

2.4 BUSINESS RESEARCH METHODS

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SYLLABUS

Module – 1: Research: Meaning, Purpose, Scientific method, types of research; scope of business research. Review of literature: need, purpose, notes taking.

Module – 2: Selection and formulation of a research problem, formulation of hypothesis, operational definition of concepts, sampling techniques. Research Design: Meaning, nature, process of preparation, components of research design.

Module – 3: Data: Sources of data, methods, of collection; observation interviewing, mailing; tools for collection data; interview schedule, interview guide, questionnaire, rating scale, socio-metry, check list; pre- testing of tools, pilot study. Processing of data; checking, editing, coding, transcription, tabulation, preparation of tables, graphical representation.

Module – 4: Analysis of data; Simple statistical techniques and their uses. Testing of Hypothesis, Research Applications – market survey. Report – Writing: Planning report writing work-target audience, type of report, style of writing synoptical outline of

chapters; steps in drafting the report

UNIT-1

- **Introduction to Research-** The word research is composed of two syllables, Re and search. The dictionary defines 'Re' meaning, again, and 'search' meaning to examine closely and carefully, to test and try, or to probe. Together they form a noun describing a careful, systematic, patient study and investigation in some field of knowledge, undertaken to establish facts or principles

MEANING & DEFINATION OF BUSINESSRESEARCH

- “The Application of the scientific method in searching for the truth about business phenomena. These activities include defining business opportunities and problems, generating and evaluating ideas, monitoring performance, and understanding the business processes”
- The systematic collection and analysis of data with the objective of finding answers to business problems. E.g.
 - a) what is the target market of my product?
 - b) How to decrease the amount of excess inventory on hand
- **According to Robert Ross**, “Research is essentially an investigation, a recording and an analysis of evidence for the purpose of gaining knowledge.” It can generally be defined as a systematic method of finding solutions to problems.

Features/Characteristics/quality

of Research

- The research essentially discovery of new knowledge
- It is essentially an investigation
- Research is a process of collecting, analyzing and interpreting information to answer questions
- It is based on observation or experimental evidences.
- It learns more about things, people, and events
- It related with the solution of a problem
- A good research must be systematic, logical, empirical, verifiable and Procedure followed in research must be sufficiently described
- It should be carefully recorded and reported

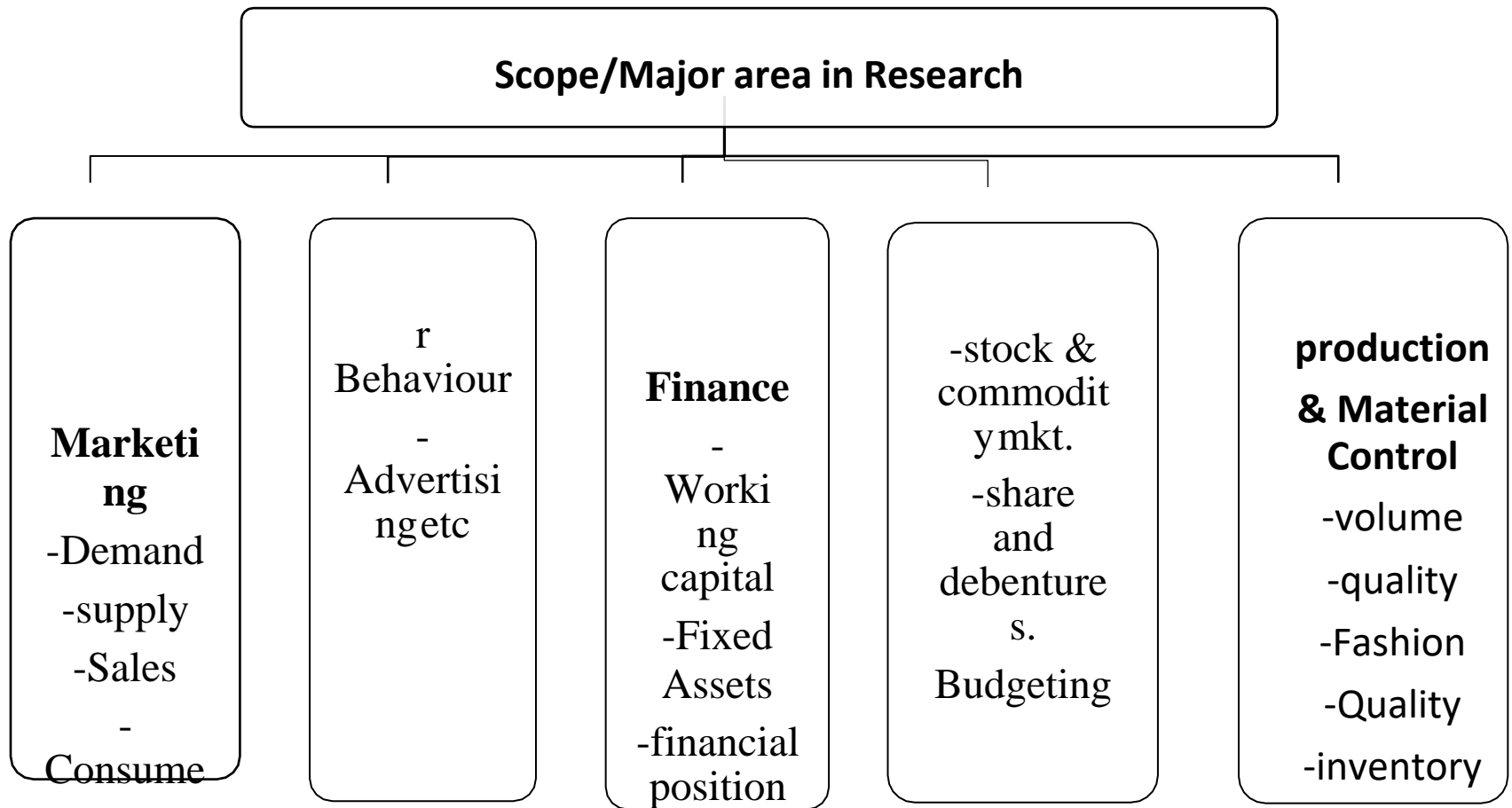
Need for Research/Importance of Research/Significance/ Role of Research

