecordings /transcripts/verbatim recorded/summaries)
2. Semi-structured interview (audio/videorecordings /transcripts/ verbatim recorded/summaries)
3. Structured interview questionnaires containing substantial open comments (Interview notes)
4. Group discussion (audio/videorecordings /transcripts/ verbatim recorded/summaries)
5. Thematically organised interview/group discussion materials or field notes
6. Unstructured or semi-structured diaries
7. Structured/time budget diaries containing substantial open comments
8. Participant observation field notes/ technical fieldwork notes
9. Kinship diagrams/other anthropological materials
10. Case study notes
11. Minutes of meetings
12. Observational recordings (e.g. in psychology and education)

13. Psychological test data
14. Personal documents (e.g. letters, personal diaries, correspondence)
15. Press clippings
16. Photographs
17. Naturally occurring speech/conversation (audio/video/transcripts)

The most common type of data that Qualitative data deals with are in depth, semi-structured and focus group transcripts. The type of data and format govern how the data are processed, as discussed in the following section.

7.6 Format of data

An increasing proportion of datasets arrive at Qualitative data in word-processed format. These may be accompanied by audio-recordings, which generally are not in digital format. Other digital formats received are, for example, extracts of more structured interview material in the form of databases or spreadsheets. Whole projects are sometimes deposited in a Computer Assisted Qualitative Data Analysis Software (CAQDAS) format, for example, NUD*IST or WinMAX, although depositors are advised to export the data into a non-proprietary format. Non-digital formats include paper, audio or video cassette, newspaper clippings and photographs.

7.7 Summary

Qualitative data describes qualities or characteristics. It is collected using questionnaires, interviews, or observation, and frequently appears in narrative form. For example, it could be notes taken during a focus group on the quality of the food at Cafe Mac, or responses from an open-ended questionnaire.

7.8 Self Assessment Questions

1. What are the various types of qualitative data?
2. What is data format?
3. What is data processing?

7.9 Key Words

Qualitative data format: Quantitative data is data that can be counted or measured in numerical values. The two main types of quantitative data are discrete data and continuous data. Height in

feet, age in years, and weight in pounds are examples of quantitative data. Qualitative data is descriptive data that is not expressed numerically.

7.10 Study Guide

1. Goode and Hatt, Methods of Social research
2. Young, P.V.,Social Survey and Social Research
3. Wilkinson and Bhandarkar, Methodology and Techniques of Social Research

Unit-08 Validity in Qualitative Research

Structure

8.1 Learning Objectives

After going through this unit, the learner will be able to-

- To understand the concepts of validity in qualitative research.

8.2 Introduction/ Assessment of Prior Knowledge

Validity is the main extent to which a concept, conclusion, or measurement is well-founded and likely corresponds accurately to the real world. The word "valid" is derived from the Latin validus, meaning strong. The validity of a measurement tool is the degree to which the tool measures what it claims to measure

8.3 Validity in qualitative research

Conclusions, based on the result of analysis, are the general principles or generalisations which are made applicable to the relevant whole. In social research the findings are construed to be the representative of the entire universe, implying that if the results are not worth generalisation, those cannot be accepted as valid or real. Hence, generalisation testifies the validity of the conclusions and thereafter only it will contribute to knowledge. As the investigator, in content analysis, is concerned with formulation of general principles, he cannot confine himself to the analysis alone. In order to say the general principles applicable to the entire universe he will have to bank not only upon the logical use of the data but also fulfil certain basic conditions and situations.

With a view to making the analysed data the representative of the universe, the researcher is required to draw a sound sample of the material for his study. For example, if the investigator is interested in the analysis of the concern of the mass media in India in regard to forest conservation, the basic task of the researcher is to define the universe. In this context, his universe is the national mass media. Since the behavioural sciences lack in providing the researcher with the very sound technique of sampling from mass media, it is but quite natural that the researcher is confronted with a wide range of materials in newspapers, magazines, radio and television broadcasts which form potential determinants of public attitude towards forest conservation. Otherwise also, if the researcher confines himself to newspapers, it would not be satisfactory to prepare a list of all the newspapers.

8.4 Summary

The generalisation testifies the validity of the conclusions and thereafter only it will contribute to

knowledge. As the investigator, in content analysis, is concerned with formulation of general principles, he cannot confine himself to the analysis alone. In order to say the general principles applicable to the entire universe he will have to bank not only upon the logical use of the data but also fulfil certain basic conditions and situations.

8.5 Self Assessment Questions

1. Discuss the meaning of validity.
2. Explain the importance of validity.

8.6 Key Words

Validity: Validity is the main extent to which a concept, conclusion, or measurement is well-founded.

8.7 Study Guide

1. Goode and Hatt, Methods of Social research
2. Young, P.V.,Social Survey and Social Research
3. Wilkinson and Bhandarkar, Methodology and Techniques of Social Research

Unit-09 Reliability in Qualitative Research

Structure

9.1 Learning Objectives

After going through this unit, the learner will be able to-

- To understand the concepts of reliability in qualitative research.

9.2 Introduction/ Assessment of Prior Knowledge

Reliability in qualitative research is used very often. In social research the researchers should have an agreement about the various aspects of the data to be analysed. It becomes difficult to reach any conclusion in the absence of common agreement about the outline of the analysis. To quote Festinger and Katz, "Objectivity requires, therefore, explicit specifications of the variables (sometimes referred to as "dimension" or "types of attributes") in terms of which descriptions are to be made".

9.3 Reliability in Qualitative Research

The problem of reliability influences every aspect of social research. The social phenomena being a complicated affair, because of its concern with human beings and qualitative nature of data, the data are not necessarily reliable and valid. For instance, if a researcher is interested to make an analysis of the political speeches delivered by different leaders and published in several newspapers, the initial problem which confronts the investigation is to provide the analysis of data from the speeches of political leaders so as to enable the investigator to observe them in an objective and reliable manner. Reliability involves a couple of broad aspects, such as; *(i)* agreement with regard to the outline of analysis, *(ii)* defining various categories of data.

In social research the researchers should have an agreement about the various aspects of the data to be analysed. It becomes difficult to reach any conclusion in the absence of common agreement about the outline of the analysis. To quote Festinger and Katz, "Objectivity requires, therefore, explicit specifications of the variables (sometimes referred to as "dimension" or "types of attributes") in terms of which descriptions are to be made".

