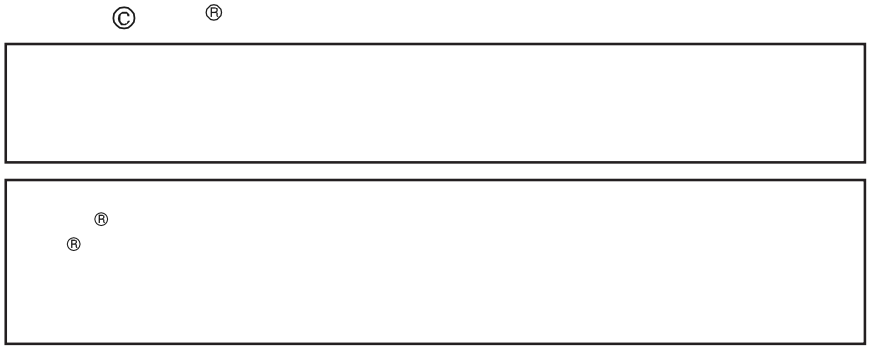
COM 433

RESEARCH METHODOLOGY - I

M Com – Part II

Semester - IV

YASHWANTRAO CHAVAN MAHARASHTRA OPEN UNIVERSITY
Dnyangangotri, Near Gangapur Dam, Nashik 422 222, Maharashtra



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M. Com. Part – II (Research Methodology - I)

Semester - IV

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INTRODUCTION

About the Book

This book deals with the syllabus for the paper "Research Methodology - I" (COM433), Semester - IV for M. Com. II.

It covers various basic aspects of Research Methodology, with special reference to M. Com. course.

The various units (1 to 12) cover topics like meaning of science, classification of social sciences, hypothesis, meaning, types, formulation and testing, theory of causation, research design, data collection and types of data; sampling techniques, data analysis, interpretation and report writing.

Writers and editors have made almost efforts for exactness, relevance, proper examples and diagramatic presentation.

the writers and the editor are grateful to the authorities of YCMOU and particularly staff of the school of commerce and Management for their kind co-operation.

The writers and editor express sincere thanks to the authors of standard textbooks referred to for preparing this book, which are mentioned in the lists of books for further reading.

Nashik

J. F. Patil
Editor

UNIT 1 : INTRODUCTION TO RESEARCH METHODOLOGY

NOTES

Structure

1.0 Introduction

1.1 Objectives

1.2 Subject Description

- 1.2.1 Meaning of Science
- 1.2.3 Functions of Science
- 1.2.3 Social Science
- 1.2.4 Classification Social Science

1.3 Summary

1.4 Key Words

1.5 Exercises

1.6 Further Reading

1.0 INTRODUCTION

Research is a very important dimension of generation, formalizing and dissemination of knowledge. Research deals, with various phenomena, events, happenings, things as to their why, what, when, how aspects. The growth and productivity of knowledge, more so its welfare impact depend on quality and quantity of research that is undertaken and completed. Research is the foundation of all scientific endeavor. Research is the foundation of knowledge.

1.1 OBJECTIVES

This unit aims at enabling a student to understand –

A] 1. The meaning of science
2. The functions of science.
3. The meaning and scope of social sciences
4. The classification of social sciences.

B] It helps students to understand meaning, scope and importance of research. It explain types of research, meaning of social research, purpose or functions of social research. It elaborates the meaning of scientific attitude. It distinguishes between research in pure/natural science and research in social sciences.

C] This unit also discusses essential characteristics of research, it elaborates the process of selection and formulation of research problem. More importantly, it discusses the utility of the research output for designing corporate and public policy and programmes / measures based on them.

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1.2 SUBJECT DESCRIPTION

In this sub section we try to explain the meaning of science, and functions of science. More particularly we explain the meaning of the term 'Social Sciences' and elaborate the classification of social sciences.

1.2.1 MEANING OF SCIENCE

Broadly science means systematically and in a causal way, explaning the interrelations between things. Science underlines relation between things. According to Dr. Singer, a medical expert, science is the process of knowledge creation. Another scientist. Havelock Ellis, maintains that science is finding out reasons of things and events. For biologist Julias Huxley science is the process which helps us in collecting and creating knowledge which aids us in controlling natural circumstances.

Science has two main dimensions –

i. Disciplined and careful collection of knowledge and,

ii. Process of acquiring knowledge, collection and further development of knowledge is relatively a more static aspect of science, whereas as search and acquisition of knowledge, science becomes a dynamic affair. However, both these aspects are mutually enhancing in results. The present stock of knowledge determines generation of future knowledge. It requires a systematic method of finding out and presentation and propagation of new things and on this (research methodology) depends the growth of knowledge. It further requires intellectual abilities to interpret collected data and information, which makes knowledge socially productive. Such collected information, and its interpretation need to be communicated to general public and peer groups in organized and accessible manner (publication – soft and hard). Earlier research, its method, its results, if repeated by others in other places and conditions, comes up with the same experiences, and then it becomes an acceptable truth for all. Knowledge communication and repeatability make science a social process. Repeatability, particularly, becomes an essentially important test of science.

1.2.2 FUNCTIONS OF SCIENCE

According to Prof. Braithwate, the functions of science may be listed as –

i. To lay down general regulatory rules regarding discovery or research of things which are empirical events or facts.

ii. To identify different or dissimilar things and collect information of the same and on their basis,

iii. Make predictions about future occurrences of similar or otherwise, phenomena.

Therefore, it is clear that the main function of any science is to lay down a scientific law and provide verification for the same.

In some cases, at the frontier of knowledge there may emerge more than one meaning, where it becomes the premier function of science to provide further

CHECK YOUR PROGRESS

1. What is Science?
2. What are the functions of science?

interpretation so that we may reach a definite conclusion. Science has no place for dogmatism. Every phenomenon must be objectively examined in a rigorous manner. It is in this way of questioning that a precise, closely interrelated and disciplined method of enquiry, collection and digestion of knowledge is shaped. Absence of subjective factors likes, dislikes; insistence on precison and continuity are the primary attributes of science and scientific method.

1.2.3 SOCIAL SCIENCE

Sciences are classified in two groups 1) Natural Sciences 2) Social Sciences. Physics, Chemistry, Biology are natural sciences. Although human body is studied in natural sciences, that is not considered as a member of social organization, but social sciences like Economics, History, Political Science, Psychology, Sociology study man/women as a member, inseparable member of society. Individual behaviour in a social context constitutes the main theme of study in such social sciences. We consider following definitions of social science to highlight the meaning of social science.

A] According to MacMillan Modern Dictionary – 'a social science is the science which treats of the structure and development of society."

B] Renowned economist E.R.A. Seligman defines social sciences as 'those mental or cultural sciences which deal with the activities of the individual as a member of a group.

C] Charles A. Beard maintains that 'a social science is a body of knowledge and thought pertaining to human affairs.'

D] Columbia Encyclopedia defines social sciences as the sciences treating of human groups.

E] Stuart Chase defines a social science as the application of the scientific method to the study of human relations.

F] Maurice R. Cohen thinks that a social science deals with the life of human beings in their group or associated life.

We on the basic of the sample definitions of social science given above, can conclude that social sciences are those sciences which study individual behaviour in a social context to arrive at logical and consistent rules and regulations of human behaviour.

CHECK YOUR PROGRESS

1. What is a Social Science?
2. What are the basic types of Social Sciences?

1.2.3.1 CLASSIFICATION OF SOCIAL SCIENCE

Broadly, according to E.R.A. Seligman, social science are classified as under –

a) Pure social sciences

b) Semi-social sciences

c) Sciences with social content

Under pure social sciences, are normally included following social sciences.

Political science, Economics, History, Law and jurisprudence, Anthropology Sociology etc. under semi-social sciences, we include subjects line- Ethics, Education, Philosophy and Psychology. Sciences which have social content are- Biology, Geography, Medicine, Linguistics and Arts. We include management,

commerce and similar other subjects, (auditing, accountancy, acturial science, marketing, organization, finance, human resources) under pure social science like economics, with greater content of scientific analysis.

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Economics is considered to be the mother of all branches of knowledge coming under commerce, industry and trade. It is realized even with primary thinking, that production, distribution and consumption involve interpersonal relations sans producers, bankers, workers, traders, shopkeepers, transporters, landowners, tenants, farmers, moneylenders etc. In a social set up, individuals are guided by Competition, Emulation, Demonstration and Co-operation. According to Nobel laurete J. R. Hicks, economics, mother science of all commercial sciences, is a branch of science, that great systematic study of the world we live in, which we call science with a capital S. Research Methodology, for this simple reason is both a pure social science as well as pure natural science.

1.3 SUMMARY

- We have seen under preceding paragraphs basically foundations of research mehodology, which relate to the concepts of science- meaning and functions – both natural sciences and social sciences.
- According to Dr. Singer, science is the process of knowledge creation. For Hovelock Ellis science finds out reasons of things and events. According to a great many scientists, science is a process of collecting and creating knowledge with a view to controlling natural circumstances.
- According to Prof. Braithwate science performs mainly three functions.
  - i. To lay down general regulations for discovery or research of things which are empirical events or facts.
  - ii. To identify differences or dissimilarities and collect information related to similiarities also.
  - iii. To predict future occurences, if any, of the observed phenomena.
- A social science is that subject which treats of the structure and development of society. According to Stuart Chase social science is the application of the scientific method to the study of human relations. According to a great Americal Social Scientist, there are three types of social sciences.

  1. Pure Social Sciences : Political Sciences and Economics, History etc.
  2. Semi-social sciences.
  3. Science with social content.
- Research methodology is both a pure and social science.

1.4 KEY WORDS

- **Science :** Process of knowledge creation.
- **Pure Science :** Deals with natural, material measurable events and uses method of controlled experimentation.
- **Social Science :** Deals with human behaviour in a group of individuals.

1.5 EXERCISES

1. What is Science?
2. What are Social Sciences?
3. What are the functions of Sciences and Social Sciences?

NOTES

1.6 BOOKS FOR FURTHER READING

- **Marshall, A.** *"Principles of Economics (ELBS)"*, MacMillan, London, 1962.
- **Robbins, Lionel** *"An Essay on The Nature and Significance of Economic Science."*

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UNIT 2 : WHAT IS RESEARCH?

NOTES

Structure

2.0 Introduction

2.1 Unit Objectives

2.2 Subject Description

- 2.2.1 What is Research?
- 2.2.2 Types of Research
- 2.2.3 What is Social Research?
- 2.2.4 Functions or purpose of Research
- 2.2.5 Research and Scientific Attitude
- 2.2.6 Comparision between Pure Sciences Research and Social Sciences Research
- 2.2.7 Essential Characterization of Research (or Researcher)

2.3 Summary

2.4 Key Words

2.5 Exercises

2.6 Further Reading

2.0 INTRODUCTION

In this unit – we try to understand –

- Meaning, Types, Functions / Purposes of Research
- And other related aspects of Research.

2.1 UNIT OBJECTIVES

The objectives of this unit are to –

i. Explain the meaning of research.

ii. Enumerate types of research.

iii. Explain social research

iv. List functions / purposes of reasearch

v. Explain scientific attitude

vi. Compare pure science research with social science research.

vii. List important characteristics of a researcher.

2.2 SUBJECT DESCRIPTION

2.2.1 WHAT IS RESEARCH?

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2.2.1.1 MEANING :

According to various meanings given in different dictionaries research means careful and repeated search. According to Small, research means finding out things. Research requires systematic efforts to acquire new knowledge. Social sciences Encyclopedia defines research as the manipulation of things, concepts or symbols for the purpose of generalizing to extend, correct as to verify knowledge, whether that knowledge aid in the construction of a theory or in the practice of art. In a different way efforts to reach definiteness or certainty, to collect facts and ascertain truth constitute research. In research we examine facts for truth. When facts are repeatedly examined and tested, a truth is established. This leads to certainty and incorporates a generalization which is unique.

2.2.2 TYPES OF RESEA RCH

Basically, research is classified in two types.

a) Basic or pure research

b) Applied or practical research.

Basic or pure research explores broad, inclusive laws, rules, theories and tendencies with precise causation. Pure research is intellectual response to great questions and seemingly difficult causal complexities. Theory of gravity (Newton), theory of relativity (Einstein), and birth of the universe theory (Hoyle and Naralikar theory) are examples of pure research. Such pure research may or may not be practically and socially useful immediately. On the other hand, applied or practical research aims at making existing, available knowledge useful in solving present problems of the society and individuals vis-a-vis production, distribution, consumption, and minimization of pain.

2.2.3 WHAT IS SOCIAL RESEARCH?

According to Pauline Young, social research is defined in the following words. “We may define social research as the systematic method of discovering new facts or verifying old facts, through sequence, interrelationship, causal explanations and the natural laws which cover them. Prof. M. H. Copal, a senior Indian social scientist defined social research as the study of phenomena resulting from interaction between different human groups in the process of their living together. This study helps us in generalizing, theorizing and policy planning. Social research is intrinsically dynamic and involves a large number of variables, some controllable some not so controllable. As a result, social research involves a process of continuous revision of existing laws, theories, periodic refutation and / or modification of the same laws and theories. Freshly generated or collected data i.e. primary data give us new insights and evidences to arrive at new conclusions.

2.2.4 FUNCTIONS OR PURPOSE OF RESEARCH

According to Wilson Gee, the main function of research is to find out new

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ideas, new thoughts, new meanings of old ideas, to expand knowledge with a view to enriching human life. In his words

"The research spirit — has led it (world) through the darkness of a past into the light of a present and will still guide it on beyond the golden dawn of a future." Essentially, research has three functions.

i. Search for truth

ii. Expanding horizons of knowledge

iii. Use of knowledge to make human life more satisfactory, enjoyable and reduction in suffering.

CHECK YOUR PROGRESS

1. What is research?
2. What is social research?
3. What is scientific attitude?

Social scientists or social engineers may also aim at more precise social interrelations, involving measurable and controllable variables and thus ensure enjoyable content of human life. Social research is a basic need of a culturally developed society. Considering limited, dwindling resources, on the one hand and multiplying number of individuals, their ever growing wants and resulting competition, conflict and chaos, it is necessary to undertake relevant social research on increasing scale and continuously, to minimize social friction and sorrow and maximize social welfare and happiness :

Briefly, the purpose and functions of social research can be enumerated as below :-

i. Search for truth

ii. Application of knowledge for better human life.

iii. Examining phenomena or events for identifying causes and establishing generalizations, and theories about human behavior.

iv. Predicting future on the basis of existing knowledge and study methods.

v. Verifying, correlating or modifying existing generalizations or theories, differences of opinion and settling debates if any.

2.2.5 RESEARCH AND SCIENTIFIC ATTITUDE

What is the essential characteristic of a researcher? What is scientific attitude? To think without bias, in a clear way and in rigorous scientific, logical and objective manner is the basic, fundamental precondition of research and scientific attitude. In collecting, organizing and analyzing data, a researcher must be open minded, unbiased, objective and always critical and without any likes and dislikes-extreme doubts and suspicion or extreme faith, both constitute demerits of a good researcher. Reaching hasty conclusions is also bad for a responsible researcher. Carelessness in collecting, handling and analyzing data are to be strictly avoided. Unnecessary class, caste, creed and political influences must always be avoided by researchers Perseverance and hard work should always be cultivated by a researcher. All these things together constitute the exact meaning of scientific attitude.

2.2.6 COMPARISION BETWEEN PURE SCIENCES RESEARCH AND SOCIAL SCIENCES RESEARCH

Although the objectives of research in natural pure sciences and social sciences are the same, there are distinct differences between their methodology. We give below these differences in research in pure/natural and social science.

i. Research in social sciences is mostly based on inductive method, in natural science research depends mostly on deductive method.

ii. Research in social sciences is philosophical, abstract, indicative and involves an element of subjectivity and value judgment. But research in pure sciences is objective, explicit, factual and relies on certainty.

iii. Facts in social sciences are in many cases, approximations not fully precise and not fully measurable and reliable, whereas in natural / pure science research facts / data are objective, precise and precisely measurable.

iv. Research in social sciences, very rarely can/may use" preplanned experimental method, but in pure sciences, preplanned, controlled, experimental method is the basic rule of research.

v. In social science research, facts / data tend to be variegated mainly because they are shaped by human likes / dislikes, vested interests, mental setup and cultural differences, but facts / data in pure science research arc essentially material, objective, measurable and neutral in value sense.

vi. A researcher in social sciences cannot separate himself from the social set ups which he examines whereas a researcher in natural or pure sciences can keep himself totally away, separate from the material phenomenon which he studies. A social science researcher is vulnerable to social influences which do not happen in case of research in natural / pure sciences.

vii. Research in social sciences tends to be highly complex because of emotional involvement and gets blurred because of unintended biases, whereas research in natural/ pure sciences, though complex is free from emotional influences which vary with person, place, time and context.

viii. Measurability in social science research is not fully developed, in natural sciences, facts / data are fully and micro-measurable.

ix. The major difference between research in social sciences and pure / natural sciences relates to power and precision of predictions of a causal phenomenon. Pure / natural science research can make precise prediction whereas social science research, at the most, indicates, what may broadly happen. It is also very difficult in social sciences to repeat a phenomenon in the same factorial environment.

CHECK YOUR PROGRESS

1. Highlight main differences between research in natural sciences & social sciences.

2.2.7 ESSENTIAL CHARACTERICS OF RESEARCH (OR RESEARCHER)

Following are the essential characteristics of an ideal researcher.

i. An unquenchable and strong desire to find out the truth,

ii. Ability to identify similarity in diverse situations and diversity in similar Situations.

iii. Curiosity, quest, doubt, patient, slow thinking, willingness to reexamine, discipline, no dogmatism are according to Francis Beacon, essential attributes of a researcher.

iv. According to John Thompson, a researcher should have a) insistence for data b) caution in statements c) clear right / understanding d) awareness about multiplicity in varied social interrelations.

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v. According to Carl Pearson, disciplined imagination is the distinguishable characteristics of an ideal researcher.

vi. According to Sidney and Beatrice Web, a researcher must always avoid influence of his personal biases.

vii. A researcher, according to C. Luther Fry, must possess intellectual honesty and integrity.

viii. According to Spaher and Swanson, a researcher must love his work, have abundant patience and perseverance, insist on authority and correctness of data, posses equity of consideration, thoughtfulness, and broadly responsible and always focused.

A senior India social scientist, Prof. M. H. Gopal has beautifully described a good researcher in following words.

"A true scientist possesses the devotion of a mother, the poise of a judge, the objectivity of a philosopher, the courage of a soldier, the perseverance and patience of a beaver, the fervor of a patriot and the vision of a prophet."

2.3 SUMMARY

In this unit we have discussed various aspects of research related mainly to –

- Meaning of Research.
- Types of Research
- Meaning of Social Research
- Functions / Purposes of Research
- Meaning of Scientific attitude
- Comparison between Pure Science Research and Social Science Research
- Characteristics of a Researcher / Research

2.4 KEY WORDS

- **Research :** Search for truth.
- **Social Research :** Study of phenomena resulting from interaction between human groups.

2.5 EXERCISES

1. Explain what is Resarch.
2. Explain Social Research.
3. What are the functions of Research?
4. What are the main differences between Social Science Research and Pure Science Research?
5. State major characteristics of a Researcher.

2.6 BOOKS FOR FURTHER READING

- **Kurien C. T.** – *"A Guide to Research In Economics"*, 1973.
- **Ackoff R. H.** – *"The Design of Social Research"*, London.
- **Selter, Jahoda & Others** – *"Research Methods in Social Relation"*, 1959.

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UNIT 3 : SELECTION AND FORMULATION OF A RESEARCH PROBLEM

Structure

3.0 Introduction

3.1 Unit Objectives

3.2 Subject Description

- 3.2.1 Research in Commerce and Management
- 3.2.2 Steps in research
- 3.2.3 Research output and policy

3.3 Summary

3.4 Key Words

3.5 Exercises

3.6 Further Reading

3.0 INTRODUCTION

In any research work, the decisions regarding –

i. Selection of a research problem and,

ii. Formulation of the research work or research project are critically very important for the ultimate success of the research work. In this unit we discuss these two fundamental aspects of research in detail.

3.1 UNIT OBJECTIVES

The reading in this unit will unable a student to –

i. Broadly understand research in economics, commerce and management.

ii. Understand essential steps in completing a research work.

iii. Plan carefully a research design.

iv. Reach important observations, findings and conclusions (output and policy) of research work.

3.2 SUBJECT DESCRIPTION

3.2.1 RESEARCH IN COMMERCE AND MANAGEMENT

It is universally accepted that all sub braches of knowledge in commerce and management. (*e.g.* accountancy, auditing, business organization, taxation,

management production, marketing, finance and human resource management, insurance etc.) basically derive from the mother science Economics which is considered to be the queen of social sciences and according to Nobel laureate, Samuelson the "Conversation of the Age."

It is widely accepted that Economics is a study of mankind in the ordinary business of life; it examines that part of individual and social action which is most closely connected with the attainment and with the use of the material requisites of well being – Dr. Marshall.

Prof. Lionel Robbins defines economics as a science which studies human behaviour as a relationship between ends and scare means which have alternative uses. If we carefully go into details of sub branches in commerce and management, it is realized that we always deal with problems of scarcity, choice, alternative decisions, minimization of cost, maximization of satisfaction, profit, substitution of factors of production, choice of technique, pricing of product and factors of production.

As in economics, in sciences dealing with commerce and management, as a practice of science, we collect, arrange and analyse economic facts and apply the knowledge gained by observation and experience in determining what are likely to be the immediate and ultimate effects of various groups of causes in solving practical problems and in laying down rules which may be a guide in life. This is how Marshall elaborated the function of science. We, therefore, can maintain that research in any branch of knowledge is arriving at guiding principles for human life by collecting, organizing and analyzing data in a systematic and disciplined way. Research is search for interrelations, according to Prof. C. T. Kurien.

Research in commerce and management similarly and therefore, deals essentially with economic problems related to practical affairs like organization, producers, process of production, distribution, marketing, storing, advertising pricing consumption and all such related issues.

3.2.2 STEPS IN RESEARCH

To make your research efforts successful and socially meaningful, the whole approach has to be carefully planned and executed step by step in a scientific and logical way. It is, therefore, necessary to explain and present steps and design of any research work carefully. Following are the distinct steps in the process of selection of research topic and formulation of research design.

A] Explain the objectives of research, present the problem and state the hypothesis/es.

B] Elaborate the research design mainly with reference to methodology of data collection and analysis.

C] System of data collection with clear understanding of sampling techniques and / or census approach.