- The main importance of research is to produce knowledge
- Research helps in problem solving
- Marketing research is important because it allows consumers and producers to become more familiar with the products, goods, and services around them.
- Research is important to society because it allows us to discover more and more that might make our lives easier, more comfortable, and safer
- Research encourages interdisciplinary approaches to find solutions to problems and to make new discoveries.
- Research is a basic ingredient for development and therefore serves as a means for rapid economic development.
- It provides a basis for government policies
- Helps in solving various operational and planning problems of business
- It is useful to students, professionals, philosophers, literary men, analysts and intellectuals

Purpose / Aims / Objectives of Research

- The main purpose of research is to discover answers to questions through the application of scientific procedures.
- To find out the truth which is hidden and which has not been discovered so far.
- Aims at advancing systematic knowledge and formulating basic theories about the forces
- Research aims to analyse inter-relationships between variables and to derive casual explanation and thus enables us to have a better understanding of the world in which we live.
- Try to improve tools of analysis or to test these against the complex human behaviour and institutions.
- To understand social life and thereby to gain a greater measure of control over social behaviour.
- To provide an educational program in the accumulated knowledge of group dynamics, in skills of research, in techniques of training leaders and in social action

Scope of Research/Research in important areas



-
purchase
e
-storage
-cost
analysis
etc

Banking
-loans and
advance
-NPA
-Assets
liability
-CAMEL
-PMJDY
-financial
inclusion
-Interest
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**Human
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Research Approaches

There are two basic approaches to research viz.

- Quantitative approach
- Qualitative approach

TYPES OF RESEARCH

- Research can be classified from *Five* perspectives:
 - 1) Application of research study
 - 2) Objectives in undertaking the research
 - 3) Inquiry mode employed
 - 4) Conceptual Research and Empirical research
 - 5) Some Other Types Research

1) Application of research study

there are *two* broad categories of research:

- a) Fundamental or Pure or Basic research** - It is a research concerning principles or laws or rules. It aims at the achievement of knowledge and truth. It may verify/testing the old theory and hypotheses or establish a new one. It tries to explain the cause and effect relationship in social phenomena. The knowledge produced through pure research is sought in order to add to the existing body of research methods. It is essentially positive and not normative. This may take the form of the following
- **Discovery**- where a totally new idea or explanation emerges from empirical research e.g Hawthorne experiments
 - **Invention**-where new technique or method is created eg. TQM
 - **Reflection**- where an existing theory, technique or group of ideas is re-examined possibly in a different organization or social context. Eg Herzberg theory of motivation applied to front-line workers in the contract catering sector?

(b) Applied Research

Applied research is concerned with the solution of particular problems; for policy formulation, administration and understanding of a phenomenon. It aims at finding a solution for an immediate problem facing a society or an industrial organization. It is empirical and practical. It is concerned with applied aspects of life. E.g. Applied research can be carried out by academic or industrial institutions

Applied research is designed to solve practical problems of the modern world, rather than to acquire knowledge for knowledge sake. The goal of the applied scientist is to improve human conditions. For example

- ❖ Improve agricultural crop production
- ❖ Treat or cure a specific disease
- ❖ Improve the energy efficiency of homes, offices, or modes of transportation

2) Objectives in undertaking the research...