As regards the problem concerning definition of various categories of the data, there is every possibility that the researchers are likely to agree about different aspects of the information to be described and analysed. Nevertheless, disagreement may crop up regarding 'coding', necessitating the determination of the codes about the data as well as the attributes and characteristics of the data. Thereafter, different groups of data may be placed under various categories on the basis of their own characteristics. Practical and experimental definitions about various categories of

data are required for formulation of principles and rules in this regard. Hence, codes should be determined for use in various categories published in India and select the sample on the basis of systematic sampling. Moreover, he may also find it difficult to exercise control to ensure that newspapers representing different parts of the country, political orientations and socio-economic categories are chosen on the basis of proportionate stratified random sampling method. In this method, difficulties are very likely to arise because the researcher may not be able to completely ascertain the influence of the newspapers, notwithstanding their size or place of publication. He may also face a dilemma tic situation in deciding whether a realistic sample of the local newspaper will weigh equally with that of a giant daily, published from metropolitan cities. In studying mass media, another major sampling issue as observed by Selltiz *et at.* is the time problem wherein the researcher is more likely to obtain a distorted impression of the general policy of newspaper, in case he selects the editions of only a single day or even a single month as a sample. Such a problem arises due to the reason that the usual attitude of the newspaper is likely to be obscured on account of a particular event which happened on that day or during that month. Otherwise also, if the investigator takes into account a period covering several Months, his task becomes unmanageable.

Another problem of generalisation relates to the formulation and application of general principles or general theories on the c o nditions under which the conclusions are obtained. It implies that the application of general theories, collection of data and drawing conclusion should be done under the same conditions. Any discrepancy in the conditions will make it impossible on the part of the researcher for formulation and application of the principles properly.

9.4 Summary

Moreover, he may also find it difficult to exercise control to ensure that newspapers representing different parts of the country, political orientations and socio-economic categories are chosen on the basis of proportionate stratified random sampling method. In this method, difficulties are very likely to arise because the researcher may not be able to completely ascertain the influence of the newspapers, notwithstanding their size or place of publication.

9.5 Self Assessment Questions

1. What is reliability?

2. What is the use of reliability?

9.6 Key Words

Reliability: is the degree of consistency of a measure.

9.7 Study Guide

1. Goode and Hatt,Methods of Social research
2. Young, P.V.,Social Survey and Social Research
3. Wilkinson and Bhandarkar, Methodology and Techniques of Social Research

Unit-10 Content Analysis

Structure

10.1 Learning Objectives

After going through this unit, the learner will be able-

1. To understand the concepts of content analysis.
2. To know the objectives of content analysis.

10.2 Introduction/ Assessment of Prior Knowledge

Content analysis is the study of documents and communication artifacts, which might be texts of various formats, pictures, audio or video. Social scientists use content analysis to examine patterns in communication in a replicable and systematic manner.

10.3 Content analysis

To understand the effects of communications, investigators need accurate measures on the way in which given topic or ideas are portrayed. Documents and records constitute valuable sources Wof such data which are not accessible by the other research techniques like tests, observations, interviews and questionnaires. [The documents and records contain an assortment of information [all of which may not be relevant for scientific study of social phenomena and therefore the techniques, observation, interviews and questionnaires have been specially devised for collection of I research data. Content analysis consists of analysing the contents I of documentary materials such as books, magazines, newspapers I and the contents of all other verbal materials which can be either spoken or printed. In order to shift the data, the content of I documents, the messages have to be analysed into discrete units. I For maintaining objectivity in the analysis, it should be guided Iby rules which are formulated in an explicit and unambiguous manner so as to enable other researchers using the documents to reach the same conclusion. Moreover, clearcut definitions and consistent criteria have to be accepted for determining which [part of the document is to be incorporated and which part is to [be left out. Thus content analysis is an extensively used procedure jfor the quantitive study of messages. As a method of studying [communication, it is concerned less with the style of the text [than the ideas contained in it. This distinction is rather artificial because words express ideas. But in content analysis, the entities analysed are not usually words but meanings. The most fundamental requirement in all types of content analysis is the definition of the purpose. The study may be designed to gain an accurate description of what has been transmitted through a given medium. Its goal may be to embark upon analysis of the trends in media content. Often it may test some hypotheses from a sociological theory.

Harold Lasswell, the political theorist and researcher, popularised Content Analysis in the 1920's as a useful procedure for a communication research programme, through his basic contribution relating to the assimilation of precision into insight. However, the backbone of the modern content analysis was formed in 1950 with the publication of definitive work of Bernard Berelson . As a result of the efforts made by Lasewell and Berelson, it made great strides and emerged as a scientific approach to the analysis of mass communication documents. In order to make it more systematic and objective than conventional review of communication content, adequate control is exercised. The researcher exercises at least three types of control:

It is required that the researcher should clearly and explicitly define the categories of analysis he has selected in his study for classifying the content which enables the scientific community to apply them for classification of the same content in order to verify his conclusion.

It is also required that the researcher should make a systematic classification of all the relevant materials in his sample, preventing himself from selecting and reporting merely what appears interesting.

The researcher is required to take recourse to quantification in order to ascertain the relative importance of varied items found in the material so as to permit comparison with other samples or material.

Berelson defined content analysis "as a research technique for the objective, systematic and quantitative description of the manifest content of communication". According to L. Festinger and Daniel Katz "content analysis is a research technique for the objective systematic and qualitative description of the manifest content of communication". Through content analysis it is possible !to study the qualitative data in a scientific manner. Its technique is helpful in simplification and analysis of the data"1. In the words of Fred N. Kerlinger "content analysis, while certainly a method of analysis, is more than that. It is a method of observation. Instead of observing people's behaviour directly, or asking them jfco respond to the scales, or interviewing them, the investigator takes the communications that people have produced and asks questions of the communications". It has also been defined by Holsti Loomba and North as "any technique for making nnferences by systematically and objectively identifying specified characteristics of Message"'

Content analysis as a method of studying communications developed in the United States as a branch of social psychology Known as Communication Research. The science of

communications which covers all communications, whether public lor private, includes propaganda and advertising, is one among the important branches of social sciences. Prior to 1940's content analysis was mostly based on quantitive analysis of documentary materials concerning certain characteristics that could be identified and counted. But since 1950's the analysis has become mostly qualitative concerning the general impact of message of Bie existing documents. Carter V. Good and Douglas E. Scates risualised that as "the difference is somewhat like that between I casual interview and depth interviewing" .