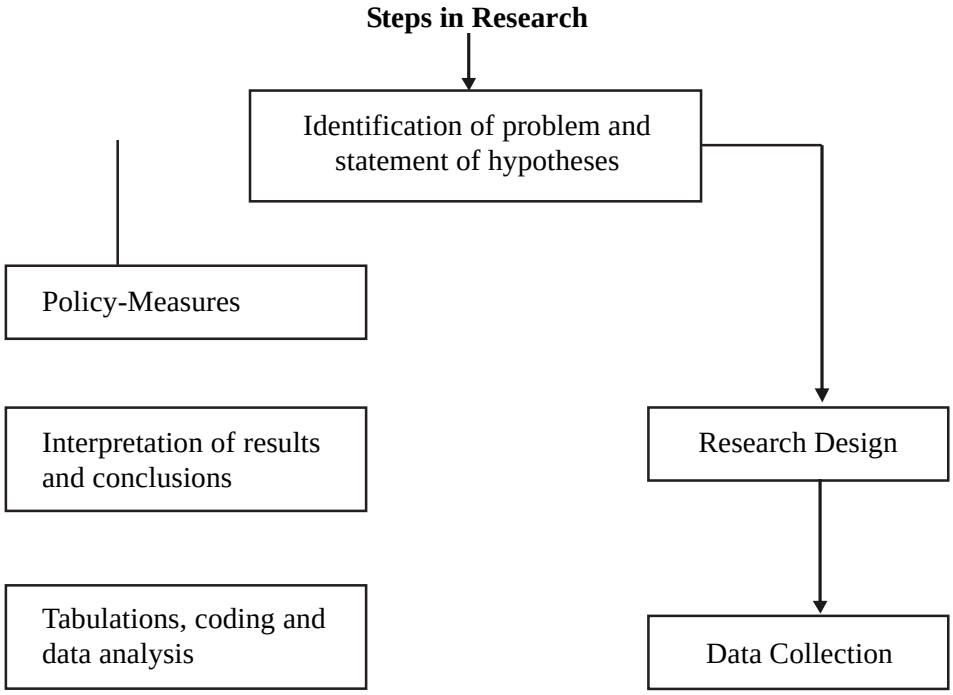
D] Description, tabulation, coding, analysis of data and statement of analytical results / findings.

E] Interpretation of these findings / results and reaching objective conclusions.

F] Attempting reliable prediction.

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We present these steps in a flow chart as given below.



Selection of the research topic / question is the first critically important step. Practical problems, emerging needs, scientific curiosity, intellectual quest values of life, life experiences are the main sources of research topics or questions.

Secondly, formation of the hypothesis/es is the next step. Before we start collecting, tabulating and analyzing data, it is necessary to have 'a priori' causal relationship which may explain the phenomenon under study, this is known as hypothesis/es. A hypothesis/es explain cause effect relationship at a logical level. The hypothesis gives us basic concepts on the basis of which we collect data generate data, for empirical evidence.

In formulation of hypothesis, we in a way, organize our research question in a scientific way. The words hypothesis and concepts are explained elaborately in subsequent units. In formulating research question and research design it is necessary that (i) the researcher has advanced in-depth reading in related literatiure, (ii) he is fully aware of the current theories and research in related area, (iii) he has close interaction with peers in the field and (iv) he must possess on inquisitive imaginative scientific mindset.

Thirdly, it is necessary to have a well planned research design. It helps in focussing work, precise explanation of events / questions and most importantly a research design helps in minimization of variance in the research system. According to R. L. Ackoff there are two types of research design- Ideal Research Design – a design without practical limitation, the other research design is practical / feasible research design. In this, we consider limitations like time, resources availability of data and intellectual skills of the researcher. Normally a practical research design has four important constituents.

i. Sampling Design
ii. Statistical design
iii. Observational Design
iv. Operational Design

In preparing a practical research design, the researcher has to consider following aspects,

i. What is the primary research focus?
ii. What is the data required for the research?
iii. What are the exact objectives of research?
iv. Sources of data?
v. Places to be visited for research
vi. Time limits
vii. Number of entities to be involved in the research
viii. Criteria of sampling
ix. Methods of data collection
x. Methods of data coding classification and tabulation.
xi. Material / financial resources available for research.

Broadly, there are five types of research design, according to Mac-Grant.

i. Controlled experiment
ii. Study / case study
iii. Survey sample / census
iv. Investigation
v. Action research

According to Seltiz and others, there are basically three types of research design,

i. Exploratory or formulative
ii. Descriptive or diagnostic
iii. Studies testing causal hypothesis.

Exploratory research relies heavily on review of literature, review of experience and entities/cases encouraging intuitions or inspiration. This depends heavily on the attitude of scientist, intensity of/or depth of his study/integrative powers of the researcher normally, reaction of indifferent individuals, behaviour of marginal individuals/groups, developmental transition, isolates, deviants and pathological cases and pure cases constitute factors which induce a researcher to explore.

In the case of many social sciences, majority of researchers collect and describe information regarding various groups, communities and sets of experiences consumption patterns, saving habits, investment, likes and dislikes, work culture, price responses, management decisions and practices, entrepreneurial behaviours, business leadership etc are such areas of research.

In the case of studies testing causal hypothesis the main objective of research is to verify an assumed causation, either positively or negatively. In such researches, experimental method is more frequently used. However, with the passage of time and revolutionary changes in technology of analysis, experimental method is now used, as in natural sciences, in social sciences also. In a very formal way experiment is a way of organizing evidence so as to reach inference about the appropriateness of a hypothesis which essentially is a statement of relationship between a cause (set of causes) and a result (set of results).

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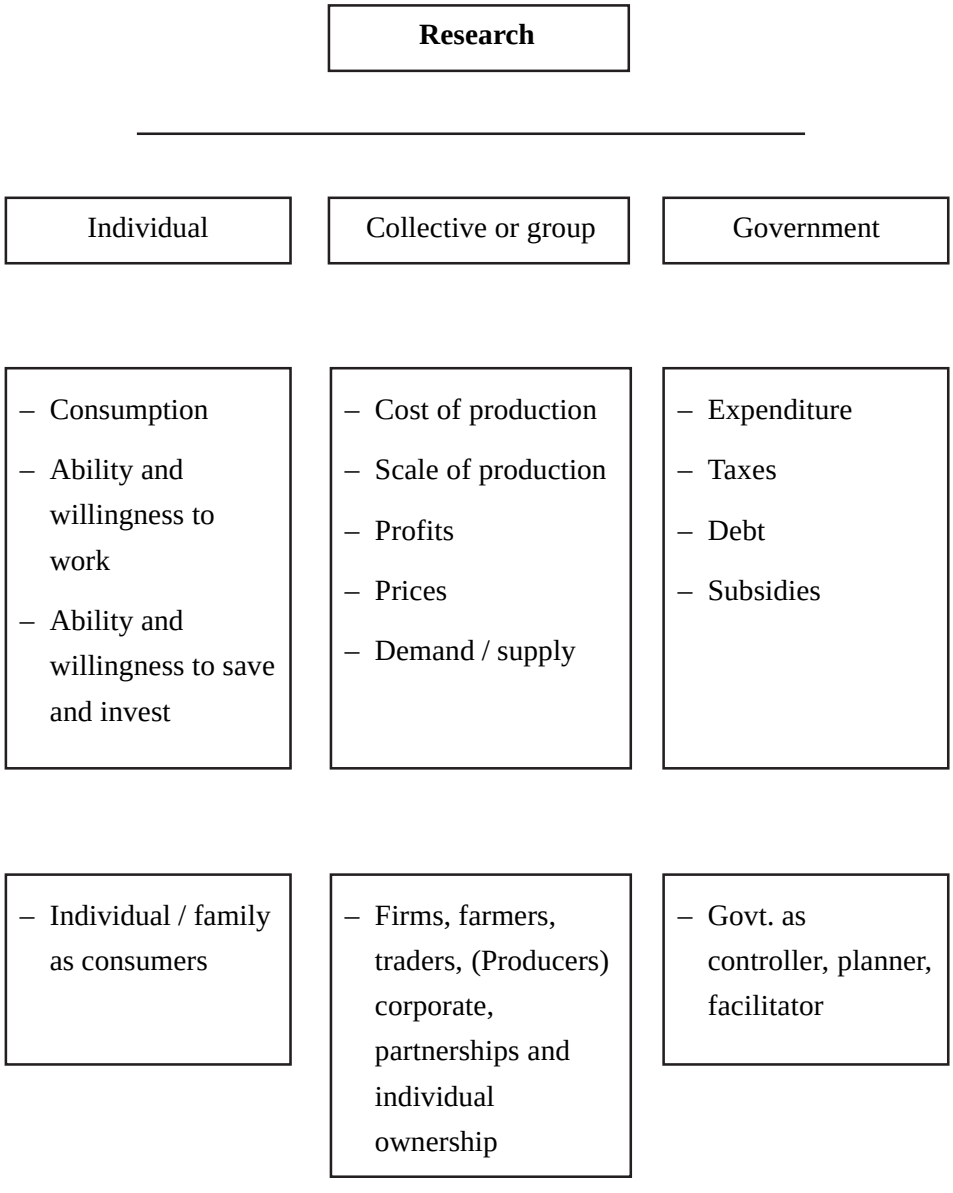
1. What is a Research design?
2. What are the important constituents of research design?
3. What are the types of research design?

In the case of experimental design two approaches are mainly practiced (i) after only experiment (ii) before after experiment.

3.2.3 RESEARCH OUTPUT AND POLICY

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All research, its output, must finally result into some policy decision and concrete action programme. The conclusions reached after completing a research project should indicate certain reasoning, a certain policy and a set of action programmes, which solve social and/or individual problems and enhance individual and/or social satisfaction or welfare or profit or market or output and employment, the relationship between research output and policy is illustrated in the following flow chart.



3.2.4 IMPORTANT WORDS AND THEIR MEANINGS

ι Research – Finding out things,
Searching for truth,
Establishing cause effect relationship

- Science – A system of knowledge explaining phenomena by reaching, Generalizations, laws, rules, theories and hypothesis/es.
- Social Science – Sciences which deal with human behaviour in its variety and diversity.

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3.2.5 ANSWERS TO QUESTIONS FOR SELF-STUDY

a) What is research?

Research means finding out things. It means careful search for truth. It is a systematic effort to acquire new knowledge. Research is establishing causal relations. According to social sciences encyclopaedia, research is the manipulation of things, concepts or symbols for the purpose of generalizing to extend, correct, or verify knowledge, whether that knowledge aid in the construction of a theory or in the practice of art.

b) What is social Research?

Social research is the systematic method of discovering new facts or verifying old facts through sequence, interrelationship, causal explanations and the natural laws which cover them.

c) What are the functions or purposes of research?

Essentially, research has three functions or purposes

i. Search for truth
ii. Expanding horizons of knowledge
iii. Use of knowledge to make human life more satisfactory, enjoyable and reduction in suffering.

d) Explain the main steps in Research :

Following are the main steps in research.

i. Statement of problem, objectives and hypothesis/es.
ii. Elaboration of research design, methodology, and analysis framework,
iii. System of data collection.
iv. Data coding, classification, tabulation and analysis and finding.
v. Interpretation of findings / results and reaching objective conclusions.
vi. Attempting reliable prediction.

3.3 SUMMARY

In this chapter we have discussed meaning of science, function of science, nature of social sciences, and classification of social sciences. More importantly, we have presented some definitions of research. We also discussed types of research, purpose of research, research and scientific attitude. We also enumerated characteristics of a good researcher. We examined differences between research in social and natural research. We briefly discussed various steps in selection and

formulation of a research topic/question/problem. Finally, we examined relevance of research output for individual, group/corporate and public entities at various levels. We also briefly answered some questions as a part of self study apart from giving important key words and their meaning.

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3.4 EXERCISES

i. Explain the characteristics of a good researcher.

ii. Discuss main types of research design.

iii. What are the main steps in selection and formulation of a research problem.

iv. What are the differences between research in social science and in natural sciences?

v. Discuss main functions of research.

vi. Explain at length, the term research.

3.5 BOOKS FOR FURTHER READING

- **Marshall, Alfred** – *"Principles of Economics"*, ELBS- MacMillan, London, 1962.
- **Robbins, Lionel** – *"An Essay on the Nature and significance of Economic science."*
- **Kurien C. T.** – *"A Guide of Research in Economics"*, 1973.
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UNIT 4 : HYPOTHESIS

NOTES

Structure

4.0 Introduction

4.1 Unit Objectives

4.2 Subject Description

4.2.1 Hypothesis- Meaning and Characteristics

4.2.2 Formulation of Hypothesis

4.2.3 Test of Hypothesis

4.3 Summary

4.4 Key terms

4.5 Exercises

4.6 Books for Further Reading

4.0 INTRODUCTION

In the previous unit, we have discussed the meaning and importance of research. We have also discussed the types of research, the process of selection of research problem and the relevance of research output to public or corporate policy. In this unit, we propose to study primary concepts related with research. These are the concepts which mark the beginning of any research activity and are therefore very important. As underscored by a well known saying, 'well begun is half done', well beginning of a research activity requires that we have a thorough understanding of these primary concepts of research. These important concepts of research are hypothesis, research design and the theory of causation. In this unit, we thus propose to discuss and understand the meaning of the hypothesis, characteristics of hypothesis, formulation and test of hypothesis.

4.1 UNIT OBJECTIVES

This unit will help us understand –

- The meaning and characteristics of the hypothesis.
- How to formulate and test a hypothesis?

4.2 SUBJECT DESCRIPTION

4.2.1 HYPOTHESIS - MEANING AND CHARACTERISTICS

Hypothesis represents the beginning of any type of research. In other words, in any type of research work, formulation of hypothesis assumes foremost

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importance, as no research work can proceed without hypothesis. Hypothesis directs us in our research or in whatever we are searching. Hypothesis is a statement which can be proved or disproved. It is a statement capable of being tested. In a sense, hypothesis is a question which definitely has an answer. Hypothesis aids us a great deal while collecting, tabulating and analyzing data and other relevant information. Hypothesis thus is inevitable in any kind of research, if it is to be carried out successfully. The meaning and exact nature of hypothesis will become clear from the following definitions.

I. J. E. Creighton & H. R. Smart :-

A hypothesis is 'a guess or supposition as to the existence of some fact or law which will serve to explain a connection of facts already known to exist.'

II. Max Black :-

Hypothesis is 'a proposition not known to be definitely true or false, examined for the sake of determining the consequences which would follow from its truth.'

III. M. R. Cohen and E. Nagel :-

'We cannot take a single step forward in any inquiry unless we begin with a suggested explanation or solution of the difficulty which originated it. Such tentative explanations are suggested to us by something in the subject matter and by our previous knowledge. When they are formulated as propositions they are called hypothesis.'

IV. W. J. Goode and P. K. Hatt :-

Hypothesis is 'a proposition which can be put to a test to determine validity and is useful for further research.'

V. C. T. Kurein :-

Hypothesis is 'a possible explanation of the phenomenon under observation.'

VI. M. H. Gopal :-

"It has been defined as a tentative solution posed on a cursory observation of known and available data and adopted provisionally to explain certain events and to guide in the investigation of others."

VII. G. A. Lundberg :-

"A hypothesis is a tentative generalization, the validity of which remains to be tested. In its most elementary stages, the hypothesis may be any hunch, guess, imaginative idea or intuition whatsoever, which becomes the basis of action or investigation."

VIII. Webster's New International Dictionary of the English Language (1956)

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

MEANING OF HYPOTHESIS :-

From the above mentioned definitions of hypothesis, its meaning can be explained in the following ways.

1. At the primary level, a hypothesis is the possible and probable explanation of the sequence of happenings or data.
2. Sometimes, hypothesis may emerge from an imagination, common sense or a sudden event.
3. Hypothesis can be a probable answer to the research problem undertaken for study.
4. Hypothesis may not always be true. It can get disproven. In other words, hypothesis need not always be a true proposition.
5. Hypothesis, in a sense, is an attempt to present the interrelations that exist in the available data or information.
6. Hypothesis is not an individual opinion or community thought. Instead, it is a philosophical means which is to be used for research purpose. Hypothesis is not to be considered as the ultimate objective; rather it is to be taken as the means of explaining scientifically the prevailing situation.

The concept of hypothesis can further be explained with the help of some examples. Lord Keynes, in his theory of national income determination, made a hypothesis about the consumption function. He stated that the consumption expenditure of an individual or an economy as a whole is dependent on the level of income and changes in a certain proportion. Later, this proposition was proved in the statistical research carried out by Prof. Simon Kuznets. Matthus, while studying the population, formulated a hypothesis that population increases faster than the supply of food grains. Population studies of several countries revealed that this hypothesis is true. Validation of the Malthus' hypothesis turned it in to a theory and when it was tested in many other countries it became the famous Malthus' Law of Population.

It thus emerges that when hypothesis is tested and proven, it becomes a theory. The theory, when found true in different times and at different places, becomes the law.

Having understood the concept of hypothesis, few hypotheses can be formulated in the areas of commerce and economics.

A) Population growth moderates with the rise in per capita income.

B) Sales growth is positively linked with the availability of credit.

C) Commerce education increases the employability of the graduate students.

D) High rates of direct taxes prompt people to evade taxes.

E) Good working conditions improve the productivity of employees.

F) Advertising is the most effecting way of promoting sales than any other scheme.

G) Higher Debt-Equity Ratio increases the probability of insolvency.

H) Economic reforms in India have made the public sector banks more efficient and competent.

NOTES

CHECK YOUR PROGRESS

1. Define the term hypothesis?
2. What are the characteristics of good hypothesis?

I) Foreign direct investment in India has moved in those sectors which offer higher rate of profit.

J) There is no significant association between credit rating and investment of fund.

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CHARACTERISTICS OF A GOOD HYPOTHESIS :

Not all the hypotheses are good and useful from the point of view of research. It is only the few hypotheses satisfying certain criteria that are good, useful and directive in the research work undertaken. The characteristics of such a useful hypothesis can be listed as below.

1. Conceptual Clarity :-

The concepts used while framing hypothesis should be crystal clear and unambiguous. Such concepts must be clearly defined so that they become lucid and acceptable to everyone. How are the newly developed concepts interrelated and how are they linked with the old one is to be very clear so that the hypothesis framed on their basis also carries the same clarity. A hypothesis embodying unclear and ambiguous concepts can to a great extent undermine the successful completion of the research work.

2. The need of the empirical referents :-

A hypothesis can be useful in the research work undertaken only when it has links with some empirical referents. Hypothesis based on moral values and ideals are useless as they cannot be tested. Similarly, hypothesis containing opinions as good and bad or expectation with respect to something are not testable and therefore useless. For example, 'current account deficit can be lowered if people change their attitude towards gold' is a hypothesis encompassing expectation. In case of such a hypothesis, the attitude towards gold is something which cannot clearly be described and therefore a hypothesis which embodies such an unclear thing cannot be tested and proved or disproved. In short, the hypothesis should be linked with some testable referents.

3. The hypothesis should be specific :-

For the successful conduction of research, it is necessary that the hypothesis is specific and presented in a precise manner. Hypothesis which is general, too ambitious and grandiose in scope is not to be made as such hypothesis cannot be easily put to test. A hypothesis is to be based on such concepts which are precise and empirical in nature. A hypothesis should give a clear idea about the indicators which are to be used. For example, a hypothesis that economic power is increasingly getting concentrated in few hands in India should enable us to define the concept of economic power. It should be explicated in terms of the measurable indicator like income, wealth, etc. Such specificity in the formulation of hypothesis ensures that the research is practicable and significant.

4. Hypothesis should be within the ambit of the available research techniques :-

While framing the hypothesis, the researcher should be aware of the available research techniques and should see that the hypothesis framed is testable on the basis of them. In other words, a hypothesis should be researchable and for this it is important that a due thought has been given to the methods and techniques

which can be used to measure the concepts and variables embodied in the hypothesis. It does not however mean that hypotheses which are not testable with the available techniques of research are not to be made. If the problem is too significant and therefore the hypothesis framed becomes too ambitious and complex, it's testing becomes possible with development of new research techniques or the hypothesis itself leads to the development of new research techniques.

5. A hypothesis should be consistent with the theory :-

A hypothesis must be related to the existing theory or should have a theoretical orientation. The growth of the knowledge takes place in the sequence of facts, hypothesis, theory and law or principles. It means the hypothesis should have a correspondence with the existing facts and theory. If the hypothesis is related to some theory, the research work will enable us to support, modify or refute the existing theory. Theoretical orientation of the hypothesis ensures that it becomes scientifically useful. According to Prof. Goode and Prof. Hatt, a research work can contribute to the existing knowledge only when the hypothesis is related with some theory.

6. Hypothesis should be concerned with observable facts and empirical events :-

This enables us to explain the observed facts and situations and also verify the framed hypothesis. In the words of Prof. Cohen and Prof. Nagel, "hypothesis must be formulated in such a manner that deduction can be made from it and that consequently a decision can be reached as to whether it does or does not explain the facts considered."

7. A hypothesis should be simple :-

If the research work based on a hypothesis is to be successful, it is necessary that the later is as simple and easy as possible. An ambition of finding out something new may lead the researcher to frame an unrealistic and unclear hypothesis. Such a temptation is to be avoided. Framing a simple, easy and testable hypothesis requires that the researcher is well acquainted with the related concepts.

4.2.2 FORMULATION OF HYPOTHESIS

The real beginning of any research is made with the formulation of hypothesis. In a sense, research is nothing but accepting the hypothesis by proving it or rejecting it if it is disproved or modifying it. Moreover, in any type of research work, the information and data is to be collected with reference to the hypothesis and the concepts embodied in it. Hypothesis therefore occupies an important place in any type of research. Formulation of hypothesis however requires that the difficulties encountered are overcome. A researcher may suffer from a number of difficulties at the stage of formulating a good hypothesis.

A) The researcher should have a thorough knowledge of the accepted theories and basic concepts of that research area where he has decided to work in.

B) The researcher should also acquire the logical and scientific thinking power to frame a hypothesis based on the theories and basic concepts known to him.

C) The researcher should also be well acquainted with the available research methods and techniques.