Research can be classified as

- a) **Descriptive and Analytical Research**- It attempts to describe systematically a situation, problem, phenomenon, service or programme, or provides information about , say, living condition of a community, or describes attitudes towards an issue i.e. **It describes the state of affairs as it exists at present**. The researcher has no control over the variables. He can only report what has happened or what is happening. Descriptive research includes
- **Case Study**-Detailed analysis of a single of people or events. The person who is presenting the case usually has some theoretical orientation. It is acceptable for a theoretical orientation to effect one's interpretation of events. The theoreticalorientation can also lead to the selection of the facts to include in the case.. Case study therefore assist psychology by illustrating how a theory could be applied to a person or events and by assisting with the development of hypotheses for more systematic testing.
 - **Survey Research**-Structure questions to assess people's beliefs, attitudes and self-reports of behaviour. and fact finding enquiries of different kinds. Such as
(1) face –to- face method, (2) phone method and (3) Mail survey
 - **Observational research**-accounts of natural behaviour of individual or group in some setting
 - **Archival Research/ Analytical research** - analysis of pre-existing data or records. one has to use facts or information already available and analyse these to make a critical evaluation of the material. It often involves content analysis

Cont. Objectives in undertaking the research

- b) **Correlation Research-** attempts to discover or establish the existence of a relationship/ interdependence between two or more aspects of a situation
- c) **Explanatory Research-** attempts to clarify why and how there is a relationship between two or more aspects of a situation or phenomenon
- d) **Exploratory research-** is undertaken to explore an area where little is known or to investigate the possibilities of undertaking a particular research study (feasibility study or pilot study)

3) Inquiry Mode- *two* approaches

a) **Structured approach/ quantitative research-** It involves a collection of numerical data to answer a specific research question. Quantitative research is applicable to phenomena that are measurable so that they can be expressed in terms of quantity. the research process- objectives, design, sample, and the questions that you plan to ask of respondents- is predetermined the extent of a problem, issue or phenomenon by quantifying the variation. e.g. how many people have a particular problem? How many people hold a particular attitude? It may involves

- ❖ **Correlation Study-**measuring two specific variables and attempting to quantify the relationship that exists between these variables
- ❖ **Ex-post Facto- study-**the investigator to determine the specific variables for analysis after the research has been completed.
- ❖ **Longitudinal study-** involves choosing a single group of participants and measuring them repeatedly at a selected time intervals to note the changes that occur over time in the specified characteristics for eg. Collecting data with respect to Age and development of children . The investigator identify the specific variable changes through the growth and development.
- ❖ **Meta-analysis-** is used to synthesize the large volume of data describing numerous independent variables and there correlation with reference accuracy.. It is undertaken for the purpose of synthesizing extensive amounts of work on a particular subject.
- ❖ **Survey-** method of collecting standardized information by interviewing representative sample

(b) Unstructured approach/qualitative research-

- Qualitative research is concerned with qualitative phenomenon. Research designed to find out how people feel or what they think about a particular subject. This approach allows flexibility in all aspects of the research process. It is more appropriate to explore the nature of a problem, issue or phenomenon without quantifying it. Main objective is to describe the variation in a phenomenon, situation or attitude. e.g., description of an observed situation, the historical enumeration of events, an account of different opinions different people have about an issue, description of working condition in a particular industry. Unstructured interview involves- (1) document analysis, (2) particular observation (ethnographic studies), (3) diaries, (4) case study (5) particular observation (6) focus groups

4) **Conceptual Research and Empirical Research**

- a) **Conceptual Research** - Conceptual research is that related to some abstract ideas or theory. It is generally used by philosophers and thinkers to develop new concepts or to interpret existing ones.
- b) **Empirical research**- empirical research relies on experience or observation alone. It is data based research coming up with conclusions capable of being verified by observation or experiment. In empirical research, the researcher has to first set up a hypothesis or guess as to the probable results. He then works out to get enough facts to prove or disprove his hypothesis. It improves knowledge and understanding as well as decision making skill and ability.

5) Some Other Types Research

- a) **Historical Research-** is that which utilizes historical sources like documents, remains etc to study events or ideas of the past, including the philosophy of persons and groups at any remote point of time.
- b) **Field setting or laboratory research or simulation research-**the research is carried out in field it is called field research or research carried out in laboratory it is laboratory research depending upon the environment in which it is to be carried out.
- c) **Clinical or diagnostic research-** such researches follow case-study methods or in-depth approaches to reach the basic casual relations. Such studies usually go deep into the causes of things or events that interest us, using very small samples and very deep probing data gathering devices.
- d) **One-time research or longitudinal research-** research confined to single time period is called one time research. Research carried on over several time-periods is called longitudinal research.
- e) **Social Research-** Social research refers to research conducted by social scientists. It is the scientific investigation conducted in the field of social sciences and also in the behavioural sciences. The research is a systematic method of exploring, analyzing and conceptualizing social life in order to expand, correct or verify knowledge. Social research methods can generally vary along a quantitative/qualitative dimension.
- f) **Educational Research-** is the activity which is directed towards development of a science of behaviour in educational situations. The methods, in which individuals evaluate different aspects of education including: “student learning,

teaching methods, teacher training, and classroom dynamics and so on. The findings of educational research need to be interpreted within the context in which they were discovered as they may not be applicable in every time or place

Research Methods Vs Research

Methodology-

- **Research methods-** All those methods/techniques that are used for conduction of research i.e. the methods which are used by the researcher during the course of studying his research problem are termed as research methods, e.g. making observations, recording data, instruments used, technique of processing data etc
- **Research Methodology-** It is the blue print of research. It explains how research is done scientifically or way to finding answers to research questions , the various steps that are generally adopted by a researcher in studying his research problem along with the logic behind them. The scope of research methodology is wider than that of research methods, e.g. Why hypotheses constructing, testing methods etc

Review of literature

- Review of literature pertaining to the current field of investigation mainly aims at critically reviewing and re-examining the earlier conceptual and empirical studies, the major methodological limitation, and direction for further research highlighted by the previous research with a view to identifying and defining the ‘research gap’ to be addressed by the current research study

BRM

- **Module – 2: Selection and formulation of a research problem, formulation of hypothesis, operational definition of concepts, sampling techniques. Research Design: Meaning, nature, process of preparation, components of research design**

Research Process/ Steps

The research process is similar to undertaking a journey. There are practical steps through which you must pass in your research journey in order to find answers to your research questions.