10.4 Objectives

The basic object of content analysis is conversion of the lualitative data into scientific form. The guiding principle of the analysis should not be just a description of the content by way of classification of the analysed units into a set of categories, rather these attributes have to be utilized for establishing the relationship between them and other attributes of the document, the producer of the document or the person(s) associated with the document. Only thereafter the analysis would serve a scientific purpose. In the words of Leon Festinger and Daniel Katz "the objective of content analysis is to convert recorded 'raw' phenomena into data which can be treated essentially in a scientific manner so that a body of knowledge may be built up. More specifically, content analysis must be conducted so as to create reproducible or 'objective' data, which are susceptible to measurement and quantitative treatment, have significance for some systematic theory and may be generalised beyond the specific set of material analysed". Berelson has given some specific purposes of content analysis which are shown in the table given below:

Category of Purpose content

1. Analysis of Specific Purpose

(a)To discover differences in communication content across nations,

(b) To describe the development process of scholarship.

(c) To identify communication content trend.

(d) To evaluate communication content vis-a-vis its objectives.

(e) To facilitate technical research operations.

(f) To provide a comparison ofmedia or level of communication.

g) To evolve and employ communication standards.

(h) To fmd out stylisticcharacteristics.

(i) To discover techniques oi propaganda.

(j) To measure the extent readability of tion materials.

Category of Purpose Analysis of producers or causes of content.

10.5 Utility of content analysis

Since content analysis is construed as a technique for conversion of symbolic behaviour of the individuals into scientific data, it simplifies various scientific processes and helps in classifying and organising the unorganised mass of the data. It is helpful in providing the data with a scientific form and organising the mass of data on scientific line. Therefore, content analysis is immensely helpful in social research. The utilities of content analysis may be given under the following heads:

***(I)* Complete Description of Communication Content** — Content analysis describes the trends in communication content and makes an analysis of the changes that have occurred during a particular time period through comparative method. It adopts ^fr uniform method of classification throughout the study. Because it is a complete description of various trends of communication, the investigator may have to repeat the questions relating to the samples many a time so as to make the ideas pertaining to changes clear to people.

***(ii)* International differences in communication ate manifested in content analysis**— Due to developed communication network the world is getting closer and smaller day by day. People all over the world have developed interest in problems concerning international impact and ramifications. The main ways of communication of ideas through mass media, such as the television, radio, newspaper, journals, etc., are studied through content analysis. These means of communication have narrowed down the gulf between different countries and nations because the world is going to be a community. From this angle content analysis may be visualized as having international bias.

(ii) **Content analysis is helpful in the comparative study of various levels of communication**—As communication has various levels and each level has its own importance and utility, a comparative study of various levels of communications is an imperative. Content analysis fulfils this requirement. For example, the same news are published in different newspapers in different ways, depending upon the news agency through which the information is gathered. Thus differences are created due to varities of

informations, calling for a comparative study to be made through content analysis.

(iv) **Content analysis helps in constructing, applying and maintaining standard in communication**—As the basis of social interaction communication plays a significant role in the society. Its agencies and means are very important for the society. Their importance is assessed on the basis of their contribution to society and levels of communication. This warrants a definite standard of ideal form. In order to make the comparative study easy, the researcher always keeps in view a particular standard at the time of construction of different means *of* communication. Thus content analysis helps in construction and application of communication standards.

(v) Content analysis helps in the study of various propaganda techniques*—In the age of* publicity propaganda, there is the requirement for employing techniques and methods for attracting people towards certain ideals and issues. Content analysis is helpful in extending the propaganda techniques and methods. To speak little differently, content analysis helps in the study of very many propaganda techniques and becomes instrumental in orienting people to various ideas and ideals.

(vi) **It is helpful in determining and tracing the psychological state of various groups**—This use of content analysis appears to be more psychological than anything else. The study of personality of various members of the group and the groups themselves are warranted because we want to study the working of various groups and the efficiency of various propaganda techniques.

As regards the positive aspects of content analysis, in modern times, it has enhanced the capacity of the researcher to utilise communication content for different research purposes as a result of its capacity to make quantification of the qualitative material. According to **Woodrum**, a properly used content analysis explicity has the following advantages: (1) It demands little more than common sense to evolve a coding system, and thereafter, to use it (2) It forms a "shoestring methodology, and thus, although labour intensive, demands minimum capital investment, (3) It is a 'safe' strategy so far as the researcher can even subsequently include required information, if it was ignored or wrongly coded by him earlier. (4) It compels the researcher to scrutinize the subject matter he is assessing and classifying by specifying category criteria and determining his success in measuring qualitative phenomena.

10.6 Guidelines for improving the effectiveness of content analysis

In order to improve the effectiveness of his content analysis, the researcher, in addition to the use of a sound sampling procedure, may also follow some other guidelines which will be of his use. The guidelines described by Rosen thai and Rosuor, based on Berelson's work, may be cited in this regard:

He may make an attempt to ensure that the analyses are consistent among the analysts. In other words, it is important to ensure that different analyses produce the same results.

Suppose, the researcher requests the analysts to code different types of gossip. They must agree on what forms "fighting and alteration". The extent of agreement among analysts can be improve

The researcher has to ensure that the specific categories and units are relevant to the problem or hypothesis of the study. While selecting categories he may ask: "What is the communication about?" and "How it is said?" These questions enable the researcher to focus his analysis on the substance ("the what") and the form ("the how") of the material. In addition, he can attempt to select any unit(s) for his study after carefully considering all the available units of analysis. Accordingly, he may consider to code words and word compounds (or phrases) and themes (or assertions).

The researcher is also required to ascertain a satisfactory sampling procedure. As content analysis is heavy time consuming, he has to ensure that the subject matter to be analyzed is representative enough to justify the effort.