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Normally, the hypothesis made in the beginning of research is of crude or working nature. Such a working hypothesis is to be made while planning a research work. As the research work proceeds with the working hypothesis, new information, data and evidence becomes available. In the light of new information and evidence, the working hypothesis is to be modified and revised. Sometimes, the working hypothesis changes in a significant way after the modifications are made. In some researches, the hypothesis is formulated not in the beginning but at the time of classification and analysis of data and information. In case of such a hypothesis also it becomes necessary that new or additional information is collected. It thus implies that every hypothesis is subject to change. In order to put the research work in an operative mode several alternative hypotheses are made in the beginning. While framing such hypotheses utmost care is to be taken while using the concepts. The nature of the hypothesis should be such that it enables the researcher to find out something new, something which is previously unknown. The process of formulating a hypothesis is therefore not less than a process of innovation.

While starting with the research work the researcher has a problem or question before him. He frames a hypothesis in order to find a solution to the problem. The information and data that he collects may or may not support the hypothesis made by him. It may appear that the hypothesis made in the beginning is entirely wrong or inconsistent with the collected information. In such cases it becomes necessary that the researcher makes a new hypothesis. This however is to be done by taking into account the required labour, expenditure, etc of taking the research in new direction. The new or the alternative hypothesis made under such circumstances can be greater in number than one. Such hypothesis are however to be exhaustive in nature and exclusive mutually.

In the context of research work and while performing the hypothesis testing exercise, both the alternative hypothesis which is to be proved and accepted and null hypothesis, which is to be disproved, are important and required. The main hypothesis of the research work is the research hypothesis or the alternative hypothesis. Researcher's job is to collect information and data so as to prove the alternative hypothesis so that it can be accepted. Null hypothesis on the other hand is the exact opposite of research or alternative hypothesis. Null hypothesis is also called a hypothesis with no difference. Like the research or alternative hypothesis, the null hypothesis is also a statement. The logic behind formulating a null hypothesis is that it is always easy to prove that a statement is wrong than to prove that a statement (research hypothesis) is cent percent true. In other words, instead of establishing the trueness of research hypothesis undisputedly, it is more easy to establish the wrongness of the opposite statement or conclusion.

In short, while framing hypothesis for a research work, it is important that at least two hypotheses are framed, one of which is a null hypothesis and the other one is an alternative hypothesis. For instance, a null hypothesis and alternative hypothesis can be as below.

NULL HYPOTHESIS :-

The average age of entry in to the labour market of commerce graduates is 22 years.

However, the collected data and information, when analysed, reveals that the average entry age is greater than or less than 22 years, then the null hypothesis gets rejected.

In such a case the alternative hypothesis can be as under

I) The average age of entry into the labour market is greater than 22 years (> 22)

II) The average age of entry into the labour market is less than 22 years (< 22)

III) The average age of entry into the labour market is not 22 years (‘“ 22)

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4.2.3 TEST OF HYPOTHESIS

As stated in the beginning of this unit, the hypothesis formulation marks the beginning of any research. After the hypothesis is formulated in the context of a research problem, next process involves collection of relevant data and information and analysis of the same using an appropriate statistical technique, which proves or disproves the hypothesis formulated in the beginning. The testing of hypothesis thus represents the end of the research work. Testing of hypothesis can be considered as the most important step in any type of research work as it determines the fruitfulness of the research work. Unless the hypothesis is tested, it will only remain an inference or a proposition. The act of determining the validity of the hypothesis based on the collected data is called the testing of hypothesis.

CHECK YOUR PROGRESS

3. How a hypothesis is formulated?
4. What do you mean by Null Hypothesis?
5. What is an Alternative Hypothesis?
6. Explain the steps involved in testing of hypothesis.

The exercise of hypothesis testing is a systematic work and normally involves following stages or steps.

1. Stating the hypothesis of interest :

Based on the research problem and a primitive understanding of the relationship between the variables involved, a researcher formulates a hypothesis of interest or a research hypothesis which he wants to prove.

2. Collection of relevant data and information

Given the research problem and the formulated hypothesis of interest, the next step is to collect the relevant data and information to proceed further towards the end objective (i.e. proving the research hypothesis).

3. Formation of null hypothesis

For the testing purpose, a null hypothesis is formed based on the statistical data. The null hypothesis is also called as the hypothesis with no difference. In other words, null hypothesis states that there is no difference between the variables involved in the hypothesis or the variables are not related. For example, if the research hypothesis is that the commerce graduates are more employable than the arts graduates, then the null hypothesis will be that both are equally employable or that there is no difference in the employment opportunities available to both. If in research hypothesis, price and demand are said to be inversely related, the null hypothesis assumes them independent or states that price and demand are not related.

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4. Alternative Hypothesis

After the formulation of null hypothesis, alternative hypothesis can be derived. Alternative hypothesis is the negation of null hypothesis and can be more than one and conform to the research hypothesis. In the example of employability, the alternative hypothesis can be 1) two sided- commerce graduates are more employable or arts graduates are more employable 2) one sided- a) commerce graduates are having more employability b) arts graduates are having more employability.

5. Selection of suitable test statistic :-

The next step in the hypothesis testing exercise is that of selecting an appropriate statistical test. It can be chi-square test, t-test or f-test or any other test. Such a test is carried out at a given level of significance.

6. Determine the level of significance :-

As stated in the above step a statistical test is conducted at a given level of significance (a). A level of significance indicates the probability of rejecting or accepting the null hypothesis.

7. Decision :-

The last step in testing hypothesis is that of taking a decision on the basis of the given level of significance (a). It is seen whether the null hypothesis falls in the accepting region or in rejecting region and accordingly a decision is taken. In this way the acceptance or rejection of null hypothesis determines the acceptance or rejection of the initial research hypothesis.

4.3 SUMMARY

Hypothesis marks the commencement of any type of research. It refers to a statement or proposition which is to be proven or disproven based on an appropriate test. A good hypothesis should be simple, conceptually clear and specific, should be connected with empirical referents, should be consistent with the theory, should be concerned with observable facts and empirical events and should be testable on the basis of available research techniques. On the basis of the objectives of study and in accordance with the characteristics of good hypothesis, a research hypothesis is formulated. For the testing purpose a null hypothesis, which is nothing but the hypothesis of no difference, and alternative hypothesis are formulated. Based on the collected data and the analysis of the same, an exercise of hypothesis testing is performed for a given level of significance and with appropriate test. Hypothesis testing represents the core part of any type of research work.

4.4 KEY TERMS

- **Hypothesis:** Hypothesis is a statement or proposition which can be proved or disproved. It is a statement capable of being tested
- **Null Hypothesis:** Null hypothesis is the opposite of research hypothesis and states that there is no difference between the variables involved in the hypothesis or the variables are not related.

- **Alternative hypothesis**: Alternative hypothesis is the negation of null hypothesis and can be more than one and conforms to the research hypothesis.

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4.5 QUESTIONS AND EXERCISES

1. What do you mean by hypothesis? Explain the characteristics of a good hypothesis.
2. Elaborate the process of formulation and testing of hypothesis.
3. Distinguish between null hypothesis and alternative hypothesis.
4. Formulate a hypothesis in the area of commerce and elaborate how it possesses the characteristics of good hypothesis.

4.6 FURTHER READINGS AND REFERENCES

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UNIT 5 : THEORY OF CAUSATION

NOTES

Structure

5.0 Introduction

5.1 Unit Objectives

5.2 Subject Description

5.2.1 Theory of Causation and Concept

5.2.2 An Example

5.3 Summary

5.4 Key Terms

5.5 Exercises

5.6 Books for Further Reading

5.0 INTRODUCTION

As discussed in the previous unit, any good research begins with the formulation of a precise hypothesis, which is nothing but a statement expressing relationship between two or more variables. The variables which are taken into consideration while formulating a hypothesis are interrelated as independent and dependent variables. In other words, the variables involved in the hypothesis are connected with each other as cause(s) and effect. A hypothesis which is formulated without any logic, that is, without cause(s) and effect variables, is meaningless and will turn out to be a big mistake if the research activity is taken forward with it. Therefore, while formulating a hypothesis, the variables which are interrelated as cause(s) and effect are to be considered, failing which will lead to the formulation of wrong hypothesis and the entire research work will move on the wrong path.

It is here that the theory of causality or causation assumes great importance. A researcher therefore is supposed to be well familiar with the theory of causation. In this unit, our attempt will be to have an understanding of the theory of causation.

5.1 UNIT OBJECTIVES

This unit will acquaint us with –

- The theory of causation.
- The types of causes.

5.2 SUBJECT DESCRIPTION

5.2.1 THEORY OF CAUSATION AND THE CONCEPTS

The primary objective of research is to find out tenability of or test a

hypothesis based on causality. The concept of causality or the theory of causation is therefore very vital in the science of research and thus needs to be understood well. It is the proper understanding of the theory of causality that will help a researcher formulate a testable hypothesis and proceed smoothly in his research work.

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To understand the theory of causality, we must first be clear about the concept of 'cause'. Cause is that event which should precede another event. It means the cause is an event which as a precondition and should occur first, if another event it to occur. According to A. E. Tylor, 'The current scientific conception of a cause is thus the totality of conditions in the presence of which an event occurs and in the absence of any member of which it does not occur.' It means, if an event is to occur then several other events are to pre-occur. The causality thus can be defined as the systematic pre-established chain of events. In this chain, those events which occur as a precondition are the causes and the event which happens in the end is the effect. Causality is chain in which the effect follows the cause(s) or, in other words, in which the later precedes the former. Every effect has its cause(s) or everything that happens is the result of some cause(s) is the basic tenet of theory of causation.

CHECK YOUR PROGRESS

1. What is the theory of causation?
2. What do you mean by a necessary cause?
3. Explain the contingent condition of an effect with the help of a hypothetical example.

For an event to occur or to make it happen, several causes (i.e. more than one) are held responsible by the modern scientists. The modern science seeks to find out the necessary and sufficient causes of an effect. The principle of 'one cause one effect,' which the layman believes in, is not accepted in modern science. Under the modern science therefore, attempts are made to find out the contributory conditions / causes, contingent conditions and the alternative conditions of an effect. All these conditions or causes make an effect probable to happen. These causes can be explained as below.

1. Necessary condition :-

A necessary condition is one that must occur if the phenomena of which it is a 'cause' is to occur. For the occurrence of 'B' effect if the 'A' is the necessary condition and if 'A' is found where ever there is 'B', then 'A' is termed as the necessary condition of 'B'. A and B in the example are related in the same way the producer and production are related. A necessary condition is therefore the pre-condition of an event or effect. An addiction to alcohol is developed by a person only when he had tasted it sometime in the past. Without taking alcohol an addiction to it cannot be developed.

2. Sufficient condition :-

If an event is always followed by another event, then the first event can be considered as the sufficient condition or cause of the second event. If 'A' is a sufficient condition for 'B', then the occurrence of 'A' is always followed by the occurrence of 'B'. While interpreting the sufficient condition, an event is not to be considered as the self sufficient cause of another event. It means sufficient condition is not the only condition that causes another event. Sufficient condition is only the last condition that makes an event happen. Other causes of an event or effect are also important.

Sometimes only one cause or condition is both the necessary and sufficient cause of an event. In such a case, 'B' event will happen only when 'A' occurs and when 'A' occurs, it's occurrence will be followed by the event 'B'

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3. Contributory condition :-

An event increases the probability of occurrence of another event. However, the first event may not necessarily be followed by the occurrence of second event; this is because the later is the combined effect of several events or causes. Social scientists have noticed higher tendency to drink alcohol among the teenagers and have attributed this tendency to the lack of company of their father in their childhood. In this example, if drinking alcohol is considered as the effect, then lack of the father's company becomes the one of the contributory factors of that effect.

4. Contingent condition :-

A contributory condition or cause works to make an event happen only when certain situation is present. A situation in which an event carries the impact of a contributory condition is called contingent condition or cause. In the above example, teenagers turn drunkards because they did not get the company of their fathers in their childhood (contributory condition). However, teenagers can turn drunkards only when the alcohol is available at or near their residence. Thus, the easy availability of alcohol becomes the contingent condition or cause and represents the situation in which the contributory condition (i.e. lack of fathers company) works on the effect (i.e. teenagers turning drunkards).

5. Alternative condition :-

In the above example, the lack of fathers' company is the contributory condition. Along with this contributory condition, other causes like unfair treatment received by teenagers from other senior members in the family also work to cause the effect. Such other causes are called the alternative causes or conditions and work with the contributory condition to cause the same effect.

As explained above the link between the cause(s) and the effect is what is implied in the theory of causation or causality. The theory states that nothing in this world happens without a cause. The cause is that event or condition which makes another event to happen. For example, if a child drinks too much cold water or ice cream, then he or she is likely to catch cold. In this example, the drinking of cold drink or eating ice cream is the cause, while the cold that the child succumbs to is the effect. The theory of causation also states that there can be more than one cause of an effect.

Under the science of research, an understanding of the relationship between the cause and effect as implied in the theory of causation is highly important. It enables the researcher formulate a sound and testable hypothesis and proceed further in the research work.

5.2.2 AN EXAMPLE

The theory of causation can be explained with the help of an example wherein a hypothesis relating to two business variables is taken into consideration. 'Increase in advertising expenditure leads to increase in market share of the company' is a hypothesis, wherein two variables, viz. advertising expenditure and market share of the company, are taken in to account. In case of this hypothesis, the variables considered are related as cause and effect and therefore the hypothesis is valid and testable hypothesis and can take the researcher in the right direction. This can be elaborated in the following manner.

Increase in advertising expenditure can be termed as a necessary condition. In this case, as is evident, the increase in advertising expenditure is a cause and the increase in market share of the company is the effect. However, a question arises as to what type of cause or condition the increase in adverting expenditure is. That is, whether the increase in advertising expenditure is a necessary condition or sufficient or contributory or a contingent condition. The increase in advertising expenditure will be the necessary condition for the increase in market share of the company only if the occurrence of increase in advertising expenditure precedes the increase in market share of the company and the former is found wherever there is the later. If this is true then the increase in advertising expenditure can be termed as the necessary condition or cause of the effect in the form of increase in market share of the company. Further, if there is no other event that occurs in between the increase in advertising expenditure and increase in market share of the company, that is, the former is the last event that occurs before the occurrence of the later, then increase in advertising expenditure is considered both necessary and sufficient condition of the effect (i.e. increase in market share of the company).

However, if immediately before the increase in market share of the company, there is another event that occurs, like say wide circulation of the advertise, then in that case increase in advertising expenditure is called the necessary condition, while the wide circulation of the advertise is considered sufficient condition of the effect. It should however be noted that sufficient condition is not the only condition that works on the effect. Sufficient condition is only the last condition that makes the effect to happen. In our example, wide circulation of the advertise is the last condition (and therefore the sufficient condition) that causes the market share of the company to go up. Besides wide circulation, there can be several other conditions which cause the market share of the company to go up.

The other factors that can be associated with the increase in market share of the company are the mouth publicity about the product of the company, favourable changes in the tastes of the people, changes in competitor's policy, etc. This means increase in market share of the company is the end result of several factors, which are termed as contributory factors or conditions.

Another type of cause or condition that works to make an event (i.e. effect) happen is the contingent condition. Contingent condition of an event or effect refers to a situation whose presence decides whether the final effect will take place or not. In our example, increase in advertising expenditure and wide circulation are termed as the necessary and sufficient conditions respectively of an effect of increase in market share of the company. However, both the necessary and sufficient conditions will work to increase the market share only if the people are literate and able to understand the advertise organized by the company. In this case, the literacy level is the contingent condition of the effect of increase in market share of the company. Thus, the literacy level of the people represents a situation in which the contributory condition (*i.e.* wide circulation) works on the effect (i.e. increase in market share).

From the above example, it becomes clear that an effect always has many factors responsible for its occurrence. It is the proper understanding of the relationship between the cause(s) and effect that enables the researcher to formulate a testable hypothesis.

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5.3 SUMMARY

The theory of causation acquaints us with the relationship between the cause and effect. The basic tenet of this theory is that everything that happens in this word has its cause(s). In other words, nothing happens without a cause. Causes are those events which occur as pre-conditions of another event and can be necessary, sufficient, contributory, contingent and alternative.

5.4 KEY TERMS

- **Cause :** Cause is that event which should precede another event. It means the cause is an event which as a precondition should occur first, if another event is to occur.
- **Effect :** Effect is that event which occurs as a consequence of the occurrence of another event.
- **Theory of Causation :** This is a theory which explains the connection between the cause(s) and effect.

5.5 QUESTIONS AND EXERCISES

1. Explain the theory of causation. How is it important from the point of view of research?
2. Explain the various types of causes.
3. Distinguish between the necessary condition and sufficient condition of an effect.

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UNIT 6 : RESEARCH DESIGN

Structure

6.0 Introduction

6.1 Unit Objectives

6.2 Subject Description

6.2.1 Research Design- Meaning

6.2.2 Research Design- Need and Features

6.2.3 Types of Research Design

6.3 Summary

6.4 Key Terms

6.5 Exercises

6.6 Books for Further Reading

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6.0 INTRODUCTION

After the selection of research topic, statement of the research problem and formulation of hypothesis based on concepts, what follows is the preparation of a research design for the actual conduction of research work. The research design pertains to the road map that the researcher follows while conducting research work. It is concerned with the statement of the problem, selection of the sample, collection and analysis of the data with appropriate statistical methods. Before initiating the actual research work, the researcher takes into consideration the available resources in the form of money, time and labor and chalks out a plan or a blue print for the actual conduction of the research work. Such of plan or blueprint is called the research design.

In this unit, our discussion will revolve around research design, which represents an important ingredient of any research

6.1 UNIT OBJECTIVES

This unit will help us understand –

- The meaning of the term research design
- The need and features of research design
- The types of research design

6.2 SUBJECT DESCRIPTION

6.2.1 RESEARCH DESIGN – MEANING

The following definitions will make the meaning of research design clear, Definitions.

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1. **F. N. Kerlinger :** 'Research design is the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and control variance.'

2. **E. A. Suchaman :** 'Research design represents a compromise dictated by the many practical considerations, that go into social research. A research design is not a highly specific plan to be followed without deviation, but rather a series of guide posts to keep one in the right direction.'

3. **Henry Manheim :** 'Research design not only anticipates and specifies the seemingly countless decisions connected with carrying out data collection, processing and analysis, but it presents logical basis for these decisions.'

4. **William Zikmurd :** 'Research design represents a master plan specifying the methods and procedures for collecting and analysing the needed information".

From the above definitions it becomes clear that research design is prepared for the following important reasons.

1. To assist in answering the research questions.
2. To collect and analyze the relevant data.
3. To keep the research work on right track or to avoid the variance or deviation.

In short, the research design provides us with the proper guidance regarding what investigation to carry out, how to carry it out, how to collect data, how to present data, what should be number of observations, how to analyze data, etc.

The research design can be of two types, namely, idealised research design and practical research design. According to Robert L. Ackoff, 'the idealized research design is concerned with specifying the optimum research procedure that could be followed where there are no practical restrictions.' Practical research design, on the other land, is the one which is prepared by taking in to account the practical restrictions in the form of available time, money, power, the preparedness of the researcher and the data availability. In framing a research design, the researcher is to strike a balance between the idealized and the practical research design and while doing so, he should not compromise the scientificness of the research.

Every research design has four factors or dimensions to it. They are:

1. **Sampling Design :** This is the plan of selecting the individuals, products or events which are to be studied as part of the research work.

2. **Observational Design :** Observational plan relates to the conditions under which observations of the individuals, products and events are to be made.

3. **Statistical Design :** This is concerned with questions like how to present and analyse the collected data and information, how to decide its reliability and what statistical method are to be employed for the analysis purpose.

4. **Operational Design :** The details of the actual execution of the above mentioned three plans or designs are given in the operational plan.

While framing a working or practical research design, following questions are to be given a thought.

1. In what respect and of what the research is to be made?
2. What type of information is needed for the research?
3. What is the specific objective of research?
4. What are the sources of information?
5. What regions and places are to be visited for the research purpose?
6. What is the duration or period of research?
7. How many cases are to be considered for research?
8. What are the criteria of sample selection?
9. What method of data collection is to be or can be employed?
10. How the coding and classification of data can be done? What techniques can be employed for the analysis of data?
11. How the optimum use of time, power and money can be ensured in the research work.

6.2.2 RESEARCH DESIGN - NEED AND FEATURES

A research design is very vital in the successful conduction of any type of research. The need or importance of research design can be elaborated in the following ways.

RESEARCH DESIGN - NEED

1. **Drawing accurate conclusions :** A well structured research design helps the researcher to keep the drawbacks in research to the minimum level or avoid them. This ultimately ensures accuracy of the conclusions drawn.

2. **Choice of the data collection techniques :** A properly chalked out research design requires the researcher to pay adequate attention to the techniques of data collection. Choice of an appropriate technique ensures the authenticity and reliability of data, which in turn guarantees accuracy and objectivity of conclusions of research.

3. **Analysis of data :** Interpretation and analysis of collected data and information is perhaps more important than the collection itself. This requires that the researcher is well aware of the data analysis exercise which covers classification, coding and presentation of data. A pre-planned approach in this respect avoids confusion and ensures that the research work moves in right direction and in accordance with the objectives. Such a pre-planned approach comes from a proper research design.

4. **Idealised research design :** An idealised research design, as noted above, is the one which is prepared when there are no restrictions. Framing of such an idealised research design, though practically not possible, ensures that researcher strives to make his research as best as possible. An idealised research design thus works like a dream or a guiding star for the researcher.

5. **Optimum use of labour, time and money :** A properly prepared research design takes the research work in the right direction, enables the researcher to deal with unexpected hurdles that come up and thus helps in avoiding the wastage of labour, time and money.

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A research design, prepared well in advance, makes the journey of research smooth and helps overcome the unexpected problems.

RESEARCH DESIGN - FEATURES

Following are the important features of a research design.

1. Research design is concerned with the research work and is a term that has been taken from the field of civil engineering.
2. Research design works like a torch in the darkness and provides the research work a proper direction.
3. Research work is basically a complex activity as it is concerned with the society, its members, their behaviour, interrelation between different events and so on. Research design provides a framework or roadmap of research and helps in getting rid of the real world complexities.
4. Research design represents a plan to be executed and is therefore prepared well in advance, that is, before the commencement of actual research work. Pre-planning is the soul of the research design.
5. Research design not only guides the research work but it also regulates the latter by enabling the researcher deal with unforeseen events or problems.
6. It ensures the optimum use of labour, money and time.
7. It enables the researcher to achieve majority of the objectives of research.
8. The research design assists the researcher in making right decisions in almost all areas of research work.

6.2.3 TYPES OF RESEARCH DESIGN :

Various types of research design have been put forward by different experts. In the opinion of Prof. MacGrant, there can be five types of research designs, namely, a controlled experiment, a study, a survey, an investigation and an action research.