Steps in Research Process:

- 1) **Selection & Formulation of Research Problem**
- 2) **Extensive Literature Review**
- 3) **Developing the objectives**
- 4) **Identifying and Labelling Variables**
- 5) **Setting Up Of Hypothesis**
- 6) **Writing a Primary Synopsis**
- 7) **Preparing the Research Design including Sample Design**
- 8) **Collecting the Data**
- 9) **Processing, Analysis and Interpretation of Data by Statistical Methods**
- 10) **Testing of Hypothesis**
- 11) **Preparation of the Report or Presentation of Results**

1. Selection & formulation of a research problem

Research problem is one which requires a researcher to find out the best solution for the given problem, i.e., to find out by which course of action the objective can be attained optimally in the context of a given environment

It is the first and *most crucial step* in the research process is a researcher has to formulate the problem related to his research work.

The *sources of research problems* in social sciences revolves around **four Ps:**

- **People**- Study of population, a group of individuals, organizations, groups, communities
- **Problems**- issues, situations, associations, needs, profiles examine the existence of certain issues or problems relating to their lives; to ascertain attitude of a group of people towards an issue
- **Programs**- content, structure, outcomes, attributes, satisfactions, consumers, Service providers, etc to evaluate the effectiveness of an intervention
- **Phenomena**- cause-and-effect relationships, the study of a phenomenon itself to establish the existence of regularity.

1. Selection and formulation of a research problem....

Considerations in selecting a research problem are:

- **Interest,**
- **Magnitude,**
- **Level of expertise,**
- **Relevance,**
- **Availability of data,**
- **Ethical issues.**

For selecting the correct problem researcher may contact expert, refer library books, discuss with teachers etc. After selecting the correct problem the researcher has to formulate the problem. The Steps in formulation of a research problem are-

- **Identify a broad field or subject area of interest to you.**
- **Dissect the broad area into sub areas.**
- **Select what is of most interest to you.**
- **Raise research questions**

2. Extensive Literature Survey

Before formulating the research it is desirable that researcher examines all available literature, both conceptual and empirical.

- The conceptual literature -is one which deals with concepts and theories.
- Empirical literature is that which contains studies made earlier and so it consists of many facts and figures observed in the earlier studies. The source literature are- books, journals, articles and the like, and
- Identified the gap of research for future study

3. Developing the objectives

Objectives are the goals you set out to attain in your study. They inform a reader what you want to attain through the study. Each objective should contain only one aspect of the Study. Objective must contain the main associations and relationships that you seek to discover or establish.

The objectives should start with words such as

- ❖ ‘To determine’,
- ❖ ‘To find out’,
- ❖ ‘To ascertain’,
- ❖ “To describe ‘
- ❖ “To measure’,
- ❖ ‘To explore’ etc

4. Identifying and Labelling Variables

and measurements scale...

- The variables whose change has affected the other variable, is called independent variable. Therefore there is a cause and effect relation between the variables. The research problem must be formulated in such a manner that it highlights the nature, extent and implications of relation existing between the variables. It is only through this process of establishing the effective relation between variables that meaningful conclusions are derived from the study e.g. age, (years/months), gender, (male or female) weight, heights, income, religion etc

4. Measurement scale

the unit of measurement of a variable. S.S. Stevens has classified the different types of scale into four categories:

- **Nominal or classificatory scale**- the classification of individuals, objects or responses into subgroups based on a common/shared property or characteristic e.g. 'water' or 'tree' have only one subgroup, whereas the variable "gender" can be classified into two sub-categories: male and female
- **Ordinal or ranking scale**- it ranks the subgroups in a certain order. They are arranged either in ascending or descending order according to the extent a subcategory reflects the magnitude of variation in the variable. E.g. 'income' can be measured either quantitatively (in rupees and paise) or qualitatively using subcategories 'above average', 'average' and 'below average' (this is also called likert pointing scale 5 points or 3 points)
- **Interval scale**-An interval scale has all the characteristics of an ordinal scale. In addition, it uses a unit of measurement with an arbitrary starting and terminating points. E.g. Celsius scale: 0°C to 100°C, Attitudinal scales: 10-20, 21-30, 31-40 etc
- **Ratio scale**- A ratio scale has all the properties of nominal, ordinal and interval scales plus its own property: the zero point of a ratio scale is fixed, which means it has a fixed starting point. E.g 40%, 20% etc