10.7 Summary

The use of content analysis appears to be more psychological than anything else. The study of personality of various members of the group and the groups themselves are warranted because we want to study the working of various groups and the efficiency of various propaganda techniques.

10.8 Self Assessment Questions

1. Discuss the objectives of content analysis.
2. Explain the utility of content analysis.

10.9 Key Words

Content Analysis: Content analysis is the study of documents and communication.

10.10 Study Guide

1. Goode and Hatt,Methods of Social research
2. Young, P.V.,Social Survey and Social Research
3. Wilkinson and Bhandarkar, Methodology and Techniques of Social Research

Block-03 Types of Research:

Unit-11 Social Research

Unit-12 Action Research

Unit-13 Participatory Research

Unit-11 Social Research

Structure

11.1 Learning Objectives

After going through this unit, the learner will be able-

- To learn what is social research.
- To know the objectives of social research.

11.2 Introduction/ Assessment of Prior Knowledge

Social research refers discovery of some facts concealed in a social phenomenon or some laws governing it. It is mainly concerned with the cause and effect relationship of human behaviour and the discovery of new facts as well as the verification of old facts. Therefore, "we may define social research as the systematic method of discovering new facts or verifying old facts, their sequences, interrelationships, causal explanations and the natural laws which govern them."

11.3 Social Research

Search implies thorough investigation and the term 'research' which has been derived from the French word 'rechercher', 're' and 'chercher', means a critical examination of a topic or subject to discover new facts for increasing the sum total of human knowledge. It is a method for discovery of new knowledge which augments to the existing body of organized facts, ideals and aspiration, "Research is considered to be the more formal, systematic, intensive process of carrying on the scientific method of analysis. It involves a more systematic structure of investigation, usually resulting in some sort of formal record of procedures and a report of results or conclusions". Research per se constitutes a method for the discovery of truth which necessitates critical thinking. "It comprises defining and redefining problems; formulating hypothesis or suggested solutions, collecting, organizing, and evaluating data; making deductions and reaching conclusions; and at least, carefully testing the conclusions to determine whether they fit the formulated hypotheses."

"It is the manipulation of things, concepts or symbols for the purpose of generalizing to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art." Thus, research is a "systemized effort to, gain new knowledge."

Research is characterised by: (i) a specific problem. Hi) involvement in original work,

(Ui) resting upon a mental attitude of curiosity, (iv) requirement of an open mind, (v) resting upon the assumption that everything is subject to law and order, (vi) discovery of laws and generalizations (vii) study of cause and effect (vii) measurement and (ix) involvement in a conscious technique.

Social research implies discovery of some facts concealed in a social phenomenon or some laws governing it. It is mainly concerned with the cause and effect relationship of human behaviour and the discovery of new facts as well as the verification of old facts. Therefore, "we may define social research as the systematic method of discovering new facts or verifying old facts, their sequences, interrelationships, causal explanations and the natural laws which govern them." While studying human behaviour and social problems and discovering new interrelations, new knowledge, new facts and verifying old ones, social research applies the scientific method and tries to establish the causal connection between various human activities and the natural laws governing them by means of logical and systematised methods because the human behaviour may be motivated by certain rules and laws and does not appear haphazardly. Briefly stated, social research implies scientific investigation conducted in the field of social as well as behavioural sciences.

11.4 Social Research has many objectives

1. **Manipulation of things, concepts and symbols**:

While dealing with things the scientist remains at the concrete level. He is able to purposefully handle things for experimentation. But at this level his results are at best limited to the. Particular thing in a specific situation and none else. Therefore the concepts symbolising the things and their properties are also dealt with, so as to make much sense to conduct controlled inquiries through abstract notions. Use of concepts or symbols in the process of manipulation not only reduces the content and load of the things but also provides the scientist with greater facility and effect.

2. ***Generalization:***

The sole purpose with which manipulation of things, concepts or symbols is undertaken is to arrive at statements of generality. It implies that the findings of controlled investigation should be a conclusion which "will enable us to expect that

under certain class of conditions influencing a class of things, something will happen in a generalized manner, notwithstanding its degree. But in any case the absence is generality cannot characterise science. Therefore the propositions derived on the basis of observations and through manipulation of things, concepts or symbols may vary in their levels of generality, may maintain a high or low degree but should never reach the null point. Otherwise those will move beyond the framework of science. In this regard, Slesinger and Stepheson have given the example of a physician or automobile mechanic as playing the role of a researcher. Whereas the automobile mechanic endeavours to generalize about the automobiles, the physician attempts to make ailments for a given class of patients.

3. Verification of Old Fact:

A major purpose of social research is verification of conclusions which have already been accepted as established facts. Since there is no place for complacency in the arena of science, the established system of knowledge always warrant frequentative scrutiny so as to confirm whether or not the observations are in accordance with the predictions made on the basis of the established corpus of knowledge. In case it is confirmed, the empirical observation strengthens the established system of knowledge. Otherwise in the light of the research outcome, the system of established corpus of knowledge calls for revision or even rejection.

4. Extension of Knowledge:

As a sequel to generalization the seemingly inconsistencies in the existing corpus of knowledge are brought into light and attempts are made to reconcile these inconsistencies. The new general proposition, established as an outcome of research also identifies gaps in the established system of knowledge. A gap in knowledge implies the inadequacy of the theory as well as the failure of a conceptual scheme to explain and account for certain aspects of a social phenomenon. The gap is bridged up in the light of the new empirical observations. Thus knowledge gets expanded. The expension of systematic knowledge occurs at least in a couple of ways. First in cognizing certain aspects of phenomena which were not examined in these terms prior to the advent of the new general proposition. Secondly in the light of new observation, the phenomena under investigation may be incorporated

in a comparatively large class of phenomena, so as to be governed by a uniform law. As a result, the new system of knowledge not only accumulates more units under its conceptual scheme, but also appreciates greater depth of understanding and bettering of predictions.

5. ***Knowledge may be used for theory building or practical application:***

By seeking to explain the unexplained social phenomena, clarifying the doubtful one and correcting the misconceived facts relating to it, social research provides the scope to use the fruits of research in two possible ways : (a) theory building (.6) practical application. In its basic or pure form social research gathers knowledge for the sake of it, for building a theory in order to explain human behaviour in its totality, only for the satisfaction of knowing. For construction of theoretic models, the researcher organizes knowledge into propositions and then meaningfully articulated those propositions to constitute a more abstract conceptual system pertaining to a class of phenomena, influenced by a certain class of conditions.