Prof Seltiz and his associates have given three main types of research design. There are,

A. Exploratory or Formulative Research design.

B. Descriptive and Diagnostic Research design.

C. Studies Testing Causal Hypothesis.

Normally, four types of research designs can be stated and distinguished. There are, a) Exploratory or Formulative, b) Descriptive, c) Diagnostic and d) Experimental. These research designs are discussed in the following part.

A. EXPLORATORY OR FORMULATIVE RESEARCH DESIGN :-

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The main function of the exploratory research design is to gain new insight for formulating research problem or to develop hypothesis for the purpose of further studies. There can be other reasons also behind such a type of research. For example, developing further the framework of investigation, deriving right questions from the point of view of further research, etc. The exploratory research design helps us develop the scientific concepts required for formulating the hypothesis in a neat form. The initial or primary stage of development of a science evolves from such a type of research. This type of research makes it possible to present a new research problem, a new hypothesis or a systematic method of testing a formulated hypothesis. This type of research helps in obtaining the required training for carrying out the research work in a flawless manner.

The exploratory research design as the name suggests, is selected to explore an area of research where there is no or very little information available. In other words, the exploratory research design is chosen when the researcher has either no knowledge or limited knowledge of the issue to be studied. Under such circumstances, the researcher starts gathering information about the problem area so that systematic research can be carried out subsequently. Such an exercise, which the researcher engages in, is of the exploratory type. The nature of exploratory research work can be explained with the help of an analogy. When we go to a doctor with an ailment, he begins with all sorts of questions. He tries to enquire into the ailment that the patient suffers from. He will check various parts of the patient's body and will gather information so as to arrive at a conclusion about the ailment. The doctor essentially is exploring the ailment of the patient and on the basis of the same will reach a conclusion. He can also go for a pathological report, if necessary, and will ultimately complete the diagnosis.

The above real world example explains the nature of exploratory research. Such an exercise of exploring the problem area ultimately helps in developing a hypothesis. In the above example, after the exploration is over, the doctor will formulate a hypothesis which may get proved or disproved in the subsequent examination. The doctor may diagnose the ailment as malaria and the hypothesis thus will be "It is Malaria." The end result of the exploratory research work is development of a hypothesis which can be put to test.

METHODS OF EXPLORATORY RESEARCH DESIGN :

Following methods are used in the context of exploratory research design.

I. Survey of Literature :-

Under this method, the available literature pertaining to the research area is surveyed. Critical reading and thinking over the available literature, making notes represents the primary step in the context of exploratory research work. Survey of available literature brings forth the material which was unknown and unread, the hypotheses which were formulated in a vague form. On the basis of the survey of available literature, it becomes possible to frame an unambiguous and testable hypothesis. Further, some important concepts, which were unknown, become known. Original books, the reviews published on the books, summary, research reports, news papers, periodicals, government publications and reports are the important forms of literature which are to be reviewed under the exploratory

type of research. Debt is not the appropriate form of financing industrial projects involving long gestation period is a crude type of hypothesis which can be formulated and tested. This however requires us to first review the literature relating to finance and forms of finance.

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II. Experience Surveys :-

This involves survey of those people who have some experience in the problem area or the chosen field of study. Such a survey will reveal the difficulties encountered while exploring the research area and can guide the research a great deal. The experienced people who are to be contacted include government officers, social reformers and experts. Such people may reveal the information which is unpublished, the policy angle of the problem, contacts of the other people concerned, etc. Survey of the experienced people will economise the use of time, money, and power, which would have otherwise been lost. This however requires that a proper or representative sample of experienced people is drawn and surveyed, instead of surveying the whole population.

The most important advantage of this type of survey is that it helps the researcher formulate a practical, logical and scientific hypothesis in the research area. The required concepts can be presented in an unambiguous manner. The subsequent stages of research can be carefully chalked out. All these things increase the probability of success and usefulness of research.

CHECK YOUR PROGRESS

1. Define the term research design.
2. Explain the dimensions of research design.
3. Why a research design is important?
4. What are the features of research design?

III. Analysis of Insight Stimulating Examples :-

Sometimes, there is very little experience available in the selected area. In such situations, some independent and insight stimulating events or cases can give the research work proper direction and help in formulating primary type of hypothesis. Study of such few selected cases turns out to be highly useful in the context of research. The success of this method however requires that researcher is alert, receptive, of seeking nature and is able to undertake intensive study and draw together many diverse bits of information into a unified interpretation.

B. DESCRIPTIVE AND DIAGNOSTIC RESEARCH DESIGN :-

Majority of the research in social sciences is one of describing the characteristics of various communities or of the nature of presenting the realistic picture about them. Availability of various facilities to the society and their use is also, to a great extent, the part of descriptive research. The structure of population of a particular city in accordance with the age, occupation, educational level and income level can be known with the help of descriptive research design. The descriptive research is also used in assessing the availability of, use of and shortfall in the facilities like transport system, residential facilities, educational facilities, health facilities, water supply, etc. How much is the percentage of people with certain behaviour or characteristics in total population can be searched with the help of descriptive research. How many people of a particular location are in favour of banning alcohol, how many of them are literate, how many of them belong to the rich class, etc can be found out with the assistance of descriptive or diagnostic research. Such a type of research is undertaken with the intention of formulating a useful and favourable public policy on its basis. Descriptive or diagnostic research is also undertaken for the purpose of prediction. A research undertaken by a business firm in the form of a survey for the purpose of estimating

the probable level of demand for a new product, the number of substitutes that will be available in the market and their impact on the sale of the new product falls in to this category. Such a type of diagnostic research is also undertaken at the government level. For example, a study of credit system of a particular rural region can help diagnose the credit requirements of that region in the coming period. The report of the Vaidyanathan Committee on restructuring of rural credit system, submitted in 2004-05 is the best example of this type of research.

Another variant of diagnostic research is the one which reviews the changes in some variables. For example, are the commerce graduates less employable than the graduates of science stream? Are the commerce graduates better paid than their counterparts in the arts stream? The research that seeks to provide answers to the abovementioned questions falls in to this category. Moreover, the study which attempts to diagnose the relationship between the wages of the workers and the strongness of their union is also of this variety. Similarly, the research aimed at finding out the approach of the large, medium and small farmers towards the new agricultural technology and the problems that the later will face in this respect can also be considered a variant of diagnostic research.

The descriptive research design and diagnostic research design, though linked with each other as the information about a situation or a problem made available by the former forms the basis of later where in the objective is to reach the root cause of a problem and suggest remedies, are different from each other. The main objective of descriptive research is to present a descriptive account containing real information and data on an individual, a group, a society, an event or any other subject or a problem. For such a presentation, detail and all the information about the study subject is required. Though acquiring knowledge is the basic objective of research, it is also undertaken with the intention of identifying the real cause of a problem and suggesting solution to it. The research undertaken to diagnose a problem is called diagnostic research. Such a type of research is used to suggest a remedy to a problem. Falling profitability of a business concern can be studied, described and solved with the help of descriptive and diagnostic research. The business problem of falling profitability can first be described with the help of descriptive research design and can then be addressed on the basis of the remedy or solution suggested through the diagnostic research.

C. DIFFERENCES BETWEEN THE DESCRIPTIVE AND DIAGNOSTIC RESEARCH DESIGNS :

Following are the main differences between the descriptive and diagnostic research :

1. **Differences in the study area :** Descriptive research is concerned with objective, broader and detailed explanation of a situation or a research subject. It is not concerned with the diagnosis of a problem. Diagnostic research on the other hand attempts to reach the root cause of a problem and suggest solution to it.

2. **Differences in the objectives :** Acquiring knowledge is the objective of descriptive research, while identifying the cause of a problem and suggesting remedies to address it; is the objective under diagnostic research.

3. **Differences in the assumptions** : Descriptive research is not based on a hypothesis. In fact, formulation of a hypothesis becomes possible on the basis of the information made available by the descriptive research.

Diagnostic research on the other hand begins with a hypothesis and the information and data is collected in accordance with it. In short, a diagnostic research starts with a hypothesis, a descriptive research, on the contrary, ends with it.

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4. **Differences in the study method :** Descriptive research is undertaken with the objective of describing a problem or a situation or an event. Realistic, scientific and reliable description of the situation under study represents the study method of descriptive research. Descriptive research doesn't deal with what the problem is, what are its causes, which are the prominent ones; etc. Under the diagnostic research however, presenting the problem in a precise manner, identifying its causes step by step, identifying the important ones, assessing their impact and suggesting remedies is the sequence that is followed as part of the study method.

D. EXPERIMENTAL RESEARCH DESIGN

This type of research design is mostly used in natural sciences, as controlled experiments are possible there. Under the experimental research, the effect of a change or manipulation in independent variable on dependent variable is studied. As the experimental research is used in natural sciences, wherever possible it is also used in social sciences and commerce and management. Under the social sciences as also in commerce and management, research can be carried out under controlled conditions. Controlled condition is very important or lies at the heart of experimental research. Therefore, an experiment is defined as an observation under the controlled condition. Controlled condition refers to a situation in which no change is allowed to happen till the experiment is over. Experimental research design thus can be described as that research design under which controlled conditions are created with the intention of studying the effect of change in independent variable on dependent variable.

Experimental research design is more useful in testing the causal hypothesis, that is, the hypothesis which is formulated to establish the cause and effect relationship. 'On-the-job training is more effective in improving labour productivity' is a hypothesis which tries to link on-the-job training with labor productivity as cause and effect and can be tested with the help of experimental research design.

Experimental research, as stated above, is the research that is carried out under the controlled conditions. Conduction of such a type of research requires that two groups are selected for the purpose of research. Of the two groups selected, one is experimental group and the other one is the controlled group. An experimental group is that group which the causal factor is applied to and on whom the impact of the causal factor is observed. The another group, which is called the controlled group, is the one which is kept away from the causal factor. After the application of the causal factor to be experimental group, both the groups are compared with respect to the dependent variable and based on the collected data; conclusions are made about the causal factor and its impact.

In other words, under the experimental research both the groups selected involve a dependent variable and an independent variable. It is in case of the experimental group that a change is made in the independent variable and the impact of the same is observed on the dependent variable. No change is made in the independent variable of the controlled group. Finally conclusions are made in terms of how the change made in the experimental group produces certain

impact, while no such impact is observed in the controlled group where no change was made.

The successful conduction of experimental research however requires that the experimental and controlled groups are selected with utmost care. Both the groups are to be similar in every respect as this will make the impact on the experimental group palpable, even when the impact is mildest

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TYPES OF EXPERIMENTAL RESEARCH :-

Following are the three main types of experimental research.

1. **After Only Experiment :** Under this category the assessment of the impact on dependent variable of the experimental group is made only after the experiment is done. The impact is said to be the result of application of the causal factor to the independent variable. For example, the impact of the on-the-job training on the labour productivity is assessed only after the training is given to the experimental group.

2. **Before-After Experiment :** In this category, the assessment of the impact is made by observing a single group both before and after the application of a causal factor. For example, a single group of labourers is observed both before and after the on-the-job training is given to it for assessing the impact on labour productivity. There are four sub categories of the before after experiment. They are:

   (a) Before-After Experiment with one single group – before experiment the group is controlled group and after it becomes experimental group.

   (b) Before-After Experiment with one control group – before experiment observation of one group (*i.e.* controlled group) and after experiment observation of another group (*i.e.* experimental group).

   (c) Before-After Experiment with two control groups - before experiment observation of two group (*i.e.* controlled group) and after experiment observation of another group (*i.e.* experimental group).

   (d) Before-After Experiment with three control groups - before experiment observation of three groups (*i.e.* controlled group) and after experiment observation of another group (*i.e.* experimental group).

3. **Ex-post Facto Experiment :** Sometime the study of an event can be done only after such an event occurs. Such events cannot be repeated. Therefore, the impact of such events on the society can be studied only with the ex-post facto experiment. Under this type of experiment, two groups are selected, one which has experienced the event and the other one which has not. Both the groups are studied and the impact of the event is ascertained on one group. In this way, the impact of an unexpected event on a group is assessed only after the event has occurred. Impact of events like political or cultural revolution in a country can be ascertained with the help this experiment.

Having understood the concept of research design and its types, the steps or stages of a research design can be enlisted as below.

1. Title of the research.

2. Purpose of the study.

CHECK YOUR PROGRESS

1. What do you mean by Exploratory Research Design?
2. Explain the survey of literature method of Exploratory Research Design.
3. How descriptive research design is different from diagnostic research design.
4. Distinguish between after only experiment and before-after experiment.

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3. Critical appraisal of the related literature / studies.
4. Statement of the problem.
5. Scope of the research.
6. Objectives of the study.
7. Limitations of the study.
8. Formulation of hypothesis.
9. Selection of the sample.
10. Data collection.
11. Data analysis and interpretation.
12. Verification of results.
13. Conclusions.
14. Suggestions.
15. Bibliography.
16. Summary of the report.

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6.3 SUMMARY

Research design is the road-map for the actual implementation of the research work. It represents a master plan indicating the way the data and information is to be collected and analysed and the hypothesis is to be tested. Every research design will have four dimensions to it, namely, sampling design, observational design, statistical design and operational design. The four important types of research designs are

1. Exploratory or Formulative research design.
2. Descriptive research design.
3. Diagnostic research design.
4. Experimental research design.

6.4 KEY TERMS

- **Research design:** The research design represents the road map that the researcher follows while conducting research work.
- **Exploratory research design:** The exploratory research design is a type of research where there is no or very little information available about the issue or the subject to be studied. In other words, the exploratory research design is chosen when the researcher has either no knowledge or limited knowledge of the issue to be studied.
- **Descriptive research:** This is a type of research which is undertaken with the objective of describing a problem or a situation or an event. Realistic, scientific and reliable description of the situation under study represents the basic tenet of descriptive research.

- **Diagnostic research:** A type of research wherein a problem or a situation or an event is diagnosed in a precise manner, its causes are identified step by step, the important ones are underlined, the impact of each is assessed and finally remedies are suggested.
- **Experimental Research Design:** Under the experimental research, the effect of a change or manipulation in independent variable on dependent variable is studied. This type of research design is mostly used in natural sciences, as controlled experiments are possible there.

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6.5 QUESTIONS AND EXERCISES

1. What is a research design? Comment on the need of research design.
2. Elaborate the important features of research design.
3. Explain the meaning and methods of Exploratory Research Design.
4. Distinguish between the Descriptive and Diagnostic Research Design.
5. What do you mean by Experimental Research? Explain the types of Experimental Research.

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UNIT 7 : METHODS OF DATA COLLECTION

NOTES

Structure

7.0 Introduction

7.1 Unit Objectives

7.2 Subject Discription

7.2.1 Methods of Data Collection

7.2.1.1 Primary Data

7.2.1.2 Advantages

7.2.1.3 Disadvantages/Limitations

7.2.2 Secondary Data

7.2.2.1 Advantages

7.2.2.2 Disadvantages/Limitations

7.3 Summary

7.4 Key Words

7.5 Questions and Exercises

7.6 Books for Further Reading

7.0 INTRODUCTION

Genrally data is presented in numerical figures. It refers to a set of information pertaining to any industry, event, market, company, consumer base and economy. For example, data of labour of an industry includes a count of the total numbers of labourers and a separate count of the various types of labourers such as, married and unmarried, male and female, age, work experience, salary etc.

7.1 UNIT OBJECTIVES

After studying this unit, you should be able –

- To understand meaning and methods of data collection.
- To analyse advantages and disadvantages / limitations of primary data.
- To analyse advantages and disadvantages / limitations of secondary data.

7.2 SUBJECT DESCRIPTION

7.2.1 METHODS OF DATA COLLECTION :

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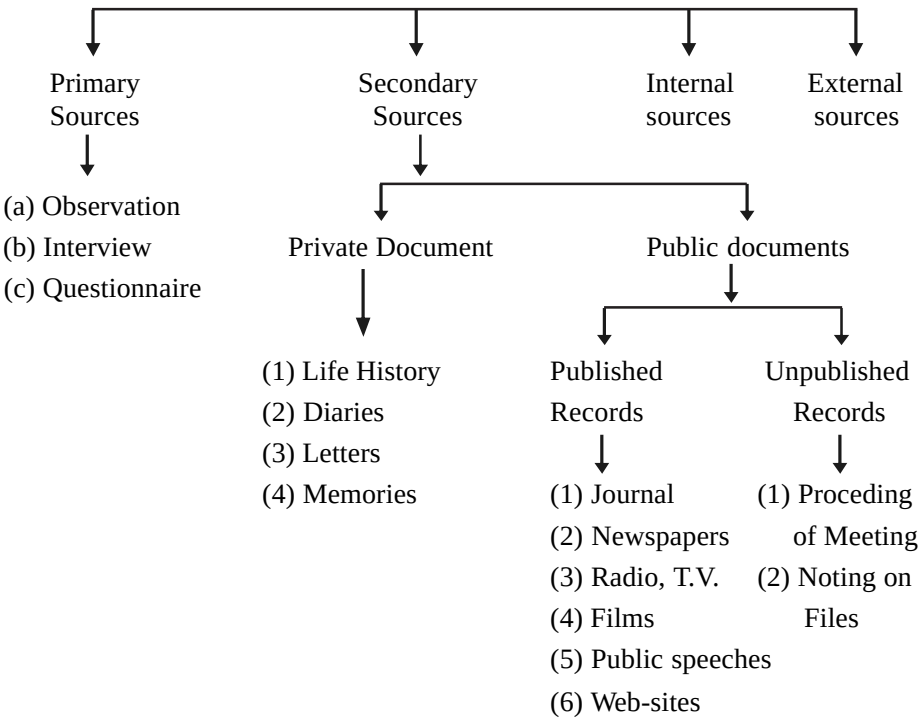
There are two approaches or methods of data collection, namely, primary data collection and secondary data collection. In research, when the researcher identifies the problem of research, then the next stage of research is data collection. The researcher can adopt any method of data collection according to his research work.

7.2.1.1 PRIMARY DATA :-

In simple words primary data means information collected for the first time. It refers to that information which is generated to meet the specific requirements of the investigation at hand. e.g. Data obtained in a population census by the census commissioner depending upon the research is the common example of primary data.

The chart No. 1 shows the methods of data collection.

Data Sources



Source : Sarvanavel, P. (2005), Research Methodology, P. 170.

There are some advantages and limitations of primary data.

7.2.1.2 ADVANTAGES OF PRIMARY DATA :-

(1) According to Primary data, the researcher can easily explain the various definitions, concepts and different terms in the research subject.

(2) Primary Data includes description of the procedure and copy of the schedule used in collecting data and selecting the sample.

CHECK YOUR PROGRESS

1. Prepared a chart of data sources
2. Define primary data.
3. Explain the advantages and disadvantages of primary data.

(3) It is more accurate, relevant and gives detailed information according to the research subject.

7.2.1.3 DISADVANTAGES / LIMITATION OF PRIMARY DATA :

NOTES

(1) For collection of Primary data, it requires trained investigators or experts are required. Otherwise, it may lead to unreliable data collection as well as wrong observations.

(2) This method of data collection is much expensive. Further it requires more efforts and enough time.

7.2.2 SECONDARY DATA :

In simple words, secondary data means data collected previously. It is also known as published data. In other words, secondary data is information that is collected for a purpose other than to solve the specific problem under investigation. A very common example of secondary sources is data published in RBI Bulletin, Govt. reports, Industrial Report, etc.

7.2.2.1 ADVANTAGES OF SECONDARY DATA :-

(1) Secondary data provides supplementary information of research subject.

(2) It is helpful for formulation of hypothesis in the research.

(3) Compared to primary data, it is less costly and less time consuming.

(4) If the secondary data is published by Govt. or any other authentic organization, means it is reliable and authentic.

CHECK YOUR PROGRESS

1. Define secondary data.
2. Explain the advantages and disadvantages of secondary data.

7.2.2.2 DISADVANTAGES / LIMITATIONS OF SECONDARY DATA :

(1) By definition of secondary data, it may be old data.

(2) If the secondary data is published by unauthorized sources. It is not reliable and authentic.

(3) When the secondary data is not commonly used and produced, it will be difficult for the researcher to find the source of secondary data.

7.3 SUMMARY

Data is presented in numerical figures. There are two approaches or methods of data collection, namely, primary data collection and secondary data collection. In research, when the researcher identifies the problem of research, then the next stage of research is data collection. The researcher can adopt any method of data collection according to his research work.

Primary data means information collected for the first time. It refers to that information which is generated to meet the specific requirements of the investigation at hand. *e.g.* Data obtained in a population census by the census commissioner, depending upon the research, is the common example of primary data. There are various types of primary data collection (*e.g.* observation, questionnaire, interview etc.). There are some advantages primary data (*e.g.* is more accurate, relevant and gives detailed information according to the research

subject) and limitations of primary data (*e.g.* This method of data collection is much expensive. Further it requires more efforts and enough time). Secondary data means data collected previously. It is also know as published data. In other words, secondary data is information that is collected for a purpose other than to solve the specific problem under investigation. A very common example of secondary sources is data published in RBI Bulletin, Govt. reports, Industrial Reports, etc. Like primary data, secondary data have also some advantages (*e.g.* Compared to primary data, it is less costly and less time consuming)and limitations (*e.g.* If the secondary data is published by unauthorized sources). It is not reliable and authentic.

7.4 KEY TERMS

- **Data :** data is presented in numerical figures.
- **Primary Data :** Primary data means information collected for the first time. It refers to that information which is generated to meet the specific requirements of the investigation at hand.
- **Secondary Data :** It means data collected previously. It is also known as published data.

7.5 QUESTIONS AND EXERCISES

A. Short Notes

1. Primary Data
2. Secondary Data

B. Long – Answer Questions

1. Explain the meaning, advantages and disadvantages of primary data.
2. Define secondary data and explain its advantages and disadvantages.

7.6 FURTHER READING AND REFERENCES

1. **Ahuja, Ram** (2001), *"Research Methods"*, Rawat Publication, New Delhi.
2. **Burns, Robert B.** (2000), *"Introduction to Research methods"*, Sage Publication, London.
3. **Khanzode, V. V.** (1995), *"Research Methodology"*, APH Publishing corporation, New Delhi.
4. **Sarvanavel, P.** (2005), *"Research Methodology"*, Kitab Mahal, Allahabad.