5. Setting Up Of Hypothesis

- Hypotheses is a assumption, assertion or anidea about a phenomenon, relationship or situation, the reality or truth of which you do not know. A hypothesis is a tentative conclusion logically drawn. The research work is conducted to test the truth of this hypothesis

6. Writing a Primary Synopsis

- After formulating the problems a brief summary of it should be written down on the topic selected for research work mentioning the summary of what is going to be done under his research

7. Preparing the Research Design

- Research design is the conceptual structure or blue print within which research would be conducted. The function of research design is to provide for the collection of relevant information with minimal expenditure of effort, time and money. The preparation of research design, appropriate for a particular research problem, involves the consideration of the following :

Method of Data Collection to be adopted-There are two types of data

1) **Primary Data**— Data collected for the first time & original in nature

2) **Secondary Data**—those which have already been collected and analysed by someone else Source of secondary data are published source books, journals, records etc

- **Source of information**—Sample Design- A sample design is a definite plan determined before any data are actually collected for obtaining a sample from a given universe. Sample design refers to the technique or the procedure which the researcher would adopt in selecting some sampling/representing/ units from the universe for drawing inferences about the universe.

8. Collecting the Data

Instruments/tools/methods used for collecting data are

- (1) Observation method.**
- (2) Direct personal interview method.**
- (3) Telephone interview method.**
- (4) Questionnaire method.**
- (5) Schedule method.**

A choice of one of these methods

9. Processing, Analysis and Interpretation

of Data by Statistical Methods-

The processing of data consists of

- Classification and tabulation.-By classification and tabulation the unwieldy data can be condense into few manageable and purposeful groups and tables so that further analysis becomes simple.
- Coding -converts the data into symbols and small figures so that the data can be dealt with in an easy manner.
- Editing -improves the quality of the data since it is at this stage that data which is irrelevant can be dropped.
- Analysis and interpretation of data- results in observation, analysis, conclusion, induction and deduction. For this various statistical measures are computed like
 - ❖ Descriptive statistics,
 - ❖ correlation,
 - ❖ regression,
 - ❖ Ratios etc

10.

Testing of Hypothesis

- Depending upon the nature of data and conclusions to be arrived one or two of these tests can be applied like

- ❖ ANOVA,

- ❖ T-test,

- ❖ F-test,

- ❖ Chi Square test etc.

Testing of hypothesis will result in either accepting or rejecting the hypothesis. Testing of hypothesis will result in contribution to existing theory or the generation of a new theory

11. Preparation of the Report or

Presentation of Results/thesis

- A report is a detailed description of what has been done and how it has been done with respect to a particular area or topic. The report should contain the preliminary section, the main body and the end matter. The preliminary section contains only titles, data, acknowledgement foreword and table of contents. The important section of a report is its main body. It carries introduction, methodology, and statements of findings, conclusions and recommendations. The end matter includes appendix, literature selected and bibliography. The appendix includes letters, questions or other tools used. Bibliography is the list of books, journals. Reports, bulletins etc. used for reference.

RESEARCH DESIGN

- A research design is a “Blue Print” for collection, measurement and analysis of data. It outlines how the research will be carried out. It provides answers to various questions like - What techniques will be used to gather data. What kind of sampling will be used? How, time and cost, constraints be dealt with?Etc.

Essentials of Research Design

- The design should be an activity and time based plan
- It is always based on research question
- It guides the selection of sources and types of information
- It indicates a framework for specifying the relationship among the study's variables
- Outlines procedures for every research activity
- It must be appropriate, efficient and economical
- It should be flexible
- It must be adequate

Types of Research Design

“You cannot put the same shoe on every foot” –Syrus

Three traditional categories of research design:

- Exploratory
- Descriptive
- Experimental

The choice of the most appropriate design depends largely on the objectives of the research

Exploratory research

- Exploratory research is most commonly unstructured, “informal” research that is undertaken to gain background information about the general nature of the research problem. Exploratory research is usually conducted when the researcher does not know much about the problem and needs additional information or desires new or more recent information. Exploratory research is used in a number of situations:
 - To gain background information
 - To define terms
 - To clarify problems and hypotheses
 - To establish research priorities
- Methods- A variety of methods/categories are available to conduct exploratory research:
 - **Experience Surveys**- Issues and ideas may be discussed with persons who have had personal experience in the field
 - **Secondary Data Analysis**-background information is existing literature containing data that has been compiled
 - **Case Analysis**-obtains information from one or a few situations those are similar to the problem situation. Primary advantage is to investigate in depth and with meticulous attention to detail
 - **Projective techniques**; - An indirect means of questioning the respondents. Uses word association tests, sentence completion test, third person test, role playing technique etc

Descriptive research

- Descriptive research is undertaken to provide answers to questions of who, what, where, when, and how – but not why

Two basic classifications: Research design-

- **Cross-sectional studies-** measure units from a sample of the population at only one point in time. Samples are drawn in such a way as to be representative of a specific population
- **Longitudinal studies-** repeatedly draw sample units of a population over time. One method is to draw different units from the same sampling frame. Second method is to use a “panel” where the same people are asked to respond periodically

Experiments

- **An experiment is defined as manipulating (changing values/situations) one or more independent variables to see how the dependent variable(s) is/are affected, while also controlling the affects of additional extraneous variables.**
 - **Independent variables:** - that over which the researcher has control and wishes to manipulate i.e. package size, ad copy, price
 - **Dependent variables:** - that over which the researcher has little to no direct control, but has a strong interest in testing i.e. sales, profit, market share.
 - **Extraneous variables:** - those that may affect a dependent variable but are not independent variable
- Experimental Design** -An experimental design is a procedure for devising an experimental setting such that a change in the dependent variable may be solely attributed to a change in an independent variable.