In its practical or applied form, social research gathers information regarding the betterment of quality of life in social settings. The findings of social research are used as the means to an end, not construed just as an end in itself. From its utilitarian point of view the results of social research provide decision makers with proper guidelines for policy making, social welfare, amelioration of practical problems, mitigation or resolution of social conflict and tensions as well as rectification and removal of social evils.

A good researcher should be in possession of the following qualities: He should be a votary of truth, truth should be his goal.

He should be able to dispel prejudice. He should not conceive any pre-conceived notion, rather he should maintain objectivity while gathering information.

The a scientific genius, the research investigator must be adequately sensitive to difficulties "Where less gifted people pass by untroubled by doubt."

He should be in possession of sufficient moral courage to face the difficult situation and should not be discouraged due to non-cooperation of the respondents

or nature of the research problem under investigation.

The researcher should be able to utilise his time properly in a balanced manner,

While making generalisations, the researcher must cautiously bear in mind that there is no short cut to truth. Therefore he must wait to obtain complete data and always eschew hasty statement. As a scientific man, says Karl Pearson, he should strive at self elimination in his judgment to provide an argument which is true for each individual mind as for his own. A good researcher is always apathetic to the approval or disapproval of society. Rather, he should be bold enough to present his findings of research to the society, notwithstanding its disapproval.

The researcher should be conceptually clear. He should use the terms uniformly and appropriately. Otherwise, his whole exercise will be defective.

The researcher should not only be careful in selecting the research tools but also properly trained so as to use these tool to procure reliable and valid data.

The researcher should also develop proper communicative skill and the abilityto establish rapport with the respondents so as to elicit proper response.

Knowledge in the language of the respondents will be of immense help for the researcher. This will enable him not only to communicate the questions properly but also to cognize the responses properly.

Awareness of the possible drawbacks and shortcomings of research is very essential on the part of a good researcher. By knowing it before, the researcher may try to minimize such problems, although it is well high impossible to claim complete perfection of a research work.

A good researcher will always be well behaved and well clad. These qualities will attract the respondents

towards him, sufficiently motivate them to produce necessary information required for the purpose of research.

11.5 Motivating factors of Social research

Research is an endless quest for knowledge or the unending search for truth. It is the movement from unknown to known and vice versa. It discovers new knowledge or corrects

previous errors and misconceptions. It adds scientific and objective facts through a careful observation, rational understanding, accurate verification and experience.

The success of a research work, to" a great extent, depends upon the motivation of both the researchers and respondents. However the following are the principal motivating factors which always motivate the researchers and respondents to the successful conduct of a research work.

Stimulation of Respondent

As the researcher depends upon the respondents for collection of data for the attainment of the research objectives, one of the most important tasks of the researcher is to inspire and stimulate the respondents with a zeal to help for the accomplishment of research goals. In other words the motivation of the respondents plays a significant role for the success of any kind of research. Human motives are based on certain needs which may be primary or secondary and vary in their intensity according to situation and time. The researcher must study these needs, try to understand their intensity and have the responsibility to satisfy them in order to stimulate the respondents for research work.

Motivation means any idea, need, emotion or organic state that prompts a man to an action. Motivation is an internal factor that integrates a man's behaviour. As the motive is within the individual, it is necessary to study the needs, emotions etc. in order to motivate him to co-operate in the research work.

The following are the important inducing factors which influence the respondent's behaviour and induce him for the best performance to meet the need of research.

(i) The research should be directed towards the solution of respondent's problem,

(ii) The nature of the problem or topic must have social relevance.

(iii) The researcher should clearly spell the goals of research.

(iv) The respondents must be informed about the matter concerning objectives of the research. The more a person knows about its subject matter, the more interest and concern he will develop.

(v) Respondents can be motivated to involve in research if they get continuous recognition for their efforts. Respondents provide valuable information and suggestion for the success of research work. If the researcher has a praise of words for the respondents' cooperation,

it motivates the respondents more and more to be involved in the research process. Thus recognition tends to motivate the respondents to provide required information for research.

Stimulation of Researcher

The success of a research work, to a great extent, depends upon the motivation of the researcher as well. The following are some of the factors which stimulate a researcher to conduct research effectively.

(i) The researcher must have a concrete and complete knowledge of the subject under study. He must be capable of removing the doubts of the respondents regarding the study.

(ii) He must have a personal interest in the study undertaken.

(Hi) The researcher must have sufficient knowledge about the respondents.

(iv) The researcher must have the idea of the tools of research.

A Sense or Participation

Participation in a research activity does not mean simply the involvement of the respondents in giving information on a topic or problem. In real sense, participation is an individual's mental and emotional involvement in research solutions that encourage him to contribute to research and to share the responsibility for it.

From utilitarian point of view the main goal of research is to understand social life and attempt on social welfare. However it can not be done without the active participation of the people involved in the process of social research.

Any social research, whether it is meant for the development °f a specific section of society or for the overall development of the entire society, requires participation of people. Research does not only means involvement of the researcher but it also requires the conscious participation of the respondents. The respondents Evolve themselves in thinking, identifying the needs, fixing Priorities of the needs, providing valuable information, lniplementing and evaluating critically various research

Programmes. Thus it involves the participation of both the researcher and the respondents.

Growth of Knowledge

Interest for increasing knowledge motivate people to do research in their own field. Research adds to the existing knowledge in a systematic way. The quest for knowledge is therefore an important motivating factor in social research. Discovering the truth always forces man to

undertake research in own society.

Quest for Progress

Research has proved to be a significant and powerful tool in bringing social progress. Without scientific social research there would be very little progress. The results of social research will provide us with the possible means to bring solution to different social problems. Research opens new avenues and provides a better alternative to us. It enhances the efficiency of all the agencies and organisations engaged in the development of society. So the quest for progress is also another motivating factor of social research.

Curiosity To Understand Cause and Effect relationship of various Social Phenomena

Research is nothing but a desire to understand the causal explanation of various facts and to explain the natural laws which govern them.