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UNIT 8 : PRIMARY AND SECONDARY DATA

NOTES

Structure

8.0 Introduction

8.1 Unit Objectives

8.2 Primary and Secondary Data

8.2.1 Method of Primary Data Collection

8.2.1.1 Observation Method

8.2.1.2 Interview Method

8.2.1.3 Questionnaire Method

8.2.2 Sources of Secondary Data

8.3 Summary

8.4 Key Words

8.5 Questions and Exercises

8.0 INTRODUCTION

Primary and secondary data plays an important role both in the quantitative and qualitative research. In this unit we will discuss the techniques of primary data collection and the sources of secondary data.

8.1 UNIT OBJECTIVES

After studying this unit, you should be able –

- To analyse the methods of primary data collection.
- To understand the sources of secondary data.

8.2 SUBJECT DESCRIPTION

8.2.1 PRIMARY AND SECONDARY DATA :

There are two approaches or methods of data collection, namely, primary data collection and secondary data collection. In research, when the researcher identifies the problem of research, then the next stage of research is data collection. The researcher can adopt any method of data collection according to his research work.

8.2.1.1 METHODS OF PRIMARY DATA COLLECTION :

There are different methods practiced and available for primary data collection. The main methods used for collection of primary data are mentioned below.

8.2.1.2 OBSERVATION METHOD :-

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Observation is a method that employs vision as its main means of data collection. The concept of observation is restricted by some people to watching, but this is too narrow a view. It also involves reading and listening. Shortly, observation method implies the use of eyes rather than of ears and the voice. According to the concise Oxford Dictionary observation method is an accurate watching and noting of phenomena as they occur in nature with regard to cause and effect or mutual relations. Observation is the natural phenomenon.

In behavioral sciences, research observation method is commonly used for data collection. In observation method the researcher or investigator is involved in accurate noting and inspection of the phenomenon as it occurs in nature with regard to cause and effect. On the other side the respondent may not be aware that his behaviour is being examined or observed. Shortly, the respondent is not interviewed. For example, to observe consumer behaviour towards a fish market. A researcher / investigator has to observe how many consumers visit the market in a day? How many consumers actually buy the fish? etc. In this process the researcher should not ask any questions to consumers or respondents. Only the researcher notes down his observations on paper.

8.2.1.2.1TYPES OF OBSERVATION :

The main types of observation are as under

(a) Uncontrolled and controlled observation

(b) Participant and non- participant observation

(c) Direct and indirect observation

(A) UNCONTROLLED AND CONTROLLED OBSERVATION :-

Uncontrolled or Non-controlled observation is also known as simple or natural observation. When the activities are performed in their usual course without being influenced and the observation is made in the natural surroundings, it is known as uncontrolled observation. According to Goode and Hatt, " Most of the knowledge which people have about social relations is derived from uncontrolled observation, whether participant or Non-participant" Generally, Uncontrolled observation is not very reliable because this observation may be coloured by the view of the observer and biased.

Due to the above defects of uncontrolled observation, the technique of controlled observation has been developed. The controlled observation is exercised in following two types,

(1) Control over the phenomena and

(2) Control over the observed or observation

But it is not easy to carryout social research in a controlled condition of laboratory as it deals with social phenomena.

(B) PARTICIPANT AND NON-PARTICIPANT OBSERVATION :-

In participant observation the observer participate in activities of the group under study. *e.g.* If the observer would like to study the habits and behaviour of

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hostel students, it will be easier to study when the observer/researcher enrolls himself as a hostel member. In participant observation the researcher lives as an authentic member of a group and he must be accepted by the other group members.

There are some advantages/merits and some disadvantages/demerits of participant observation.

ADVANTAGES / MERITS :-

(1) Observation of real and neutral behavior

(2) Easy to exchange ideas of group members

(3) Getting wide information etc.

DISADVANTAGES / DEMERITS :-

(1) Trained observer required

(2) Time consuming

(3) Costly

(4) Loss of objectivity etc.

In non-participant observation the researcher/observer is present in the group but he does not participate in the activities of the group. Here the research does not take efforts to create a relationship between him and the group. There are some merits like acquiring information, maintaining scientific outlook and objectivity as well as impartial status etc. of non-participated observation. Further, subjectivity, incomplete observation, unnatural attitude of the subject matter of observation etc. are the demerits of non-participant observation.

(C) DIRECT AND INDIRECT OBSERVATION :

In direct observation, the researches is physically present and describes the situation personally. In this type of observation the researcher is free to shift places and change the focus of the observation. The demerits of this approach are that the researcher is not able to record those movements which are left. Further, the distracting events, boredom and observer's fatigue can reduce the completeness and accuracy of this approach of observation.

Indirect observation covers the recording done by electronic means or photographic, mechanical devices etc. Indirect observation approach is flexible than direct approach. It is also less erratic and less biasing in recording accuracy. Further, permanent recording is useful for reanalysis of the different dimensions of the event.

The other types of observation approaches are casual and scientific approach, subjective and objective observation, factual and inferential observation, simple and systematic observation, behavioural and non-behavioural observation etc.

8.2.1.1.2 ADVANTAGES OF OBSERVATION METHOD :

The advantages of observation method are as follows :

(1) Natural Environment :

In observation method the behaviour of respondent is observed in natural environment and therefore, it will not cause any bias. Observation will neither be restrictive nor artificial.

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(2) Simple Method :

It is very simple and non technical method of data collection. For this the researcher or investigator requires relatively less training.

(3) Longitudinal Analysis :

In observation method, compared to survey method, the researcher or investigator is able to conduct his study over a much longer period.

(4) Accurate and Reliable Data :

In this method the collected data are based on first-hand perception by the eyes. It does not largely depend on reflection or retrospection. Further, there is no scope of respondent's bias in the data. Therefore, it is accurate and reliable data.

(5) Useful for Formulation of Hypothesis :

Due to observation, the researcher is able to know about the cause and effect relationship and the sequences. The relationship between cause and effect and the sequences forms the basis of hypothesis.

8.2.1.1.3 DISADVANTAGES / LIMITATION OF OBSERVATION METHOD :

According to Pauline V. Young, "Not all occurrences are open to observations, can be observed when the observer has at hand, not all occurrences lend themselves to study by observation techniques." The limitations of observation method are as follows,

(1) Lack of control :-

In observation method, the researcher has little control over variables that affect the data.

(2) Lack of Anonymity :-

In observation method, it is very difficult to maintain respondent's anonymity. The researcher has very little control on respondent and can not ask any question to the respondent, as per this desire.

(3) Small Sample Size :-

Compared to survey studies, observation method uses the small sample size. Sometimes, two or more observers observe large sample size but then their observations can not be compared.

(4) Costly and Time Consuming Method :-

Sometimes in observation method the researcher is required to conduct his study over a much longer period. In this case the technique of observation is expensive and time consuming.

CHECK YOUR PROGRESS

1. What is the observation method?
2. Explain meaning and types of observation method.
3. Discuss the advantages and disadvantages of observation method.

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(5) Inadequacy :-

Many times in observation method, the full answer cannot be obtained by the observer. Therefore, observation must be supplemented by other methods of study.

8.2.1.2 INTERVIEW METHOD :

Interview is another important tool of data collection. There are several definitions of interview. According to Bingham and Mooze, " The interview is a conversation with a purpose." Lindzey Gardner defined, "Interview as a two person conversation, initiated by the interviewer for the specific purpose of obtaining research relevant information and focused by him on the content specified by the research objectives, description and explanation."

In interview the person who is giving interview is called respondent or interviewee and the person who is interviewing is called interviewer. Research related data collection is the main purpose of interview.

8.2.1.2.1TYPES OF INTERVIEW :

Following are the main types of interview.

(A) Personal and Group Interview :

Personal interview is known as face to face contact with persons selected for interview. In this approach a single individual is interviewed. This type of interview helps to establish close personal contact between respondent and interviewer (researcher). But this method is not useful always because it requires more time and more money.

Opposite to the personal interview is the group interview. In group interview more than one interviewee / respondent are interviewed simultaneously. Compared to personal interview the group interview is less time and money consuming but the knowledge gained through group interview is very superficial and routine like.

B] Formal & Informal Interview :-

In formal interview the researcher prepares, a set of questions systematically and asks these questions to the respondent one by one. The answers of respondent are noted down by the interviewer or researcher in accordance with prescribed rules.

The informal interview is the opposite of the formal interview. In informal interview, the researcher/interviewer has full freedom to make suitable alterations in the questions of a particular situation.

C] Other -administered and Self – administered Interview :-

When the researcher/interviewer himself writes answers to the questions on the response sheet it is called other – administered interview.

And if the interviewee is supplied a systematic list of questions along with suggestions for writing answers in the right place on the interview form it is called self-administered interview.

D] Hard and Soft Interview :-

The hard interview is a quantitative interview. In this type of interview, the researcher/interviewer runs the interview with the help of police. The police warn the respondent not to lie and apply force to obtain an answer when the respondent hesitates.

E] Telephone and Computer Interview :-

When the respondent is living at a distance, then the interviewer goes for the telephone interview method. It is comparatively economical, cheaper and faster method of interview. More importantly, the interviewer records the replies of the respondent easily. In this method the additional staff is not required. But on the other side, there are some disadvantages or demerits also. They are, i) Through telephonic method the interviewer can not ask difficult questions to the respondent. ii) The interviewer may face some telephonic disturbances. iii) In this method, the interviewer has little time for taking information.

Computer interview is a modern method of data collection. Computer interview is conducted with the help of computers. A computer along with the internet facility is required for this type of interview. In developed countries like U.K., U.S.A. etc. this type of interview technique is very popular. This is audio-visual interview technique. Compared to developed countries, in India this technique is not popular.

8.2.1.2.2ADVANTAGES / MERITS OF INTERVIEW METHOD:

According to Gordon, there are five major advantages of the interview method. They are as follows.

i) Flexible : This method permits flexibility in questioning.

ii) Quick information : Interview method quickly provides the information to the interviewer.

iii) Control: Exercising control on the context of questions and answers is easily possible.

iv) Proper interpretation : Interviewee is able to interpret the questions in proper manner.

(v) Validity checking : The validity of the data collection can be readily checked.

Besides, some more advantages are : (1) Mutual encouragement (2) Knowledge of past and future (3)Direct and in depth research (4) It is possible to the interviewer to observe respondent very well. (5) The response rate is high, etc.

8.2.1.2.3 DISADVANTAGES / LIMITATIONS OF INTERVIEW METHOD :

The certain limitations of interview method are as follows :

(1) Personal Bias :-

In this method the interviewer can not totally eliminate the personal bias. And because of personal bias it resuls in wrong generalizations.

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CHECK YOUR PROGRESS

1. What is the interview method ?
2. Explain meaning and types of interview method.
3. Discuss the merits and demerits of interview method.

(2) Interviewing is an art rather than science :-

The procedure of interview method can not be standardized. There is large scope for improving it. The success of interview depends on the skill, tact and the knowledge of interviewer.

(3) Costly and Time consuming :-

Compared to questionnaire, interview method is more costly and time consuming.

(4) Inadequate information :-

Many times the respondent can give wrong and inadequate information. Some times the respondent can hide information purposely. This is the major problem in interview method.

Besides, some more limitations are :

(1) Interview method offers less anonymity than other method.

(2) For sensitive questions it is less effective.

(3) One – sided and incomplete research etc.

8.2.1.3 QUESTIONNAIRE METHOD

Questionnaire is described as "a document that contains a set of questions, the answers to which are to be provided personally by the respondents". In this method the researcher prepares a list of questions systematically and sends them to the various respondents by post or by mail. In questionnaire the researcher provides sufficient space for the answers. Also a covering letter is attached to the questionnaire and through a covering letter the researcher requests the respondent to fill up the questionnaire in a proper manner and send it back within a specific time.

8.2.1.3.1 TYPE OF QUESTIONS :-

The questions in the questionnaire may be divided into following types,

(1) Primary Questions :-

This type of questions directly relate to the research topic. They elicit information directly related to the research subject. *e.g.* who takes the decision in your collage?

(2) Secondary Questions :-

This type of questions are not directly related to the research subject. They elicit only information of secondary importance.

(3) Tertiary Question :-

This type of questions are neither primary nor secondary. It allows convenient data collection and sufficient information without biasing the respondent/ interviewee.

(4) Multiple Choice Question :-

This type of questions consist of large number of questions with alternative answers. The interviewee or respondent has to select any one of the alternatives provided with each question.

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(5) Pictorial Question :-

The researcher draws some pictures in the type of questions and the interviewee or respondent selects the picture which he prefers.

(6) Open- End Questions :-

It is also called free response questions. In this type of questions the respondent answers the question in his own words. e.g. How would you describe the problem of corruption in Indian economy?

(7) Closed- ended Questions :-

It is opposite to the open-end questions. In this type, the respondent is not allowed to give answers freely. Further, it is fixed choice question. e.g. What is your father? Who is your favourite superstar etc.

Besides, some more type of question are :

(1) Direct and indirect questions (2) Filter questions (3) Contingency questions (4) Nominal questions (5) Internal questions (6) Ordinal questions (7) Ambiguous questions etc.

8.2.1.3.2 ADVANTAGES/ MERITS OF QUESTIONNAIRE METHOD

The merits of questionnaire method are as follows :-

(1) Time saving :-

When the sample size is very large and scattered and it is not possible to take information by face to face interview. Then we adopt questionnaire method. The mailed questionnaire saves time of the interviewer.

(2) Economical :-

Compared, to other methods, the questionnaires are less expensive. In this method much staff is not required. The matter of TA/DA of investigators increases the cost of survey. But in questionnaire method it will not happen because the researcher has to spend money only on postage for sending the questionnaire. Therefore, the questionnaire method is economical.

(3) Minimum pressure on the respondent :-

Compared to interview method, in questionnaire the respondents have too much time for properly answering questions.

(4) Uniformity :-

Questionnaire are a uniform measure, consistent and stable, without variation.

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(5) No place for interviewer's Bias :-

In this method, the researcher is not physically present at respondent's place. The interviewer can not influence his answers, either by giving his own opinion or by prompting.

8.2.1.3.3 DISADVANTAGES / DEMERITS OF QUESTIONNAIRE METHOD :

The demerits of questionnaire method are as follows:

(1) Uneducated and Illiterate Respondents :

The mailed questionnaire is only useful for literate respondents. The illiterate respondents are not able to fill up the questionnaire. This is the major disadvantage of questionnaire.

(2) Low Return Rate :

The proportion rate of return of mailed questionnaire is usually low. The common return rate is 30 to 40%. Sometimes, it may be as low as 10%.

(3) Incomplete Response :-

Many times the respondent doesn't complete the questionnaire due to various reasons like laziness, lack of seriousness, interest and sincerity etc. Then it is rejected.

CHECK YOUR PROGRESS

1. Explain meaning and types of interview method.
2. Discuss the merits and demerits of interview method.
3. What is the questionnaire method ?

(4) Lack of Interest :-

As stated earlier lack of interest of the respondent is another difficulty in questionnaire. Due to large number of questions the respondents get disinterested. Therefore, the reliability of the data is at stake.

(5) Lack of Additional Information :-

In this method the researcher doesn't have an opportunity to collect additional information on the respondent.

(6) No place for personal Control :-

In this method there is no provision for coming face to face with the respondent. It means there is no place for personal contacts of the researcher.

8.2.2 SOURCES OF SECONDARY DATA :

Basically, secondary data is classified into four main categories namely, (a) Internally source (b) Externally source (c) Personal documents and (d) Public documents.

8.2.2.1 INTERNAL SOURCES :-

The information which already exists within the company in which the research problem arises is called internal sources. For example, annual budgets record of the company, promotional expenditure, advertising etc. All this record is useful to the manager for decisions making of the company. Further, it is important for the researchers.

8.2.2.2 EXTERNAL SOURCES :-

The data which is collected from the external sources of the firm is called external secondary data. For example, the data collected from the commercial agencies, business reference sources and Govt. publications, other sources, etc.

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8.2.2.3 PERSONAL DOCUMENTS :

The documents which are developed by the individuals are called personal documents. In such documents the individual may record his problems, views and thoughts without knowing that these documents are useful for the researcher as sources of study. The personal documents are classified into four main categories, namely. (1) Memoirs (2) Diaries (3) Life history & (4) Letters.

CHECK YOUR PROGRESS

1. Explain the sources of secondary data.

8.2.2.4 PUBLIC DOCUMENTS :

Public documents are different than the personal document. They deal with the matter of various interest. Public document are divided into two main categories. *i.e.* (a) Published Records (*e.g.* Govt. office publications, newspapers, magazines, journals, survey report etc.) and (b) Unpublished Records (*e.g.* proceeding of meetings, noting on the files and memoranda etc.)

8.3 SUMMARY

This unit discussed the methods of data collection (i.e. prmary data and secondary data). There are different methods practiced and available for primary data collection. The main methods used for collection of primary data are (a) Observation Method (b) Interview Method and (c) Questionnaire. Each method of primary data collection have some merits and demerits.

Secondary data is classified into four main categories namely, (a) Internal sources (b) External sources (c) Personal documents and (d) Public documents.

8.4 KEY TERMS

- **Observation :** It is an accurate watching and noting of phenomena as they occur in nature with regard to cause and effect or mutual relations. Observation is the natural phenomenon.
- **Interview :** Interview as a two person conversation, initiated by the interviewer for the specific purpose of obtaining research relevant information and focussed by him on the content specified by the research objectives, description and explanation.
- **Questionnaire :** It is described as “a document that contains a set of questions, the answers to which are to be provided personally by the respondents

8.5 QUESTIONS AND EXERCISES

A. Short Notes

1. Primary Data

NOTES

2. Secondary Data
3. Obseravation Method
4. Interview Method
5. Questionnaire Method

B. Long – Answer Questions :

1. What is the observation method? Explain meaning and types of observation method.
2. Analyse the advantages and disadvantages of observation method.
3. What is an interview method ? Explain meaning and types of interview method.
4. Analyse the merits and demerits of interview method.
5. What is the questionnaire method? Explain meaning and types of interview method.
6. Analyze the merits and demerits of interview method.
7. Explain the sources of secondary data.

8.6 FURTHER READING AND REFERENCES

1. **Ahuja, Ram** (2001), *"Research Methods"*, Rawat Publication, New Delhi.
2. **Burns, Robert B.** (2000), *"Introduction to Research methods"*, Sage Publication, London.
3. **Khanzode, V. V.** (1995), *"Research Methodology"*, APH Publishing corporation, New Delhi.
4. **Sarvanavel, P.** (2005), *"Research Methodology"*, Kitab Mahal, Allahabad.

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UNIT 9 : SAMPLING TECHNIQUES

NOTES

Structure

9.0 Introduction

9.1 Unit Objectives

9.2 Subject Discription

9.2.1 Sampling Techniques

9.2.1.1 Concept

9.2.1.2 Theory of Sampling

9.2.1.3 Scope of Sampling Method

9.2.1.4 Features of Sampling Method

9.2.1.5 Limitations of Sampling Techniques

9.2.1.6 Characteristics of Ideal Sampling

9.2.1.7 Types of Sampling Method

9.2.1.7.1 Probability Method

9.2.1.7.2 Non-Probability Method

9.2.1.8 Sample size

9.2.1.9 Sampling and Non-sampling Errors

9.3 Summary

9.4 Key Words

9.5 Questions and Exercises

9.0 INTRODUCTION

In sampling technique, instead of observing and studying each and every unit of universe, only a part of it is studied, assuming that it best represents the entire population. It is applicable only to random samples. In short, data collection and sampling technique play an important role in the quantitative research.

9.1 UNIT OBJECTIVES

After studying this unit, you should be able –

- To understand meaning and basic principles of sampling techniques.
- To analyse types of sampling techniques.

9.2 SUBJECT DESCRIPTION

9.2.1 SAMPLING TECHNIQUE :-

Before acquiring knowledge of sampling techniques it is necessary to understand the concept of sampling.

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9.2.1.1 CONCEPT :-

Simply a smaller representation of a large whole is called sample. When the researcher would like to find out something about the population in the specific region, some elements are selected in the population by researcher, selection process of elements is called sampling. Shortly, when population is relatively large (e.g. All patients in the hospital or all households in the village) and is physically not accessible, the researcher surves only a sample. Sampling can be defined as " the selection of part of an aggregate or totality on the basis of which a judgment or inference about the aggregate or total is made." The concept like parameter, statistic, sampling errors, precision, variable, sampling frame, sampling design etc. are used in sample and sample design.

9.2.1.2 THEORY OF SAMPLING :-

Sampling theory is a study of relationship between samples and population. It is applicable only to random sample. The theory of sampling is known as the methodology of drawing inference of the universe from random sampling. The theory deals with,

(a) Statistical Estimation :

Estimating the value of unknown parameter is the main objective of sampling. Point estimate and interval estimate are the two type of estimates. Point estimate is a single estimate in the form of a single figure. On the other side interval estimate has two limit. i.e. lower limit and upper limit within which the parameter value may lie.

(b) Testing of Hypothesis :

Accepting or rejecting a hypothesis is the second objective of the sampling theory. This theory helps us to decide whether an observation obtained in sampling has occurred due to a real one or fluctuations in sampling.

(c) Statistical Inferences :

Theory of sampling helps in making generalization about the population and determining the accuracy of such generalization.

9.2.1.3 SCOPE OF SAMPLING METHOD :

Sampling is a widely used technique. The sampling technique plays an important role in the field of quantitative research. In the research of social sciences, commerce and management, education and science, the researcher uses the sampling technique systematically. Also in our daily activities the sampling technique is very important. For example, when the housewife cooks the rice, she examines very little part of it and then decides it is eatable or not. Likewise, the pathologist also takes the sample of urine or blood for diagnosis of the patient's disease or illness. In other words, sample is an instrument for learning about large masses by observing a very few individuals.

9.2.1.4 FEATURES OF SAMPLING METHOD :

The main features of sampling method can be described as under.

(1) Save time & money :

The sampling technique saves time and money of the researcher. Compared to census technique, sampling technique is less expensive and less time consuming.

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(2) Respondent Co-operation :

Through sampling technique the researcher achieves greater response and co-operation from respondents.

(3) Accuracy and Reliability :

Sampling technique increases the accuracy of data and if the researcher selects the units of sample carefully, automatically reliability of results highly increases.

(4) Detailed and Depth study :

Sampling will reduce the large number of people. The sample unit is small. Therefore, the researcher can easily elaborate and examine the sample in detail and depth with various dimensions.

(5) Scientific base and greater suitability :

The conclusions derived from the sample study can be checked by other samples. Moreover, according to most surveys, the sampling techniques are found suitable in maximum cases.

9.2.1.5 LIMITATIONS OF SAMPLING TECHNIQUES :

The limitations of sampling technique are mentioned below.