BRM

UNIT-3

Module – 3

- **Data: Sources of data, methods, of collection; observation interviewing, mailing; tools for collection data; interview schedule, interview guide, questionnaire, rating scale, socio-metry, check list; pre- testing of tools, pilot study. Techniques of data collection & Processing of data; checking, editing, coding, transcription, tabulation, preparation of tables, graphical representation**

DATA-SOURCE OF DATA

- **Data:** data are facts, figures and other relevant materials past and present serving as basis for study and analysis
- **Methods of data:** There are two types of data
 - a. Primary data-** Primary data are those data which are collected for the first time and these are in original character. This data are also called first hand information
 - b. Secondary data-** Secondary data are those which have already been collected and used by some other persons. They are usually in the shape of finished products. They are called secondary information

Methods of Collecting Primary Data

- 1) Observation
- 2) Survey method
- 3) Interview
- 4) Experimentation
- 5) Simulation
- 6) Questionnaire- (i) Mail survey (ii) Schedule
- 7) Use of telephone
- 8) Panel method
- 9) Projective technique
- 10) Content analysis

1. Observation

- **Meaning:** Observation is the systematic viewing/watching of specific phenomenon or investigator's own direct observation of relevant people, actions and situations without asking from the respondent for gathering primary data for a particular study **Example:** Watching the life of street-children provides a detailed description of their social life

Features of observation & Component

of process of observation

- **Features of observation**
 - Physical & mental activity-direct contact with the environment.
 - Selective-Specific purpose of noting things relevant to the study
 - Purposive & not informal
 - Grasps the significant events & occurrences
 - Should be exact & based on standardized tools of research
- **Component of process of observation**
 - Sensation
 - Attention
 - Perception

Types of observation...

- 1) **Participant and non participant-Participant observation** : participation by the observers with the various types of operations of the group under study e.g. study of tribal customs by taking part in tribal activities like folk dance etc. But in the **non participant** type of observation, no participation of the observer in the activities of the group takes place and also there occurs no relationship between the researcher and the group. This method calls for skill in recording observations in an unnoticed manner.
- 2) **Direct and indirect- direct method**, sees/watch and record of an event personally by the observer when it takes place. **Indirect method** of observation involves studies of mechanical recording or the recording by some of the other means like photographic or electronic
- 3) **Subjective and objective- Subjective observation** the observation of the one's own immediate experience. **Objective observation** the type of activity or operation or things being observed. It is also called as the retrospection

Types of observation

- 4) **Casual and scientific-** *Casual observation*, observing the right thing at the right place and also at the right time by a matter of chance or by luck. *Scientific observation* involves the use of the tools of the measurement
- 5) **Structured and unstructured-** *Structured observation* works according to a plan. The operations that are to be observed and the various features that are to be recorded are decided well in advance. But in *unstructured observation*, observer has the freedom to note down what he or she feels is correct and relevant to the point of study
- 6) **Controlled and Non Controlled observation:** *Controlled observations* are the observations made under the influence of some of the external forces. It is carried in laboratory or in the field. *Non controlled observations* are made in the natural environment and no influence or guidance of any type of external force

Advantages& Limitations

- **Advantages of observation method**

- 1) observing the behaviour in a normal setting
- 2) Actual or habits of person are observed
- 3) Obtain information from those who are unable to effectively communicate in written or oral form
- 4) No better way to gather information than through observation
- 5) Most reliable method of data collection

- **Limitations**

- 1) Feelings, beliefs and attitudes that motivate buying behaviour and infrequent behaviour cannot be observed.
- 2) expensive method
- 3) Options and attitudes cannot be obtained by observation

2. Survey method (Scheduling)

- **Meaning**-Survey research also called field research, the investigator/interviewer gathering first hand information by using formal lists of questions asked of all respondents in the same way. This method is suited for gathering descriptive information.
- **Approaches**-
 - *Direct Approach*: The researcher asks direct questions about behaviours and thoughts. E.g. why don't you eat at MacDonald's?
 - *Indirect Approach*: The researcher might ask: "What kind of people eat at MacDonald's?"
- **Advantages**
 - collect many different kinds of information
 - Quick and low cost as compared to observation and experimental method
- **Limitations**
 - Respondent's reluctance to answer questions asked by unknown interviewers about things they consider private
 - Busy people may not want to take the time
 - unable to answer because they cannot remember