Social research tries to discover the cause-effect relationship between different aspects of a social phenomena. In order to solve a social problem, one must first understand the root cause of that particular problem. Finding the cause of an effect is one of the greatest tasks of research and its quest always motivates people to undertake research.

11.6 Summary

Research is an endless quest for knowledge or the unending search for truth. It is the movement from unknown to known and vice versa. It discovers new knowledge or corrects previous errors and misconceptions. It adds scientific and objective facts through a careful observation, rational understanding, accurate verification and experience.

11.7 Self Assessment Questions

1. What is social research?
2. Explain the objectives of social research.

11.8 Key Words

Social Research: Social research refers discovery of some facts concealed in a social phenomenon or some laws governing it.

11.9 Study Guide

1. Goode and Hatt,Methods of Social research
2. Young, P.V.,Social Survey and Social Research
3. Wilkinson and Bhandarkar,Methodology and Techniques of Social Research

Unit-12 Action Research

Structure

12.1 Learning Objectives

After going through this unit, the learner will be able-

- To learn the concept of action research.
- To understand the relevance of action research.

12.2 Introduction/ Assessment of Prior Knowledge

An action research is different from other types of applied research in the sense that whereas the former is concerned with the immediacy of the researcher's involvement in the action process, the latter are involved in the application of theories for solution of human problem in different social settings and conducted with practical considerations, relevant in a particular setting.

12.3 Action Research

Action research has been construed as a form of applied research or a significant variant of utilitarian research. It not only aims at solving an ongoing problem within some organisational frame work by effecting a planned change or induced change but also observes the results or change simultaneously. According to Rapopart, "Action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration with in a mutually acceptable framework." An action research is different from other types of applied research in the sense that whereas the former is concerned with the immediacy of the researcher's involvement in the action process, the latter are involved in the application of theories for solution of human problem in different social settings and conducted with practical considerations, relevant in a particular setting. In our country, action researches are undertaken in the arena of both education and, organizational behaviour. As regards the field of education, action research may incorporate educational problems in specific class-room settings by involving both class-room teacher and research specialist in the analysis and application of the findings of research. Action research in the field of organisational behaviour, is concerned with the design of human resource system which consists of different dimensions like overall planning of initiation in an organisation, function of the consultant in different stages and consultant's relationship with the clients.

Wendell L. French has pointed out the main aspects of action research as *(i)* diagnosis, *(ii)* collection of data, *(Hi)* feed-back to the client group, *(iv)* discussion of data as well as work by the client group, *(v)* action strategy and *(vi)* action.

Since the emphasis of action reserach is on action, not on research, "the effective way of studying a group or organization", comments Kurt Lewin, "is to study it as it tries to cope with a problem". It begins with the entry of the researchers into the ailing organisation as consultants. Thereafter the consultants embark upon assessing what is going on in the organisation by interviewing or surveying a representative number of cases. At the next stage they share the findings with all or most of the members of the organisation. The evaluation is made jointly so as to suggest workable proposals for future action.

12.4 Summary

Action research in the field of organisational behaviour, is concerned with the design of human resource system which consists of different dimensions like overall planning of initiation in an organisation, function of the consultant in different stages and consultant's relationship with the clients.

12.5 Self Assessment Questions

1. Discuss action research.
2. Explain the relevance of action research in social science.

12.6 Key Words

Action Research: Action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration with in a mutually acceptable framework

12.7 Study Guide

1. Goode and Hatt, Methods of Social research
2. Young, P.V., Social Survey and Social Research
3. Wilkinson and Bhandarkar, Methodology and Techniques of Social Research

Unit-13 Participatory Research

Structure

13.1 Learning Objectives

After going through this unit, the learner will be able-

- To understand the meaning of participatory research.
- To know the significance of participatory research.

13.2 Introduction/ Assessment of Prior Knowledge

The use and execution of participatory research may not get written up. Oral and visual methods characterise this process of knowledge creation. If people can be stimulated to write them up in their own idiom then such research could be an important source of a people's literature, and reading materials for a wider public.

13.3 Participatory Research

In sharp contrast to elitist research the key features of participatory research are: people are the subjects of research: the dichotomy between subject and object is broken, people themselves collect the data, and then process and analyse the information using methods easily understood by them the knowledge generated is used to promote actions for change or to improve existing local actions the knowledge belongs to the people and they are the primary beneficiaries of the knowledge creation research and action are inseparable – they represent a unity research is a praxis rhythm of action-reflection where knowledge creation supports action people function as organic intellectuals there is an built-in mechanism to ensure authenticity and genuineness of the information that is generated because people themselves use the information for life improvement.

Such participatory research may not get written up. Oral and visual methods characterise this process of knowledge creation. If people can be stimulated to write them up in their own idiom then such research could be an important source of a people's literature, and reading materials for a wider public.

Some of the material could be translated into pictures, cartoons, graphics, posters and slogans which may be a more effective method of communication. Such documentation may be carried out by community activists who are well placed to articulate the community's way of thinking.

13.4 The Key Process of Participatory Research

The promotion of participatory research is basically an exercise in stimulating the people to:

- collect information
    - reflect and analyze it
    - use the results as a knowledge base for life improvement, and
    - Whenever possible, to document the results for wider dissemination i. e. for the creation of a people's literature.

The role of the outside professional

The role of the outside professional is to promote the above processes. This can be done by: assisting people to collect data and then to process and analyse the information using simple methods which enables them to systematise their knowledge linking the local situation (which the people know best) to the larger external situation (about which the outside may know more)improving people's access to new information and formal knowledge (eg technology) introducing local people to experiences from outside their environment throwing up relevant issues or problems for local people to reflect on and analyse and then assisting them in coming to their own conclusions.

The important thing is that the interaction between local people and the outside professional must primarily benefit the people concerned by enabling them to articulate and systematize their own thought processes and thereby enhancing their knowledge base so that the can pursue independent actions.

Reaching a wider audience

Along with the above contributions, outside professionals could document the experiences of people's processes to cater for two audiences: development workers who wish to promote participatory processes policy makers and intellectuals who wish to create wider support and facilitating structures for people-centred development

The reduction of intellectual dependence

Participatory Research is an important means of building people's capacities – their intellectual capacities – and thus reducing their dependence on outside professionals and intellectuals.