(1) Requirement skilled person :

It is necessary that the researcher is skilled enough for using sampling technique. If the non-skilled researcher performs the sample selection, it can be incorrect leading to sampling error.

(2) Less accuracy and reliability :

Compared to census technique, the conclusions of sampling techniques are less accurate and reliable. It is more liable to error than the census technique's conclusions.

(3) Misleading conclusions :

For using sampling technique it is necessary that extra care is taken by the researcher. Otherwise, the conclusions derived from sampling techniques will become misleading.

CHECK YOUR PROGRESS

1. Briefly explain theory of sampling.
2. Discuss features of sampling method.
3. Discuss limitations of sampling Techniques.
4. Discuss Characteristics of Ideal Sampling:

9.2.1.6 CHARACTERISTICS OF IDEAL SAMPLING:

For reliable and accurate conclusions from the research it is necessary that the selected sample exhibits certain qualities. These qualities are as follows —

(1) Every sample should be independent of each other.

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(2) The homogeneity in selected sample is required. Every element in selected sample should be identical with another element.

(3) An ideal sample represents the characteristics of entire population.

(4) The selection of sample should be sufficient. If the selected sample size is very small or too large, the researcher can not derive correct conclusion.

9.2.1.7 TYPES OF SAMPLING METHOD :

Basically, Sampling is divided into two broad heads i. e (a) Probability/ Random Sampling and (b) Non- probability/ Non Random Sampling.

(A) PROBABILITY/ RANDOM SAMPLING :

When every unit of the total population has an equal probability of being selected for the sample, it is called probability sampling. This technique of sampling is relatively time consuming, complicated and expensive because of a high degree of representativeness. The probability sampling methods are described as under—

1. Simple Random Sampling :

According to Goode and Hatt, "A random sample is one which is so drawn that the researcher, from all pertinent points of view, has no reason to believe a bias will result. In other words the units of the universe must be so arranged that the selection process gives equiprobability of selection to every unit in that universe." Sometimes random sampling is referred to as " Representative Sampling."

The simple random sampling is also known as the method of chance selection. In this sample each possible sample combination or each and every item in the whole population has an independent and equal chance of being included in the sample. While adopting this technique of sampling some precautions have to be taken. The list of all the units that are available for the purpose of population should be well defined. According to this method the sample units are selected by number sub-method like Tippet's tables, pricking blind folded, Personal identification number (PIN) Lottery Method, Computer etc.

MERITS/ ADVANTAGES :

(1) Very simple and easy method for understanding.

(2) Each unit of the population has equal chance for selection.

(3) No place for personal bias.

DEMERITS/ DISADVANTAGES :

(1) It is expensive and time consuming method.

(2) Practically it is very difficult to give equal chance of selection for all the element.

(3) The researcher has no control over the selection of the units.

2. STRATIFIED RANDOM SAMPLING :

NOTES

In this method, the whole population is divided into homogeneous groups called ‘ strata’ and a sample is drawn from each stratum. It should be noted here that the strata should be homogeneous but between the strata, there should be heterogeneity.

According to research objectives, the researcher will divide the population into homogeneous strata. The homogeneity is based on various criteria’s of the population. e.g. age, gender, religion, caste, class, family type, education, occupation and so on. The stratified random sampling is systematically defined as,

“The method involving dividing the population in homogeneous strata and then selecting simple random samples from each of the stratum.”

The types of stratified sampling are,

(a) Proportionate and (b) Disproportionate.

When the researcher draws the number of items proportionately from each stratum, it is called proportionate and if the researcher draws the unequal number of items from each stratum, it is called disproportionate.

MERITS/ ADVANTAGES :

(1) It is useful for comparing sub- categories / groups,

(2) Compared to simple random sampling, it can be more precise.

(3) The researcher has greater control over the selection of sample.

DEMERITS/ DISADVANTAGES :

(1) Compared to simple random sampling, it requires more effort.

(2) If the stratification is based on non scientific consideration or biases, automatically the sampling can get biased.

(3) It is time consuming and complex method of determining sample.

3. Systematic Sampling :

It is also called interval or quasi random sampling. It is a variation of simple random sampling. Systematic sampling is randomly selecting the first respondent and then every K th person after that; ‘K’ is a number termed as sampling interval. In this method the population are arranged in such a way that each unit of the universe can be identified by its order. e. g. Muster roll, companies, telephone directory etc. From this the sample is drawn based on specific interval. For example, arrange the names of students in B.Com class in ascending or descending order on the basis of alphabet. In this order the researcher draws the sample at regular intervals with a random start. Suppose, in selecting a sample of 40 students out of 400, the population total, viz 400 is divided by 40. Then any random number between 1 to 10 is selected by the researcher. Suppose, the researcher selects the random number 3. Then, item numbered 3, 13, 23, 33, 43, ……, etc. are selected. This system ensures greater representativeness throughout the population.

$$\text{Sampling interval or } K = \frac{\text{Size of the population}}{\text{Size of the sample}}$$

NOTES

This method is popularly used in that cases where a complete list of the population is available.

MERITS/ ADVANTAGES :

(1) Simple and easy method for use.

(2) It is rapid method in probability sampling. Further, it eliminates several steps for choosing sample.

DEMERITS/ DISADVANTAGES :

(1) This method is used only when the systematic sufficient is available.

(2) According to Black and Champion, in this method each element has no equal chance of being selected.

4. CLUSTER SAMPLING :-

According to this method, the total population is divided into clusters and after that the sample is drawn either from the selected clusters or from all clusters. Small grouping within the population are called clusters. Initial clusters are known as primary sampling units. 1st stage state level, 2nd stage district level, 3rd stage village level and 4th stage household level. In stratified sampling each stratum should be as heterogeneous as population is. But in cluster sampling all the units should possess all the characteristics of the population.

MERITS /ADVANTAGES :

(1) It is an economical method

(2) This method is useful for capturing the wide disparity of heterogeneity of population.

DEMERITS/ DISADVANTAGES :

(1) Cluster sampling is less precise than random sampling.

(2) Within the clusters there is not as much information as in the sample.

(B) NON PROBABILITY/NON-RANDOM SAMPLING :

This type of sampling technique does not provide every element in the population with the equal chance of being selected in the sample. The researcher decides which sample element should be chosen. This method of sampling is usually used for qualitative exploratory analysis. The major forms of non-probability sampling are described as follows.

(I) CONVENIENCE SAMPLING :

It is also known as accidental or unsystematic sampling. In this method the researcher interviews that population which is selected neither by judgment nor

by probability. Shortly, the researcher studies all those people who accidentally come in his contact during research period or who are available most conveniently. Generally, the results obtained by this method are unsatisfactory and biased. This method may be used when complete list of the source is not available, when sample unit is not clear and when population/universe is not well defined.

MERIT/ADVANTAGES :

(1) For making pilot studies, convenience sampling is useful.

(2) It is economical and a quick method of sampling.

DEMERIT/DISADVANTAGES :

(1) Mostly, the results, obtained by this method are unsatisfactory and biased.

(2) In this method, the respondents may be those who are vocal.

(II) QUOTA SAMPLING :

It is another version of stratified sampling. There is little difference between stratified and quota sampling. In stratified sampling population is divided by strata and then the researcher chooses the respondents, but in quota sampling it works on 'quota' fixed by the researcher. Like stratified sampling in quota sampling the researcher specifies the groups. The groups are prepared on the basis of sex, age, income, education or other characteristics much like the 'strata' in stratified sampling.

MERIT/ADVANTAGES :

(1) Compared to other sampling techniques it is an economical method.

(2) It is less time consuming sampling method.

DEMERIT/DISADVANTAGES :

(1) In this method, there is a possibility of interviewer's bias influencing the sample selection.

(2) It is not possible to estimate the error.

(3) Quota sampling is not a representative sampling technique.

(III) PURPOSIVE SAMPLING :

This method is also called judgment sampling method. In this method the researcher selects the sample according to his personal judgment. But, when the researcher is choosing the sample, he omits extreme items and considers only the average items. Shortly, in this method the researcher selects only those variables which represent the universe but the selection of these units is based on prior judgment and deliberate thinking.

MERITS /ADVANTAGES :

(1) This method is useful when a small number of sampling units are in the universe.

(2) It is useful for solving the urgent problems in business and making public policy decisions.

DEMERITS/DISADVANTAGES :

(1) In this method, there is no objective way of evaluating the reliability of sample results.

NOTES

(2) It is not useful for large universe.

(IV) SNOWBALL SAMPLING :

In this sampling method, the researcher begins his research with few known and available respondents. This technique is used by the researcher when the population is rarely found and not easily accessible. In this method, when the first respondent is found to the researcher then the researcher can ask respondent to provide contact details of other individuals who fall in the same population. This process is followed by the researcher until adequate number of respondents are interviewed or no more respondents are discovered.

CHECK YOUR PROGRESS

1. Explain probability sampling techniques in brief.
2. Explain non- probability sampling techniques.

MERITS/ ADVANTAGES :

(1) This technique is useful in case of rare population.

(2) This technique reduces the sample size.

(3) Comparatively it is an economical sampling technique.

DEMERITS/ DISADVANTAGES :

(1) It is very difficult to track the respondents at a time and in time.

(2) Sometimes this technique's cost is going to be very high.

9.2.1.8 SAMPLE SIZE :

The wrong sample size in the research would make the study difficult. If the researcher chooses small sample size it makes the result less accurate and a larger sample size involves more cost and time. On this background it is necessary that the size of sample is optimum in nature. But it depends on the following factors.

(1) The population size :

The larger/ smaller the size of the population, the larger/smaller should be the sample size.

(2) Nature of population :

For homogeneous population a small sample size may be sufficient. But for heterogeneous population, a large size of the sample required.

(3) Type of sampling :-

In stratified or cluster sampling, a smaller sample size will be required. But in the case of simple random sampling a large sample size is necessary.

(4) The degree of accuracy :-

When the researcher is highly interested in accurate results of the research study, he needs to have larger sample size.

(5) Qualitative or Quantitative Study :-

This factor also affects the size of the sample. For qualitative research, the size of sample has no numerical boundaries. But, for quantitative study the researcher himself can decide the sample size (e.g. accidental sampling).

NOTES

9.2.9 SAMPLING AND NON-SAMPLING ERRORS :-

[A] SAMPLING ERRORS :

Sampling errors are also known as sampling fluctuations. When the researcher completes his research through sample survey of small proportion of the total population and derives the results, naturally, there would be a certain amount of errors or inaccuracies. Such type of errors are called sampling errors.

There are two types of sampling errors

(I) Biased Errors :

This type of errors arises due to the researcher's bias or prejudice in sampling technique of sample selection. For example, when the researcher adopts purposive sampling method in place of simple random sampling technique. As a result of such selection, some fluctuations or errors are bound to arise, which are called biased errors.

(ii) Unbiased Errors :

Unbiased errors arise due to chance differences between the members selected in the population and those not included or selected. It is also known as random sampling error. If the researcher increases the size of the sample automatically the random sampling errors decline.

[B] NON-SAMPLING ERRORS :

It occurs in any type of survey in research. It includes mistakes and biases. Non sampling errors mainly arise due to vague questionnaire, inappropriate statistical unit, data processing operation errors, faulty interviews, inadequate and inconsistent data specifications, errors from respondents reply etc. It should be noted that the researcher cannot reduce non-sampling errors to zero.

CHECK YOUR PROGRESS

1. Explain the concept of sample size.
2. Briefly explain the sampling and non-sampling errors.

9.3 SUMMARY

In this unit, sampling techniques are discussed in detail. i.e concept of sampling, theory of sampling, scope of sampling method, features of sampling method, limitations of sampling techniques, characteristics of ideal sampling, types of sampling method, sample size, sampling and non-sampling errors, etc.

In sampling technique, instead of observing and studying each and every unit of universe, only a part of it is studied and assuming that it best represents the entire population. Simply a smaller representation of a large whole is called sample. Sampling theory is a study of relationship between samples and population. It is applicable only to random sample. The theory of sampling is known as the methodology of drawing inference of the universe from random sampling. The theory deals with. (a) Statistical Estimation (b) Testing of

Hypothesis (c) Statistical Inferences. Basically, Sampling is divided into two broad heads i. e (a) Probability/ Random Sampling and (b) Non- probability/ Non Random Sampling.

NOTES

Sampling errors are also known as sampling fluctuations. When the researcher completes his research through sample survey of small proportion of the total population and derives the results, naturally, there would be a certain amount of errors or inaccuracies. Such type of errors are called sampling errors.

Non sampling errors occur in any type of survey in research. It includes mistakes and biases. Non sampling errors mainly arise due to vague questionnaire, inappropriate statistical unit, data processing operation errors, faulty interviews, inadequate and inconsistent data specifications, errors from respondents reply etc. It should be noted that the researcher cannot reduce non-sampling errors to zero.

9.4 KEY TERMS

- **Sample :** A smaller representation of a large whole is called sample.
- **Probability Sampling :** When every unit of the total population has an equal probability of being selected for the sample, it is called probability sampling.
- **Non Probability Sampling :** This type of sampling technique does not provide every element in the population with the equal chance of being selected in the sample.
- **Sampling Errors :** When the researcher completes his research through sample survey of small proportion of the total population and derives the results, naturally, there would be a certain amount of errors or inaccuracies. Such type of errors are called sampling errors.
- **Non-Sampling Errors :** Non sampling errors mainly arise due to vague questionnaire, inappropriate statistical unit, data processing operation errors, faulty interviews, inadequate and inconsistent data specifications, errors from respondents reply etc. It should be noted that the researcher cannot reduce non-sampling errors to zero.

9.5 QUESTIONS AND EXERCISES

(A) Short Notes

1. Simple random sampling
2. Stratified random sampling
3. Systematic or quasi random sampling
4. Cluster or Area sampling
5. Convenience sampling
6. Purposive sampling
7. Quota sampling
8. Sample size
9. Sampling and non sampling errors

(B) Long – Answer Questions :

1. Explain the Probability sampling technique .
2. Describe the Non- Probability sampling techniques.

NOTES

9.6 FURTHER READING AND EXERCISES

1. **Ahuja, Ram** (2001), *"Research Methods"*, Rawat Publication, New Delhi.
2. **Burns, Robert B.** (2000), *"Introduction to Research methods"*, Sage Publication, London.
3. **Khanzode, V. V.** (1995), *"Research Methodology"*, APH Publishing corporation, New Delhi.
4. **Sarvanavel, P.** (2005), *"Research Methodology"*, Kitab Mahal, Allahabad.

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UNIT 10 : STAGES OF DATA ANALYSIS

NOTES

Structure

10.0 Introduction

10.1 Unit objectives

10.2 Subject description

10.2.1 Stages of data analysis and interpretation

10.2.2 Editing

10.2.3 Coding

10.2.4 Classification

10.2.5 Tabulation

10.3 Summary

10.4 Key terms

10.5 Exercises

10.6 Books

10.0 INTRODUCTION

In the previous unit, your have learned the methods, techniques, types of data collection and their advantages and limitations. After collection of data it has to be processed and analysed for developing research plan. Data processing, classification, tabulation are the primary stages of data analysis and interpretation. These are essential for a scientific study. In this unit you will read about processing of data i.e. stages of data analysis. This unit will also describe the different methods of editing, coding, classification and tabulation.

10.1 UNIT OBJECTIVES

After going through this unit, you will be able to —

(i) Describe the stages of processing of data

(ii) Understand editing and coding

(iii) Describe data classification and tabulation

10.2 COST CONCEPTS

The data collected from the field has to be processed and analysed as laid down in the research plan. Research needs proper processing and analysis of data after collecting it. The processing of data implies editing, coding, classification and tabulation of the data so that they are amenable to analysis.

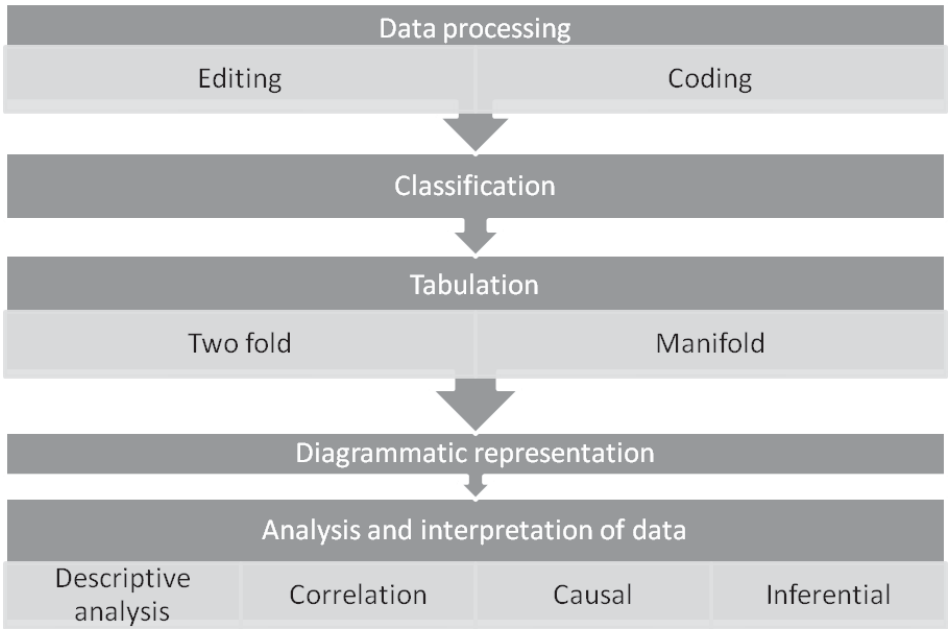
10.2.1 STAGES OF DATA ANALYSIS AND INTERPRETATION

NOTES

The various stages of data analysis and interpretation are shown in the following chart 10.1.

Chart 10.1

Stages of data analysis and interpretation



10.2.2 EDITING

After getting the raw data, the first job is to edit the data to eliminate the existence of inaccurate, inconsistent and inadequate answers present in the schedule and questionnaires. The editing process is necessary in such a way that the data are presentable, readable and accurate. The editing of data is a process of examining the raw data to detect errors and omissions and to correct them. The basic purpose of editing is to impose some minimum quality standard on the raw data. Editing of data involves testing of data collection instruments in order to ensure maximum accuracy. It includes the inspection and correction of each questionnaire or observation form. Because the raw data contains a large quantity of observation recorded arbitrarily. So, the process of editing is necessary. This will facilitate coding and tabulation of data.

The editing can be done at two stages–field editing and central office editing (Churchill, 1988):

Field Editing : The field editing consists of review of the reporting forms by the investigator that are written in abbreviated form at the time of recording the respondent's responses. This sort of editing should be done as soon as possible after the interview. If performed after sometime, such editing becomes complicated to the researcher, as it is difficult to recall the memory. While doing such kind of editing, care should be taken so that the investigator does not correct the errors of omission by guesswork.

Central Office Editing : The central office editing follows the field editing. It involves more thorough and rigorous scrutiny and correction of completed

returns. The editors correct errors such as the data recorded in the wrong place or the entry recorded in daily terms whereas it should have been recorded in weeks or months, and so on.

NOTES

Data editing involves following points:

1. taking care of missing data
2. taking care of ambiguous answers
3. checking of accuracy and quality of data
4. computer editing can be used instead of manual editing.

A careful editing is performed to assure that the data has the following features:

1. Consistency
2. Completion
3. Accuracy
4. Uniformity
5. Computation
6. Deciphering
7. Effective arrangement

10.2.3 CODING DATA

Coding of data is done after the collected data is edited. It is the process of assigning some symbols (numbers or letters or both) to the responses so that the responses can be recorded into a limited number of categories. It facilitates classification and tabulation of data.

For examples –

Original data — Coding

Male — 1

Female — 2

or

White — A

Black — B

According to Goode and Hatt, “Coding is an operation by which data are organised into classes and number or symbol is given to each item according to the class in which it falls.” In the words of Patronm, “It consists in assigning a number or symbol to each answer which falls in a predetermined class.”

The coding is necessary for the efficient analysis of data. It facilitates reduction of data from a variety to a small number of classes or categories.

After coding the data, we can prepare table. For example, we have data of annual income of the respondents.

Table No. 10.1

Annual Income of the Respondents

Annual Income (Rs.)	Coding	Classification
Below Rs. 1,00,000	1	Low income group
Rs. 1,00,001 to Rs. 3,00,000	2	Lower middle income group
Rs. 3,00,001 to Rs. 8,00,000	3	Upper Middle income group
Rs. 8,00,001 to Rs. 15,00,000	4	High income group
Above Rs. 15,00,000	5	High income group
Refused to answer	6	Other

NOTES

From the above example, it is clear that the coding is a part of classification.

10.2.4 CLASSIFICATION

Unorganised, clumsy data cannot be used for the purpose of comparison or interpretation. So, it is essential to put the unorganised data in a systematic manner. It is in order to obtain the desired results and their interpretations scientifically. To make research project easier, the data or information needs to be classified into different groups for understanding the relationship among different phases parts of research project. Classification helps in making comparisons and drawing meaningful conclusions.

According to N. R. Connor, "Classification is the process of arranging things either actually or notionally-in groups or classes according to their resemblances and affinities." In the words of Samuel Hays, "Classification is the process of analysing data according to common characteristics processed by the items constituting the data."

It is clear from the above definitions that the classification is a process by which collected information are put into different classes on the basis of their values. Classification of data usually depends on attributes or qualitative characteristics of the collected information. According to above definitions and meaning following are the characteristics of classification:

(i) Classification is the division of whole data in different groups.

(ii) It is a process.

(iii) The basis of grouping is uniformity of attributes.

(iv) The basis of classification is unity among diversity .

(v) Classification may be actual or notional.

The main objects of the adoption of the system of classification are:

(i) To present statistics in a simple form to understand by eliminating the unnecessary details.

(ii) To make the study and comparisons easier.

(iii) To indicate the points of similarity and dissimilarity clearly.

(iv) To condense the universe and to make the things more intelligible.

(v) To help the drafting of the required report.

TYPES OF CLASSIFICATION

Types of classification depend on the type of data which have been collected in an investigation. Classification has the following major types or methods:

NOTES

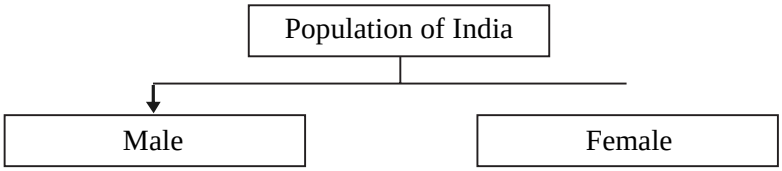
1. CLASSIFICATION ACCORDING TO ATTRIBUTES –

Attributes are those features which are not capable of direct numerical measurement such as honesty, blindness, nationality, sex etc. Here the basis of qualification is some attribute or quality. It is also called qualitative classification. According to this, there are two methods of classification, namely two-fold classification and manifold classification.