3. Interview...

- **Meaning-** interview is a two-way systematic conversation between an investigator and an informant, initiated for obtaining information relevant to a specific study. Interviewing requires face to face contact or over telephone.
- **Interview schedule-** is a tool in interviewing method. It contains a complete list of question on which, information is elicited from the respondents and it is filled out by the interviewer
- **Interview Guide-** this is used for non-directive and depth interviews. It does not contain complete list of items on which information has to be elicited from a respondent. It contains only the broad topics or areas to be covered in the interview.
- **Types of interviews**
 - 1) **Structured Interviews-** involve the use of a set of pre-determined questions and of highly standardized techniques of recording, interviewer follows a rigid procedure laid down asking questions in a form and order prescribed. (used in descriptive studies)
 - 2) **Unstructured interviews-** flexibility of approach to questioning-do not follows a system of pre-determined questions and standardized techniques of recording information the interviewer is allowed much greater freedom to ask, he may even change the sequence of questions. (used in exploratory studies)

3. Interview...

- 3) **Focused group Interview-** is a tool to understand people's thoughts, experience and feelings, about a product, service or organization. Comments are recorded through note taking or videotaped
- 4) **Clinical/Depth Interview** - it is concerned with broad underlying feelings, opinion, emotions or motivations or with the course of individual's life experience about a product, service or organization on the basis on interview guide.
- 5) **Direct interviews/Interview Schedule** –it is a set questionnaire, when the researchers asks the questions and records the respondent's reply on the interview schedule.
- 6) **Non-direct Interview-** Interviewer encourage the respondent to talk about the given topic with a base minimum of direct questioning for the purpose eliciting the respondents feeling and beliefs on the given topic.
- 7) **Telephone-** quick method of collecting information contacting respondents on telephone. In this process interviewer can explain questions not understood by the respondent.
- 8) **Personal Interviewing-** Personal interview can be used in any type of questionnaire and can be conducted fairly quickly. Interviewers can also show actual products, advertisements, packages and observe and record their reactions and behaviour

3. Interview...

- **Merits of interview method-**
 - a) More information can be obtained
 - b) Greater flexibility
 - c) Observation method can be applied
 - d) Group discussions may also be used
 - e) Supplementary information can collect
- **De-merits of interview method**
 - a) Very expensive
 - b) More time consuming
 - c) Basis of interviewer and interviewee

4. Experimental Method-

- Also called *Empirical Research* or *Cause and Effect Method*; it is a data-based research, coming up with conclusions which are capable of being verified with observation or experiment. Such research is characterised by the experimenter's control over the variables under study and the deliberate manipulation of one of them to study its effects. Researcher must provide *working hypothesis*. Then work to get enough facts (data) to prove or disprove the hypothesis.
- **Types-**
 - **Laboratory experiments-** is an investigation conducted in situation created specifically for that purpose
 - **Field experiments-**This is an experiment conducted in real life situation in which the experiments manipulate an independent variable in order to test a hypothesis

5. Simulation

- **Meaning-** It is a realistic enactment of roles in an imagined situation. *There are three uses;*
 - Assessment of a situation,
 - understanding a situation and
 - Decision making in a situation
- **Types of Simulation**
 - Computer simulation
 - Man simulation
 - Man computer simulation

6. Questionnaire

- Questionnaire is a document containing a list of questions presented to a respondent for answers.
- **Mail-** questionnaire sent by post to respondents with covering letter or note introduce you; explain the purpose of doing research and requesting to send filled questionnaire within in reasonable time to the researchers. The respondents read the questions, interpret what is expected and then write down the answers themselves.
- **Advantage**
 - It can be used to collect large amounts of information at a low cost
 - respondents may give more honest answers to questions
 - Convenient for respondent's who can answer when they have time

Characteristics of a good questionnaire/ guidelines

- There are no hard and fast rules, only guidelines can be provided in **developing a questionnaire**
 - Questions should be a simple and there should be no abbreviation
 - Maximum clarity should be maintained
 - Sequences of questions should be maintained
 - Questions should be an elegant appearance
 - It should attract the attention and generate interest of the informant.
 - The reliability and validity of the questions asked to be maintained
 - Question should contain polite, scope and coverage
 - Questions should be pre-testing

Precautions/ Question Wording- Do's

/Criteria/ Construct questionnaires

- Question should be Define the Issue-Who, What, When, Where, Why, and Way (The Six Ws). E. g. which brand of shampoo do you use? (Incorrect) Which brand or brands of shampoo have you personally used at home during the last month? (Correct)
 - Use Simple Ordinary Words
 - Use Unambiguous Words
 - Avoid Leading or Biasing Questions
 - Avoid Double-barreled Questions-includes two or more questions in one
 - Avoid Implicit Alternatives
 - Avoid Implicit Assumptions
 - Avoid Questions that are Based on Presumptions
 - Avoid Generalizations and Estimates
 - Avoid long questions.
 - Avoid very general questions
 - Avoid questions that include negatives
 - Avoiding Leading Question/ or Biasing Questions

Determining the Order of Questions

- Start with easy and interesting questions.
- General to specific questions (funnel sequence).
- Use filter questions (and prompts).
- Ask sensitive or potentially embarrassing questions at the end of the questionnaire
- Use alternative phrasings of the same question to yield more accurate total response.