Intellectual dependence is a subtle process which makes people feel small and thus dehumanises them; it is more subtle than dependence in the material sphere but no less

important.

Outsiders who assist the people to engage in Participatory Research must of necessity be highly sensitised persons who are willing to dialogue with people on more or less equal terms ie who are willing to adopt a horizontal mode of communication.

Participatory Research seeks to de-elitise and de-mystify research thereby making it an intellectual tool which people can use for life improvement.

13.5 Summary

In participatory research the important thing is that the interaction between local people and the outside professional must primarily benefit the people concerned by enabling them to articulate and systematize their own thought processes and thereby enhancing their knowledge base so that they can pursue independent actions.

13.6 Self Assessment Questions

1. Discuss the meaning of participatory research.
2. Explain the importance of participatory research.

13.7 Key Words

Participatory Research: is a form of research in which everybody becomes the important part of research and they create the knowledge and use this knowledge for further advancement through certain method.

13.8 Study Guide

1. Goode and Hatt,Methods of Social research
2. Young, P.V.,Social Survey and Social Research
3. Wilkinson and Bhandarkar,Methodology and Techniques of Social Research

Block-04 Research Report Writing:

Unit-14 Report Writing

Unit-15 Report Stages

Unit-16 Report Procedures

Unit-14 Report Writing

Structure

14.1 Learning Objectives

After going through this unit, the learner will be able-

- To examine the research report.
- To understand the purpose of research report.

14.2 Introduction/ Assessment of Prior Knowledge

The research report always incorporate the material which will be of interest to the target audience, may that be investigator of fundamental research or applied research, practitioners, policy formulators, funding agents or sponsors or even the general public. To a report writer, the prima facie task may appear an easy affair. But in real terms this is a herculean task as uncertainty about target group results in ineffective communication.

14.3 Research Report

The purpose of research report is to convey the interested persons the whole result of study in sufficient detail and to determine him the validity of the conclusions. As the culmination of the research investigation, the research report contains a description of different stages of the survey and the conclusions arrived at. Thus it is an end product of a research activity which gives an account of a long journey on the path of finding a new knowledge or modified knowledge. Writing a research report is a technical task as it requires not only skill on the part of the researcher but also considerable effort, patience and penetration, an overall approach to the problem, data and analysis along with grasp over language and greater objectivity, all springing from considerable thought.

Writing a research report also involves adequate planning and a vast amount of preparation. That apart perfection of research report is also attributed to coherence of thought, creativity and intelligence of the researcher. Although a definite standard criterion for the organisation is not possible, a good report writer should always be conscious about the effective and purposeful communication with the society by conveying the interested persons the entire outcome of the study so as to ensure each reader to comprehend the data and to enable himself to cognize the validity of the conclusions. Consideration of certain questions like who says 'what is it about, 'to whom', 'in what manner' and 'of what use' will enable the researcher in preparing a standard research report.

No uniform research report can be prepared to cater to the needs of different categories of

audiences. The report should always incorporate the material which will be of interest to the target audience, may that be investigator of fundamental research or applied research, practitioners, policy formulators, funding agents or sponsors or even the general public. To a report writer, the prima facie task may appear an easy affair. But in real terms this is a herculean task as uncertainty about target group results in ineffective communication.

14.4 Purpose of Research Report

A good research report not only disseminates knowledge, but also presents the findings for expansion of the horizon of knowledge. That apart, it also checks the validity of the generalization and inspires others to carry on related or allied problems. The purpose of the research report may be discussed under the following heads:

Transmission of Knowledge :

The knowledge that has been obtained on the basis of research need transmission for proper utilization of the resources invested. Because of that reason, it is always advisable to prepare to report in a written manner so that it can also provide knowledge to layman in understanding various social problems.

Presentation of findings:

Society is more concerned with the finished product in terms of output of research which has the input of immense money, human resources and precious time. Therefore, the social utility of the research report lies in its exposure to the laymen as well as its submission to the sponsoring agency of the project. Whereas people may acquire knowledge about various social problems in the widest possible manner, the sponsoring agency may take the credit of the conduct of a piece of successful research. Even interesting findings may draw the attention of the world community through mass media. That apart, it may also result in legislative or ameliorative measures.

14.5 Examining of validity of generalizations

Submission of the report enables the researchers to examine the validity and authenticity of the generalisations. For that purpose the report must be prepared and presented in an organized form. Thereafter, it can be checked discrepancy, if any, in generalizations, practical or real, can be dispelled and the facts can be re-examined and reorganized.

Inspiration for further research- Research report inspires others to undertake further

research in the same line or in any other inter-disciplinary fields. If the report appears to be interesting and a novel one, it is more likely to draw the attention of the attention of the social scientists.

14.6 Summary

Thereafter, it can be checked discrepancy, if any, in generalizations, practical or real, can be dispelled and the facts can be re-examined and reorganized. Inspiration for further research- Research report inspires others to undertake further research in the same line or in any other inter-disciplinary fields.

14.7 Self Assessment Questions

1. Explain what research report is.
2. Discuss the purpose of research report.

14.8 Key Words

Research report- The research report always incorporate the material which will be of interest to the target audience.

14.9 Study Guide

1. Goode and Hatt, Methods of Social research
2. Young, P.V., Social Survey and Social Research
3. Wilkinson and Bhandarkar, Methodology and Techniques of Social Research

Unit-15 Report Stages

Structure

15.1 Learning Objectives

After going through this unit, the learner will be able-

- To know different stages of report writing.
- To understand the importance of report writing.

15.2 Introduction/ Assessment of Prior Knowledge

The research report is the outcome of the total study conducted. And report is the presentation of what has been done in consecutive order to reach and know the reality. However, report writing is an art and researcher is mostly expected to be an artist. The key to writing an effective report is to allocate time for planning and preparation. With careful planning, the writing of a report will be made much easier.

15.3 Stages of report writing

All reports need to be clear, concise and well structured. The key to writing an effective report is to allocate time for planning and preparation. With careful planning, the writing of a report will be made much easier. The essential stages of successful report writing are described below. Consider how long each stage is likely to take and divide the time before the deadline between the different stages. Be sure to leave time for final proof reading and checking.