(a) Two-fold classification : In this method the data are constructed on the basis of presence or absence of that characteristics. All those units in which a particular characteristic is present are placed in one group and those in which it is absent are placed in another group. For example –

Chart No. 10.2

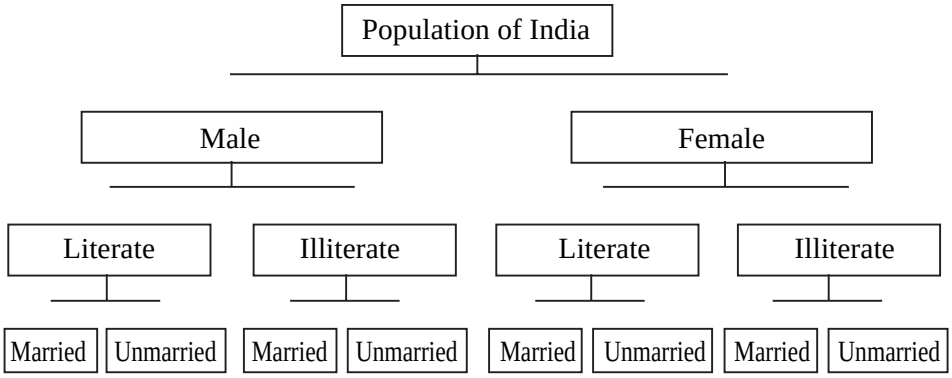
Two-fold Classification



(b) Manifold classification : In this type of classification two or more attributes are considered simultaneously and the data is categorized into a number of classes. For example, the population of India may be divided into male and female, and further sub-divided into literate and illiterate, and they may be further divided into married and unmarried as described in the following chart.

Chart No. 10.3

Manifold Classification



2. CLASSIFICATION ACCORDING TO CLASS-INTERVALS –

Classification of data according to class-intervals is a quantitative phenomenon. This type of classification is done where direct measurement of facts is possible, *e.g.* income, production, age and weight. The data can be measured through some statistical tools like arithmetic mean, mode and median. On the basis of construction of a series, series are of three types:

(a) Individual series

(b) Discrete series

(c) Continuous series

(A) INDIVIDUAL SERIES –

In individual series various items are presented serially either in ascending or descending order or without any order. This type of series is used when number of items is small. Every item is presented individually. The items are not observed individually but also listed and entered as individual cases. The following table is an illustration for individual series.

Table No. 10.2

Marks Secured by Ten Students

Roll No.	Marks (out of 100)
1	68
2	40
3	59
4	70
5	72
6	78
7	17
8	95
9	18
10	67

(B) DISCRETE SERIES –

When items are arranged in groups (frequency distribution) showing definite breaks from one point to another and when they are exactly measurable. In discrete series any statistic is not written repeatedly. It is used to classify discrete variables. The following table shows the number of childrens in a family.

Table No. 10.3

Number of Childrens

No. of Childrens in a Family	Number of Families
0	05
1	15
2	20
3	10
	50

(C) CONTINUOUS SERIES –

In case of continuous series, the items are arranged in class or groups and they can be arranged either in discending order or ascending order of magnitude and their continuity is not broken. This series are used to classify continuous variables. A series is said to be continuous when it passes from one value to the next by indefinitely small gradations. The following table shows the example of continuous series.

NOTES

Table No. 10.4 : Monthly Income of Families

(Rs.)

Monthly Income	No. of Families
0- 5000	32
5000-10000	35
10000-15000	30
15000-20000	25
20000-25000	23
25000-30000	18
30000-35000	15
35000-40000	10
40000-45000	07
45000-50000	05
Total	200

10.2.5 TABULATION

In a research, after collection and classification of data, presentation of data is very important. Statistical data can be presented in the form of table and graphs. Presentation of data helps in understanding and interpreting the data. Data can be presented with the help of following methods.

(i) Presentation of data through tabulation

(ii) Presentation of data through diagrammatic presentation

Tabulation is a process of orderly arrangement of data into series of rows and columns where they can be read in two dimensions. It means that tabulation is a systematic organisation of statistical data in columns and rows. In other words, a table is a typographical devise used to present in condensed form many pieces of related information for the study.

Tabulation is necessary to represent a particular result of investigation. It is a scientific process involving the presentation of classified data in an orderly manner so as to bring out it's essential features. The arrangement of data which is obtained as a result of this process is called a table.

Structure of tables

Table No. 10.5 : Revenue Expenditure of the Government

(Rs. Crore)

Item / Category	2010-11		2011-12	
	Actual	Percentage	Actual	Percentage
1. Developmental Expenditure	476409.75	45.00	486444.33	45.00
2. Non-developmental Expenditure	539921.73	52.00	457000.48	51.00
3. Grants to States	32149.00	3.00	49298.62	4.00
4. Total	1048480.48	100.00	1092743.43	100.00

Source: Indian Public Finance Statistics, 2011-12, Ministry of Finance, Government of India, New Delhi.
Note : Grants to states are for developmental and non-developmental expenditure.

(i) The title: In the above example, *Revenue Expenditure of the Government* is the title. The title should never be too lengthy or ambiguous. One table should consist of only one title.

(ii) The unit: The title is followed by the unit. In the above table, *Rs. Crore* is the unit. The unit is not essential for all tables.

(iii) The caption : It is a technical name for the column headings. Every table has many columns. Title of any column in table is called caption. In the above table, *2010-11* and *2011-12* are the master caption. *Actual* and *Percentage* under these master caption are the caption.

(iv) The stub : It is the left end of the table. In the above table *developmental expenditure, non-developmental expenditure and grants to states* are the stubs. Sometimes title is given to all the rows collectively. This title is called stub head.

(v) The body : This is the most significant part of the table. Proper care is taken to make the body of the table appear as it out to be. All the data or statistics presented in the table, taken together constitute the body of the table.

(vi) The source : It is another important part of the table. The source of the data must be mentioned. However, the table is a result of primary enquiry, then the source may not be needed.

(vii) Foot note : Below the table, necessary information and explanations are needed to make certain points clear. These are called foot notes.

Following are the precautions that must be undertaken for a good tabulation:

(i) Proper care should be taken to include all types of relevant data in the table.

(ii) All tables should be featured with clarity and readability.

(iii) Unnecessary details must be avoided in the table.

(iv) The table must be capable of satisfying the basic needs of it's preparation.

(v) Arrangement of data in the stub must follow some logical order.

TYPES OF TABULATION

There are various types of tables depending upon the nature of the data, and purpose of presentation. On the different basis, tables are classified into following types.

1. On the basis of purpose - On the basis of purpose, table can be classified into general purpose table and special purpose table. General purpose tables are not cunstructed for some special purpose but for general purpose. On the other hand, special purpose tables are constructed with special purpose. These tables are used to analyse or to assist in the analysis of classified data.

2. On the basis of originality - On the basis of originality, tables are classified into original table and derivative table. The original tables are the tables in which data are presented in original form. The derivative tables are the tables in which data are not presented in the original form but in the form of percentage, variations, etc.

3. On the basis of construction - On the basis of construction, tables are classified into simple table and complex table.

NOTES

(i) Simple table: A table wherein only one characteristic or quality or attribute is mentioned is called a simple table. This base may be age, weight, type of work, percentage of marks, etc. This type of table is known as table of the first order. A simple table is illustrated below.

Tablel No. 10.6 : Number of Workers in a Textile Factory According to their Work

Sr. No.	Name of work	Number of Workers
1.	Spinning	87
2.	Weaving	73
3.	Dyeing	40
	Total	**200**

In this table base of presentation is type of work.

(ii) Complex table : A complex table presents more than one group of items set out in additional columns or rows. It generally shows the relationship of one set of data to another. A complex table may be in the form of double, triple or manifold tabulation.

(a) Double tabulation : In these tabulation, numericals are presented on the basis of two characteristics. It is a two-way table which gives information about two interrelated characteristics of particular phenomenon. It is also known as table of the second order, which is illustrated in table No. 10.7.

Table No. 10.7 : Population in Maharashtra

(In thousands)

Year	Population in Maharashtra		Total
	Rural	Urban	
1961	28,391	11,163	39,554
1971	34,701	15,711	50,412
1981	40,791	21,993	62,784
1991	48,395	30,542	78,937
2001	55,778	41,101	96,879
2011	61,580	50,793	1,12,373

(b) Triple tabulation: It sub-divides a total into three different categories. In these tables data are presented on the basis of three characteristics. It is also known as table of the third order. It is illustrated in table No.10.8.

Table No. 10.8 : Population in Maharashtra

(In thousands)

Year	Population in Maharashtra						Total
	Rural			Urban			
	Male	Female	Total	Male	Female	Total	
1961							
1971							
1981							
1991							
2001							
2011							

(c) Manifold table : When statistical information are presented on the basis of more than three characteristics, table is called manifold table. Such table supply information about a large number of interrelated questions. It is also called higher order tables, which is illustrated in table No. 10.9

Table No. 10.9 : Population in Maharashtra

(In thousands)

Year	Age Group (years)	Population in Maharashtra						Total
		Rural			Urban			
		Male	Female	Total	Male	Female	Total	
1991	Below 15							
	15 – 60							
	Above 60							
	Total							
2001	Below 15							
	15 – 60							
	Above 60							
	Total							
2011	Below 15							
	15 – 60							
	Above 60							
	Total							

10.3 SUMMARY

In this unit, you have learned about the stages of data analysis. Processing, analysis and interpretation are necessary for a scientific study. The processing of data implies editing, coding, classification of data and tabulation of data collected. It facilitate it's analysis and interpretation. Research needs proper processing and analysis of data after collecting it. The editing can be done at two stages – field editing and central office editing. The process of editing will facilitate coding and tabulation of data. Another important stage of data analysis and interpretation is coding. Coding facilitates classification and tabulation of data. To make research project easier, the data or information needs to be classified into different groups i.e. classification of data. After collection and classification of data, presentation of data is very important. Data can be presented with the help of tables and graphs.

10.4 KEY TERMS

- **Processing :** Processing of data means editing, coding, classification and tabulation of data collected so as to reduce it to manageable size.
- **Editing :** It is the activity where in the investigator reviews the reporting forms.
- **Field editing :** It consists of review of the reporting forms by the investigator that are written in abbreviated form at the time of recording the respondent's responses.

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CHECK YOUR PROGRESS

1. Define editing.
2. Define processing.
3. What do you understand by classification?
4. Define field editing.
5. What do you mean by central office editing?
6. What are the points involved in data editing?
7. Define tabulation.
8. List the types of tabulation.

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- **Central office editing :** It involves more thorough and rigorous scrutiny and correction of completed returns.
- **Coding :** Coding can be defined as representing the data symbolically using some predefined rules.
- **Classification :** It is a process by which collected data are put into different classes on the basis of their characteristics or attributes.
- **Tabulation :** Tabulation means placing the result and data collected from research into tabular form.

10.5 QUESTIONS AND EXERCISES

1. What is processing of data? Explain in brief the various steps involved in processing of data.

2. Distinguish between editing and coding.

3. What is meant by classification.

4. Enumerate the objectives of classification.

5. Explain types of classification.

6. Explain data classification according to attribute.

7. Explain data classification according to class intervals.

8. Distinguish between data classification according to attributes and according to class intervals.

9. What are the bases of classifing collected data into categories?

10. Why tabulation is considered essential in a research study? Give the characteristics of a good table.

11. Describe the major functional parts of a statistical table. Draw a format of table showing all these parts.

12. Explain structure of tables.

13. Describe various types of tabulation.

14. Monthly salary (in rupees) of 24 employees of a firm is given below. Tabulate the data after selecting suitable class intervals.

3250	6500	13000	19000	3800	20000
1220	13768	2700	18750	5900	16000
12500	1780	13365	7830	4500	12990
19999	8900	14500	17900	11990	6725

15. Write short notes :-

(i) Stages of data analysis

(ii) Editing

(iii) Field editing

(iv) Central office editing

(v) Coding

(vi) Classification

(vii) Characteristics of classification

(viii) Types of classification

(ix) Objectives of classification

(x) Classification according to class-intervals

(xi) Tabulation

(xii) Types of tabulation

(xiii) Complex table.

10.6 BOOKS FOR FURTHER READING

1. **Ackoff R. L.** and **Maurice W. Sasieni** (1963) : *'Fundamentals of Operations Research',* John Wiley and Sons Inc., New York.
2. **Ahuja Ram** (2003): *'Research Methods',* Rawat Publications, Jaipur.
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UNIT 11 : ANALYSIS AND INTERPRETATION OF DATA

NOTES

Structure

11.0 Introduction

11.1 Unit objectives

11.2 Subject description

- 11.2.1 Diagrammatic representation of data
- 11.2.2 Types of Diagrams
- 11.2.3 Analysis of data
- 11.2.4 Types of data analysis
- 11.2.5 Interpretation

11.3 Summary

11.4 Key terms

11.5 Exercises

11.6 Books

11.0 INTRODUCTION

In the previous unit, you have learned processing of data i.e. stages of data analysis. Processing of data implies editing, coding, classification of data and tabulation of data collected. It facilitates its analysis and interpretation. Research needs proper processing and analysis of data after collecting it. Processing, analysis and interpretation of data are essential for a scientific study. In this unit you will read about analysis and interpretation of data. This unit will also describe the different methods of diagrammatic representation. After the data is analysed, it needs to be interpreted. Usefulness of research findings lies in proper interpretation. For proper interpretation it is necessary to have knowledge about various types of statistical methods. There are number of statistical methods that enable the researcher to process, classify, tabulate and interpret the collected data and draw inferences and conclusions.

11.1 UNIT OBJECTIVES

After going through this unit, you will be able to –

(i) Understand the methods of diagrammatic representation

(ii) Understand advantages of diagrams

(iii) Understand analysis of data and its characteristics

(iv) Understand interpretation of data

(v) Explain sources of errors in interpretation

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11.2 SUBJECT DESCRIPTION

Diagrammatic representation of data is an important process for representation of facts and figures. It is the important method of presenting the complex and scattered data.

11.2.1 DIAGRAMMATIC REPRESENTATION OF DATA:

After completion of the process of classification and tabulation, it becomes necessary to arrange data for their proper representation. Diagrammatic representation of data is important for representation of facts and figures. Diagrammatic presentation is the method of presenting the complex data in a simple, attractive and comparable form.

ADVANTAGES OF DIAGRAMS :

The main advantages of diagrams are given below:

(i) Diagram presents the data in an attractive form.

(ii) It exhibit the results more clearly.

(iii) It does not require any special training to understand them.

(iv) It helps in presenting the data in simple way.

(v) It facilitates comparison without any computation. In reality, the main objective of diagrams is to help in comparison.

(vi) They save the time and energy of the observer.

(vii) They are being used in almost all the spheres such as trade, economics, advertisement, etc. It means that they have universal applicability.

Thus, diagrams have a very important place in statistical methods, but they are not meant to replace classification and tabulation.

11.2.2 TYPES OF DIAGRAMS :

A large number of diagrams and graphs are used in research studies depending upon the nature and scope of data. The following are the different types of diagrams.

1. Bar diagrams
2. Pie diagrams
3. Frequency curve
4. Histogram

1. BAR DIAGRAMS –

A bar diagram is a chart with rectangular bars with lengths proportional to the values that they present. In other words, it is a chart that uses either vertical or horizontal bars to show comparisons among categories. A vertical bar diagram is also known as a column bar diagram. In this diagram one axis of the diagram

shows the specific categories being compared and the other axis represents discrete values. Bar diagrams can take any of the following forms:

(a) Simple bar diagram

(b) Sub-divided bar diagram

(c) Multiple bar diagram

(d) Percentage bar diagram

Let us consider the illustration of simple bar diagram given below:

Illustration – I

The marks obtained in the B. Com final year by a student are given below. Present this information with the help of bar diagram.

	Subject	Marks
1.	Accountancy	40
2.	Marketing	45
3.	Economics	75
4.	Human resource	80
5.	Banking	68
6.	Co-operation	50

Following figure shows the bar diagram for the data given above. In this figure subject have been shown along the horizontal axis and the number of marks along the Y-axis.

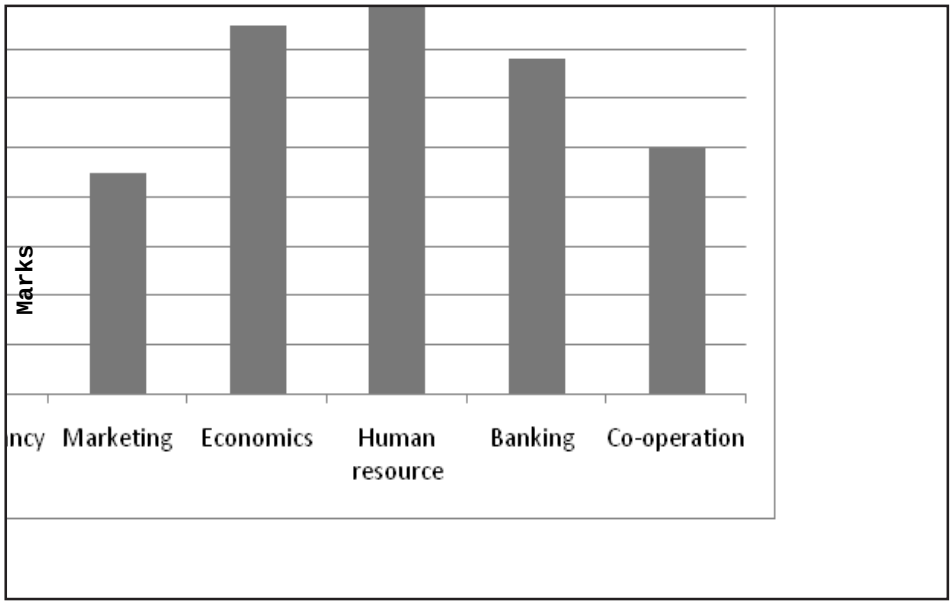


Figure 11.1: Bar Diagram

Sometimes the data for the same unit is given in different sub sections and it is desirable to present such type of data in sub-sections only. At that time such type of data are presented with the help of a sub divided diagrams. Sub-divided bar diagrams are used if the data are made up of different components. Sometimes multiple bar diagrams are very useful for direct comparison between two or more

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independent variables. In this diagram, different designs or colours may be used to show different variables. When the components of sub-divided bar diagram are presented on a percentage basis, then the new diagram is called the percentage bar diagram.

2. PIE DIAGRAM –

A pie diagram or chart is a circular chart divided into sectors, illustrating numerical proportion. In this diagram, the angle of 360^0 at the centre of the circle is divided in proportion to the size of each item of information. Pie charts are very widely used in the business world. Let us consider the construction of pie chart given below.

Illustration – II

Draw a pie chart to present the following sales of the company in percentage in various countries.

Country	India	China	USA	Pakistan
Sales (percentage)	50	30	15	5

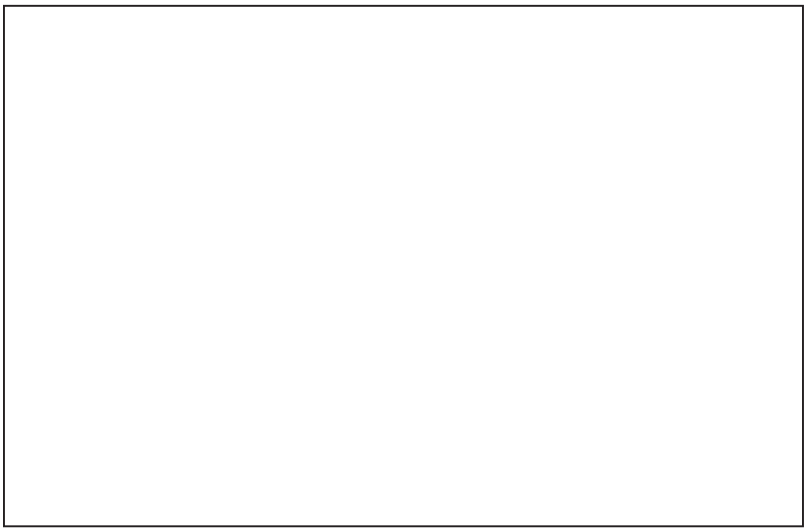


Figure 11.2: Pie chart

3. FREQUECY CURVE :

Another method of representation is to draw the frequency curve. These are graphs used to represent frequency distribution. In these diagrams, frequencies are shown along verticle axis and variable values along X-axis. The greatest advantage of this method is the simplicity of it's drawing and a more natural appearance. Let us consider the illustration of frequency curve given below.

Illustration – III

Construct a frequency graph for the distribution given below.

Marks :	15	30	45	60	75	90
No. of students :	2	1	15	30	18	24

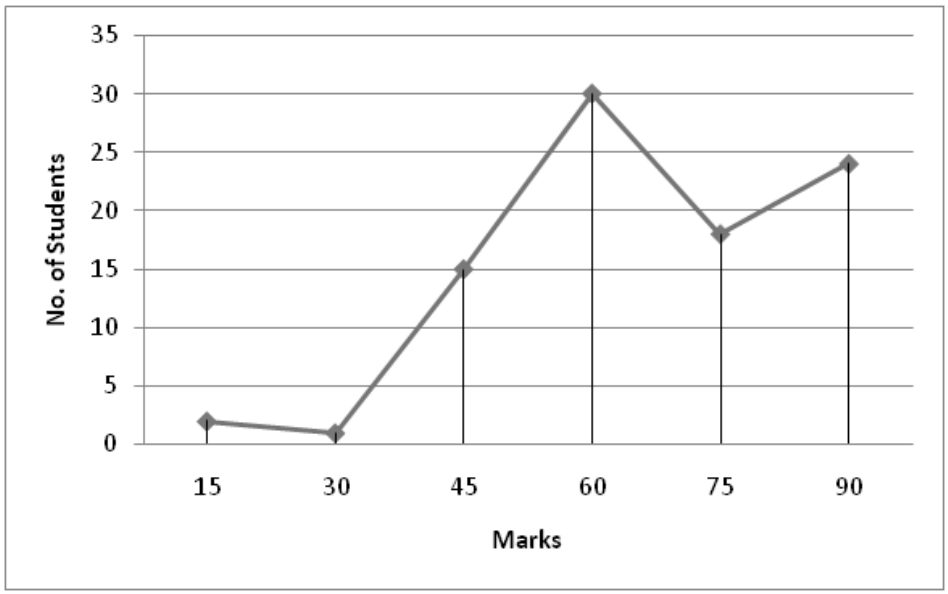


Figure 11.3: Frequency curve

4. HISTOGRAM :

Histogram is a diagramatic representation of a continuous grouped frequency distribution. It is one of the most popular and commonly used device for charting continuous frequency distribution. In this diagram, the length or magnitudes of the class-intervals is shown along X-axis and the corresponding frequencies along Y-axis. It has a lot of theoretical importance. The following example will show the graphic representation of histograms.

Illustration – IV

Construct a histogram for the data given below.

Wages (Rs. 000) :	1-50	5-10	10-15	15-20	20-25
No. of labour :	12	15	22	35	14

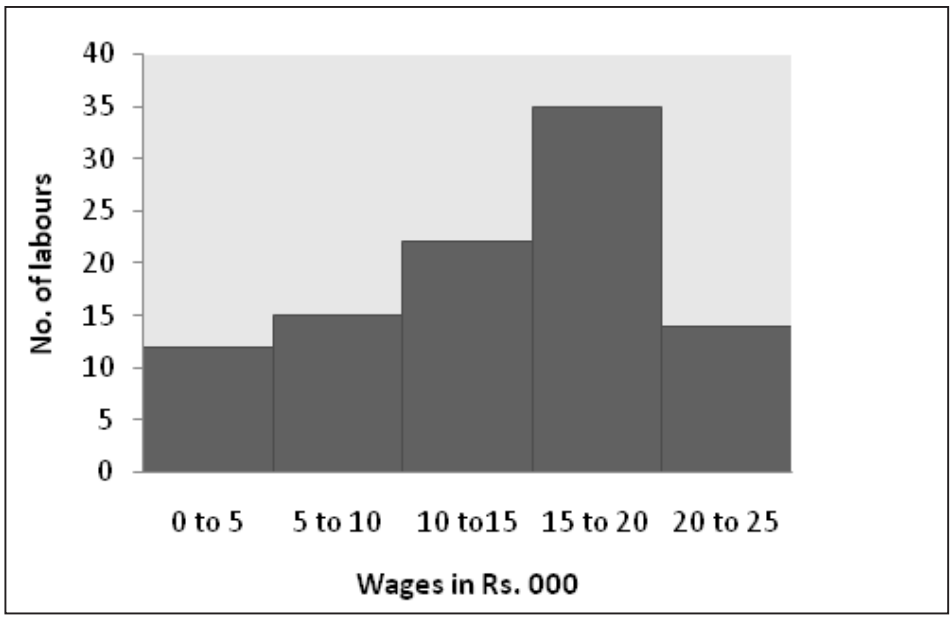


Figure 11.4: Histogram

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11.2.3 ANALYSIS OF DATA

Analysis of data is one of the important steps in research process. It is an act of transforming the data with the objective of extracting some useful information. Analysis of data is useful to facilitate findings and some useful conclusions. Analysis of data involves several statistical operations performed to derive the hidden message in the data collected. Findings and conclusions from analysed data is known as interpretation of data. After analysis and interpretation of data, researcher gets answer to research questions or highlights the causal relations among the variables. It will help to solve the practical problems studied in the research or to formulate theories.

According to Bereleson, "analysis is a research technique for the objective, systematic and quantitative description of the manifest content of communication". According to Wilkinson and Bhandarkar, "analysis of data involves a number of closely related operations that are performed with the purpose of summarising the collected data and organising these in such a manner that they will yield answer to the research questions or suggest hypothesis or questions if no such question or hypothesis had initiated the study."

Analysis of data is the most skilled task of all the stages of the research. It may be quantitative or qualitative.

Characteristics of analysis of data:

Following are the important characteristics of analysis of data.

(i) Analysis of data is skilled and technical task of research.

(ii) Systematic process of analysis reveals hidden message in data.

(iii) Analysis of data and interpretation of data are the two closely inter-related activities and these are complementary to each other.

(iv) Various statistical methods may be used in the analysis of data.

(v) Analysis of data provides the basis for interpretation.

11.2.4 TYPES OF DATA ANALYSIS:

Following are the types of data analysis

1. **Descriptive analysis** – Descriptive analysis is largely the study of distribution of one variable. It is the discipline of quantitatively describing the main features of a collection of data. It is different from inferential analysis. It aims to summarize a sample rather than use the information to learn about the population. Central tendency and dispersion are commonly used to describe data.

2. **Correlation analysis** – The measurement of the degree of relationship between variables is called correlation. The two or more variables are said to be correlating if change in one variable is accomapanied by the change in the other variable. It does not necessarily note a cause and effect relationship. For example, use of irrigation facilities and production of agricultural commodities are correlated or associated. In this method various measures of relations may be used to analyse the data. These measures are co-efficient of correlation, the rank co-efficient of correlation, co-efficient of association, co-efficient of multiple correlation, etc.

3. **Causal analysis** – As earlier said that correlation analysis dose not necessarily note a cause and effect relationship. However causal analysis is concerned with cause and effect relationship. It is concerned with the study of how one or more variables affect changes in another variable. For example, The demand for a commodity is dependent upon various determinants of demand *i.e.* price of the commodity, income of the consumer, price of the relative goods, etc. It means that causal analysis is the study of functional relationship existing between two or more variables.
4. **Inferential analysis** – Inferential analysis is used to describe the data. It is concerned with the various tests of significance for testing hypothesis. The task of interpretation is performed on the basis of inferential analysis.

11.2.5 INTERPRETATION OF DATA :

After analysis of the data the most important task of the researcher is interpretation of the analysed data. This has to be done very carefully, otherwise missleading conclusions may be drawn. With the help of interpretation researcher can expose relations and processes that underline his findings.

Interpretation means the translation of a statistical result into an intelligible description. In other words, it refers to the identification of trends in different variables. By interpretation it is possible to provide explanations for concepts. Interpretation is essential. Usefulness of research findings lies in proper interpretation. Interpretation is a basic component of research process. It is essential because it facilitates understanding of research findings. It forms hypothesis. It facilitates understanding of abstract principle behind findings. It establishes the explanatory concepts that can serve as a guide for future research study.

PRE-REQUISITES OF INTERPRETATION :-

For a reliable and valid interpretation of the available data, a trained researcher is required. But it is also necessary to take several safeguards. He has to ensure the fulfilment of a minimum number of pre-requisites before he starts interpreting the data. These requisites have been listed below.

(i) Homogeneity of the data may be considered to be the most important pre-requisite for interpretation. Unless data are homogeneous, comparability of different situations can not be ensured.

(ii) Many a times people make conclusions with only inadequate data. Such conclusions are bound to be dangerous and misleading. However, the data should be adequate, appropriate and trustworthy.

(iii) It is advisable that the most up-to-date and scientific methods should be used to analyse the data. A lot depends on the analysis of data. In this case, care should be taken in the selection of statistical methods and in using them.

SOURCES OF ERRORS IN INTERPRETATION

The main sources of errors in interpretation are listed below:

(i) In some situations, it is found that an individual's bias may affect analysis and interpretation at the stage of the data collection. So, interpreter should be a fair minded person. So that he interprets any result objectively.

CHECK YOUR PROGRESS

1. List the types of diagram.
2. What do you mean by bar diagrams?
3. What do you mean by pie chart?
4. What do you mean by frequency curves?
5. List the characteristics of analysis of data.

(ii) Sometimes the interpreter uses various statistical techniques i.e averages, correlation, co-efficients, regression, etc to interpret analysed data. At that time the interpreter has to take special care in the use of these tools.

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The sources of errors discussed above have to be eliminated to offer correct interpretation. Interpretation is most important aspect of research process. The quality of research depends upon interpretation of the data and does not depend upon how much data is collected by the researcher.

11.3 SUMMARY

In this unit, you have learned about the analysis and interpretation of data. You have also learned about diagrammatic representation of data. Diagrammatic representation is the method of presenting the complex data in a simple, attractive and comparable form. There are number of advantages of diagrammatic representation of data. Diagrams have universal applicability. They are being used in almost all the spheres such as trade, economics, advertisement, etc. Bar diagrams, pie charts, frequency curve and histogram are the types of diagrams. Analysis of data is one of the important steps in research process. It is the most skilled task of all the stages of the research. After analysis of the data the most important task of the researcher is interpretation of the analysed data. Usefulness of research findings lies in proper interpretation.

11.4 KEY TERMS

- **Diagrammatic presentation** – It is the method of presenting the even data in simple and attractive way, so that it can be understood by a layman.
- **Bar diagram** – It is a statistical presentation technique that represents frequency data as horizontal or vertical bars.
- **Pie chart** – Statistical representation technique that uses sections of a circle to represent 100 per cent of a frequency distribution.
- **Frequency curve** – These are graphs used to represent frequency distribution.
- **Histogram** – It is a diagrammatic representation of a continuous grouped frequency distribution.
- **Analysis** – It is a research technique for the objective, systematic and quantitative description of the manifest content of communication.
- **Correlation co-efficient** – A statistic that quantifies the degree of association between two or more variables.
- **Causal analysis** – It is concerned with cause and effect relationship.
- **Inferential analysis** – It is concerned witht the various tests of significance for testing hypothesis.
- **Interpretation -** It means the translation of a statistical result into a intelligible description.

11.5 QUESTIONS AND EXERCISES

1. Describe, in brief, the importance of editing, coding, classification, tabulation and presentation of data in the context of research study.

2. What is a diagrammatic presentation? Write briefly about the different forms of diagrammatic representation.

3. What is significance of diagrammatic presentation in research report?

4. What is analysis and interpretation of data? What are the characteristics of analysis?

5. What are the types of diagrams?

6. What are the types of data analysis?

7. What precautions must be taken while doing interpretation?

8. What are the sources of errors in interpretation?

9. Write short notes :–

(i) Advantages of diagrams.

(ii) Types of diagrams.

(iii) Bar diagrams.

(iv) Pie diagrams.

(v) Frequency curves.

(vi) Histogram.

(vii) Types of data analysis.

(viii) Characteristics of analysis of data.

(ix) Correlation analysis.

(x) Interpretation of data.

(xi) Sources of errors in interpretation.

11.6 BOOKS FOR FURTHER READING

1. **Ackoff R. L.** and **Maurice W. Sasieni** (1963) : *'Fundamentals of Operations Research'*, John Wiley and Sons Inc., New York.

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UNIT 12 : RESEARCH REPORT

Structure

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12.2.1 Research report - meaning

12.2.2 Contents of research report

12.2.3 Significance of report writing

12.2.4 Essential qualities of good report

12.2.5 Steps in writing research report

12.3 Summary

12.4 Key terms

12.5 Exercises

12.6 Books

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12.0 INTRODUCTION

In the previous unit, your have learned about diagrammatic representation of data. Diagrammatic representation of collected data is an important process for representation of facts and figures. It is the method of presenting the complex data in a simple, attractive and comparable form. You have also learned about analysis and interpretation of data. It is the most skilled task of all the stages of the research. After the collected data has been analysed and interprete the report has to be prepared. Writing of research report is the last step in the research process. In this unit you will read about writing of research report. It comprises meaning of research report, contents of it, importance of report writing. You will also learn about essential qualities of good report and steps in writing research report.

12.1 UNIT OBJECTIVES

After going through this unit, you will be able to –

(i) Explain the concept of research report.

(ii) Understand the contents of research report.

(iii) Understand the significance of report writing.

(iv) Appreciate the essential qualities of good report.

(v) Describe the steps in writing research report.

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12.2 SUBJECT DESCRIPTION

Research reporting is the oral or written presentation of the findings in such detail and form as to be readily understood and assessed by the society, economy or particularly by the researchers. As earlier said that it is the final stage of the research process and its purpose is to convey to interested persons the whole result of the study. Report writing is common to both academic and managerial situations. In academics, research report is prepared for comprensive and application oriented learning. In business or organisations, report are used for the basis of desigion making.

12.2.1 RESEARCH REPORT - MEANING :-

According to C. A. Brown, "A report is a communication from someone who has information to someone who wants to use that information."

According to Goode and Hatt, "The preparation of report is the final stage of research, and it's purpose is to convey to the interested persons the whole result of the study, in sufficient detail and so arranged as to enable each reader to comprehent the data and to determine for himself the validity of the conclusions."

It is clear from the above definitions of research report, it is a brief account of the problem of investigation, the justification of it's selection and the procedure of analysis and interpretation. It is only summary of entire research proceedings. In other words, it can be defined as the written documents, which presents information in a specialized and concise manner.

12.2.2 CONTENTS OF RESEARCH REPORT :-

Although no hard and fast rules can be laid down, the report must contain the following points.

(A) Preliminary part -

1. Cover
2. Title
3. Preface
4. Acknowledgement
5. Table of contents
6. List of tables
7. List of graphs

(B) Introduction of the report -

1. Introduction
2. Background of the research study
3. Statement of the problem
4. Brief outline of the chapters

(C) Review of literature –

1. Books review

2. Review of articles published in books, journals, periodicals, etc.
3. Review of articles published in leading newspapers
4. Working papers / discusssion paper / study reports
5. Articles on authorised websites
6. A broad conclusion and indications for further research

(D) The research methodology –

1. The theoretical framework (variables)
2. Model / hypothesis
3. Instruments for data collection
4. Data collection

(E) Results –

1. Pilot study
2. Processing of data
3. Hypothesis / model testing
4. Data analysis and interpretation
5. Tables and figures

(F) Concluding remarks –

1. Findings
2. Conclusions
3. Shortcomings
4. Suggestions to the problems
5. Direction for further research

(G) Bibliography –

1. Appendices

NOTES

(A) PRELIMINARY PART :

The preliminary part may have seven major components – cover, title, preface, acknowledgment, table of contents, list of tables, list of graphs. Long reports presented in book form have a cover made up of card sheet. The cover contains title of the research report, the authority to whom the report is submitted, name of the author, etc. Preface introduces the report to the readers. It gives a very brief introduction of the report. In the acknowledgements author mention names of persons and organisations that have extended co-operation and helped in the various stages of research. Table of contents is essential. It gives the title and page number of each chapter.

(B) INTRODUCTION OF THE REPORT:

The introduction of the research report should clearly and logically bring out the background of the problem addressed in the research. The purpose of the introduction is to introduce the research project to the readers. A clear statement of the problem with specific questions to be answered is presented in the introduction. It contains a brief outline of the chapters.

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(C) REVIEW OF LITERATURE :-

The third section reviews the important literature related to the study. A comprehensive review of the research literature refered to must be made. Previous research studies and the important writings in the area under study should be reviewed. Review of literature is helpful to provide a background for the development of the present study. Researcher may review concerned books, articles published in edited books, journals and periodicals. Researcher may also take review of articles published in leading newspapers. Researcher should study working papers / discussion papers / study reports. It is essential for a broad conclusion and indications for further research.

(D) THE RESEARCH METHODOLOGY :-

Research methodology is an integral part of the research. It should clearly indicate the universe and the selection of samples, techniques of data collection, analysis and interpretation, statistical techniques, etc.

(E) RESULTS :-

Results contain pilot study, processing of data, hypothesis / model testing, data analysis and interpretation, tables and figures, etc. This is the heart of research report. If a pilot study is planned to be used, it's purpose should be given in the research methodology. The collected data and the information should be edited, coded, tabulated and analysed with a view to arriving at a valid and authentic conclusions. Tables and figures are used to clarify significant relationship. The results obtained through tables, graphs should be critically interpreted.

(F) CONCLUDING REMARKS :-

The concluding remarks should discuss the results obtained in the earlier sections, as well as their usefulness and implications. It contains findings, conclusions, shortcomings, suggestions to the problem and direction for future research. Findings are statements of factual information based upon the data analysis. Conclusions must clearly explain whether the hypothesis have been established and rejected. This part requires great expertise and preciseness. A report should also refer to the limitations of the applicability of the research inferences. It is essential to suggest the theoretical, practical and policy implications of the research. The suggestions should be supported by scientific and logical arguments. The future direction of research based on the work completed should also be outlined.

(G) BIBLIOGRAPHY :-

The bibliography is an alphabetic list of books, journal articles, reports, etc, published or unpublished, read, referred, examined by the researcher in preparing report. The bibliography should follow standard formats for books, journal articles, research report. The end of the research report may consist of appendices, listed in respect of all technical data. Appendices are for the purpose of providing detailed data or information that would be too cumbersome within the main body of the research report.

12.2.3 SIGNIFICANCE OF THE REPORT WRITING

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Report writing is an important communication medium in organisations. The most crucial findings might have come out through research report. Report is common to academics and managers also. Reports are used for comprehensive and application oriented learning in academics. In organisations, reports are used for the basis of decision making. The importance of report writing can be discussed as under.

Through research report, manager or an executive can quickly get an idea of a current scenario which improves his information base for making sound decisions affecting future operations of the company or enterprise. The research report acts as a means of communication of various research findings to the interested parties, organisations and general public. Good report writing play, a significant role of conveying the unknown facts about the phenomenon to the concerned parties. This may provide new insights and new opportunities to the people. Research report plays a key role in making effective decisions in marketing, production, banking, materials, human resource development and government also. Good report writing is used for economic planning and optimum utilisation of resources for development of nation.

Report writing facilitates validation of generalisation. Research report is an end product of research. As earlier said that report writing provides useful information in arriving at rational decisions that may reform the business and society. The findings, conclusions, suggestions and recommendations are useful to the academicians, scholars and policy makers. Report writing provides reference material for further research in the same or similar areas of research to the concerned parties.

While preparing research report, researcher should take some proper precautions. Report writing should be simple, lucid and systematic. Report writing should be written speedily without interupting the continuity of thought. The report writing should sustain interest of readers.

12.2.4 ESSENTIAL QUALITIES OF GOOD REPORT

Report writing is a highly skilled job. It is a process of analysing, understanding and consolidating the findings and projecting a meaningful view of the phenomenon studied. A good report writing is essential for effective communication. Following are the essential qualities of good report:

(i) A research report is essentially a scientific documentation. It should have a suggestive title, headings and sub-headings, paragraphs arranged in a logical sequence.

(ii) Good research report should include everything that is relevant and exclude everything that is irrelevant. It means that it should contain the facts rather than opinion.

(iii) The language of the report should be simple and unambiguous. It means that it should be free from biases of the researchers derived from the past experience. Confusion, pretentiousness and pomposity should be carefully guarded against. It means that the language of the report should be simple, employing appropriate words, idioms and expressions.

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(iv) The report must be free from grammatical mistakes. It must be grammatically accurate. Faulty construction of sentences makes the meaning of the narrative obscure and ambiguous.

(v) The report has to take into consideration two facts. Firstly, for whom the report is meant and secondly, what is his level of knowledge. The report has to look to the subject matter of the report and the fact as to the level of knowledge of the person for whom it is meant. Because all reports are not meant for research scholars.

12.2.5 STEPS IN WRITING RESEARCH REPORT

Report writing is a time consuming and expensive exercise. Therefore, reports have to be very sharply focused in purpose content and readership. There is no single universally acceptable method of writing a research report. Following are the general steps in writing research report:

(i) Analysis of the subject matter – This is the first and important step in writing research report. It is concerned with development of a subject. Subject matter should be written in a clear, logical and concise manner. The style adopted should be open, straightforward and dignified and folk style language should be avoided. The data, the reliability and validity of the results of the statistical analysis should be in the form of tables, figures and equations. All redundancy in the data or results presented should be eliminated.

(ii) Research outline – The research outline is an organisational framework prepared by the researcher well in advance. It is an aid to logical organisation of material and a reminder of the points to be stressed in the report. In the process of writing, if need be, outline may be revised accordingly. Time and place of the study, scope and limitations of the study, study design, summary of pilot study, methods of data collection, analysis interpretation, etc., may be included in a research outline.

(iii) Preparation of rough draft – Having prepared the primary and secondary data, the researcher has to prepare a rough draft. While preparing the rough draft, the researcher should keep the objectives of the research in mind, and focus on one objective at a time. The researcher should make a checklist of the important points that are necessary to be covered in the manuscript. Researcher should use dictionary and relevant reference materials as and when required.

(iv) Rewriting and polishing – This is an important step in writing research report. It takes more time than rough draft. While rewriting and polishing, researcher should check the report for weakness in logical development or presentation. He should take breaks in between rewriting and polishing, since this gives the time to incubate the ideas.

(v) Writing the final draft – The last and important step is writing the final draft. The language of the report should be simple, employing appropriate words and expressions and should avoid vague expressions such as 'it seems' and 'there may be' etc. It should not used personal pronouns, such as I, We, My, Us, etc and should substitute these by such expressions as researcher, investigator, etc. Before the final drafting of the report it is advisable that the researcher should prepare a first

CHECK YOUR PROGRESS

1. Define report.
2. List the contents of research report.
3. What are the essential qualities of good report?

draft for critical considerations and possible improvements. It will be helpful in writing the final draft. Finally, the report should be logically outlined with the future directions of the research based on the work completed.

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12.3 SUMMARY

In this unit, you have learned about the writing of research report. In it, you have learned meaning and contents of research report, significance of report writing, essentials qualities of good report. The steps in writing research report are also studied. Writing of research report is highly skilled job. As earlier said, it is a process of analysing, understanding and consolidating the findings and projecting a meaningful viewof the phenomenon studied. Therefore, before a final draft is completed, the report should be thorougly reviewed and edited.

12.4 KEY TERMS

- **Report :** A report is a written document which presents information in a specialised and concise manner.
- **Facts :** Empirically observed events.
- **Hypothesis :** A declarative statement that describes the relationship of two or more variables.
- **Inference :** Any conclusion drawn on the basis of some set of information.
- **Bibliography :** It is an alphabetic list of books, journal articles, reports, etc, published or unpublished, read, referred, examined by the researcher in preparing report.
- **Appendices :** They are for the purpose of providing detailed data or information that would be too cumbersome within the main body of the research report.
- **Research outline :** It is an organisational framework prepared by the researcher well in advance.

12.5 QUESTIONS AND EXERCISES

1. Define report and explain its importance.
2. How should a research report be organised?
3. What precautions will you take while writing a report?
4. Explain significance of report writing.
5. What are the contents of a report?
6. Mention the steps involved in the report writing process.
7. Discuss the guidelines that must be followed while preparing a written report.

NOTES

8. Write short notes :–

(i) Report writing.

(ii) Contents of research report.

(iii) Importance of writing research.

(iv) Essential qualities of good report.

(v) Steps in writing research report.

12.6 BOOKS FOR FURTHER READING

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