Stage One: Understanding the report brief]

This first stage is the most important. You need to be confident that you understand the purpose of your report as described in your report brief or instructions. Consider who the report is for and why it is being written. Check that you understand all the instructions or requirements, and ask your tutor if anything is unclear.

Stage Two: Gathering and selecting information

Once you are clear about the purpose of your report, you need to begin to gather relevant information. Your information may come from a variety of sources, but how much information you will need will depend on how much detail is required in the report. You may want to begin by reading relevant literature to widen your understanding of the topic or issue before you go on to look at other forms of information such as questionnaires, surveys etc. As you read and gather information you need to assess its relevance to your report and select

accordingly. Keep referring to your report brief to help you decide what relevant information is.

Stage Three: Organising your material

Once you have gathered information you need to decide what will be included and in what sequence it should be presented. Begin by grouping together points that are related. These may form sections or chapters. Remember to keep referring to the report brief and be prepared to cut any information that is not directly relevant to the report. Choose an order for your material that is logical and easy to follow.

Stage Four: Analysing your material

Before you begin to write your first draft of the report, take time to consider and make notes on the points you will make using the facts and evidence you have gathered. What conclusions can be drawn from the material? What are the limitations or flaws in the evidence? Do certain pieces of evidence conflict with one another? It is not enough to simply present the information you have gathered; you must relate it to the problem or issue described in the report brief.

Stage Five: Writing the report

Having organised your material into appropriate sections and headings you can begin to write the first draft of your report. You may find it easier to write the summary and contents page at the end when you know exactly what will be included. Aim for a writing style that is direct and precise. Avoid waffle and make your points clearly and concisely. Chapters, sections and even individual paragraphs should be written with a clear structure. The structure described below can be adapted and applied to chapters, sections and even paragraphs.

Introduce the main idea of the chapter/section/paragraph

Explain and expand the idea, defining any key terms.

Present relevant evidence to support your point(s).

Comment on each piece of evidence showing how it relates to your point(s).

Conclude your chapter/section/paragraph by either showing its significance to the report as a whole or making a link to the next chapter/section/paragraph.

Stage Six: Reviewing and redrafting

Ideally, you should leave time to take a break before you review your first draft. Be prepared to rearrange or rewrite sections in the light of your review. Try to read the draft from the perspective of the reader. Is it easy to follow with a clear structure that makes sense? Are the points concisely but clearly explained and supported by relevant evidence? Writing on a word processor makes it easier to rewrite and rearrange sections or paragraphs in your first draft. If you write your first draft by hand, try writing each section on a separate piece of paper to make redrafting easier.

Stage Seven: Presentation

Once you are satisfied with the content and structure of your redrafted report, you can turn your attention to the presentation. Check that the wording of each chapter/section/subheading is clear and accurate. Check that you have adhered to the instructions in your report brief regarding format and presentation. Check for consistency in numbering of chapters, sections and appendices. Make sure that all your sources are acknowledged and correctly referenced. You will need to proof read your report for errors of spelling or grammar. If time allows, proof read more than once. Errors in presentation or expression create a poor impression and can make the report difficult to read.

15.4 Summary

Report writing follows various stages. Report writing is an artistic work and researcher always tries to become that one. Therefore, researcher is the key person who can present the report in a proper format. And that fruitfulness depends on adoption of certin pertaining stages to the report writing.

15.5 Self Assessment Questions

1. Discuss the meaning of report writing.
2. Explain the significance of stages of report writing.

15.6 Key Words

Report writing: Report writing is an artistic work and researcher always tries to become that one.

15.7 Study Guide

1. Goode and Hatt,Methods of Social research
2. Young, P.V.,Social Survey and Social Research
3. Wilkinson and Bhandarkar, Methodology and Techniques of Social Research

Unit-16 Report Procedures

Structure

16.1 Learning Objectives

After going through this unit, the learner will be able-

- To understand the procedures of report writing.

16.2 Introduction/ Assessment of Prior Knowledge

After one round of critical analysis by the researcher (or by his group), another researcher or another group reviews it, perhaps in exchange for you reviewing their work for checking the flow of ideas. While it may be good to get someone working in the same area, for much of the feedback, this may not really be necessary.

16.3 Procedure of Report Writing

Based on the above, the following strategy is recommended for researchers who want to produce a high-quality report, which would then have a high potential for being turned into a publication: Think through the outline of the report even as you are working on the details of the problem. Such thinking will also lend focus to your work and you will end up optimizing the returns on the time invested.

Two months before the actual deadline, the researcher will have to have at least a paragraph-level outline of the report, with all details worked out.

After one round of critical analysis by the researcher (or by his group), another researcher or another group reviews it, perhaps in exchange for you reviewing their work for checking the flow of ideas. While it may be good to get someone working in the same area, for much of the feedback, this may not really be necessary.

Now the researcher is probably about 6-7 weeks from the deadline. At this point, the researcher will have to give his advisor/instructor feedback on the paragraph-level outline. Getting this early is important since, based on this; he may have to reorganize his report, rework his theorems, or rerun his experiments/simulations.

Have a pre-final version of the report ready two weeks before the deadline. Again, he will go through one round of self/peer-feedback, and then advisor/instructor feedback.

With these 3-4 rounds of revision and critical analysis, the quality of his report is bound to improve. And since many of the student theses are of good quality, quality of writing dramatically improves chances of publication.

16.4 Summary

Think through the outline of the report even as you are working on the details of the problem. Such thinking will also lend focus to your work and you will end up optimizing the returns on the time invested. Two months before the actual deadline, the researcher will have to have at least a paragraph-level outline of the report, with all details worked out. After one round of critical analysis by the researcher (or by his group), another researcher or another group reviews it, perhaps in exchange for you reviewing their work for checking the flow of ideas.

16.5 Self Assessment Questions

1. Discuss the procedures of report writing in detail.

16.6 Key Words

Procedure of report writing: procedure means certain ways to be followed when report is written.

16.7 Study Guide

1. Goode and Hatt, Methods of Social research
2. Young, P.V., Social Survey and Social Research
3. Wilkinson and Bhandarkar, Methodology and Techniques of Social Research