Type of Questionnaire...

- 1) **Closed –ended Questionnaire:** Closed ended questions include all possible answers/prewritten response categories, and respondents are asked to choose among them. E.g. multiple choice questions, scale questions e. g. how many people use a service?
- 2) **Open-ended Questionnaire:** Open-ended questions allow respondents to answer in their own words. Questionnaire does not contain boxes to tick but leaves a blank section for the response to write in an answer e.g. what people think about a service
- 3) **Combination of both:** Begins with a series of closed –ended questions, with boxes to tick or scales to rank, and then finish with a section of open-ended questions or more detailed response.
- 4) **Dichotomous Questions-** It has only two response alternatives: E.g Yes or no, agree or disagree, and so on
- 5) **Contingency Question:** A survey question is intended for only some respondents determined by their responses to some other questions E.g. do you smoke cigarette?– Yes/ No If yes, how many cigarettes you smoke per day?

Type of Questionnaire

6) **Multiple-Choice Questions:** The researcher provides a choice of answers and respondents are asked to select one or more of the alternatives given. E.g Do you intend to go on an outstation holiday within the next six months? - Definitely will not go,

-Probably will not go

-Undecided,

-Probably will go,

- Definitely will go

-Other (please specify)

7) **Scales:** Do you intend to go on an outstation holiday within the next six months? E.g

Definitely
Will not go,

Probably
will not go

2

Undecided

3

Probably
will go

4

Definitely
will go1

5

Pilot Study & pre-test

- A **PILOT STUDY**: is the process of carrying out a **preliminary study**, going through the entire research procedure with a small sample before a large scale field study is termed as *pilot survey*
- A **PRE-TEST** : usually refers to a small-scale trial of particular research components. i.e. where a questionnaire is tested on a (statistically) small sample of respondents, in order to identify any problems such as unclear wording or the questionnaire taking too long to administer
- **Uses of Pilot Study**
 - To pre-test the suitability of questions
 - To generate fixed choice answers
 - To avoid unforeseen problems during the large survey
 - To provide experience and confidence to the interviewer

Difference between Questionnaires

and Schedules

Sl	Schedule	Questionnaire
1	A schedule is generally filled out by the research worker or the field worker	Questionnaires are sent by post to respondent, to answer as specified in the covering letter
2	Schedule is relatively more costly	Questionnaire is relatively cheap
3	schedule the response is better since the enumerators clear the doubts of the respondents and get the replies from the respondents at the spot itself	Response to the questionnaire is poor.
4	Time consumption is less	Time consumption is more
5	personal contact is established with the respondents	there is no direct personal contact
6	Schedules can be applied even if the respondents are not literate	Questionnaire can be used only if the respondents are literates

Collection of Secondary Data

Secondary data are those which have already been collected and used by some other persons. They are usually in the shape of finished products. They are called secondary information

- **Advantages of Secondary data**

- **Less cost:** The information can be collected by incurring least cost.
- **Less time consuming:** The time requires for obtaining the information is very less
- **Large quantity of information:** Most of the secondary data are those published by big institutions. So they contain large quantity of information

- **Disadvantages of Secondary data-**

- Since the secondary data is a result of some other person's attempt, it need not be suitable for a researcher, who makes use of it
- It may be inaccurate and unreliable.
- It may contain certain errors.

Precautions to be taken before Using Secondary Data & Sources of Secondary Data

Precautions

- **Suitability:** - The investigator should satisfy him that the data available are suitable for the enquiry on hand.
- **Adequacy:** - the adequacy of the data should be tested by studying the items covered by the original enquiry and the items to be covered by the enquiry.
- **Reliability:-** The reliability of secondary data should be tested

Sources of Secondary Data-There are varieties of published sources from which one can get information for his research work. The important such sources are;

- Official report of the central, state and local government.
- Official publications of the foreign governments and international bodies like UNO and its subordinate bodies.
- Reports and publications of Trade Associations, Banks, Cooperative Societies and Similar Semi Government and Autonomous Organizations.
- Technical journals, News papers, Books, Periodicals, etc
- Publications of research Organizations, Centers, Institutes, and reports submitted by Economists, Research scholars etc.

Difference between Primary data and Secondary data

Sl.	Primary data	Secondary Data
1	Primary data is Original in character	Secondary data is not original
2	Collection of data is expensive	Collection of secondary data is less expensive
3	Primary data is in the shape of raw materials	Secondary data is the shape of finished products
4	Primary data is adequate and suitable	Secondary data need not be ample and apposite
5	It is original collected by the investigator	It is available in available sources

Choice between Primary and

Secondary Method

- The following factors are to be considered while choosing between primary and secondary methods.
 - Nature and scope of enquiry
 - Availability of time and money
 - Degree of accuracy desired.
 - Status of the investigator

Case Study

- Case study is a method of exploring and analyzing the life of a social unit. The social unit may be a person or a family or an institution or an organization or even a community. It is a method of collecting information and its analysis. It is a way of organizing social data so as to preserve the unitary character of the social object, being studied.

- **Sources of Case Study**

The sources from which information are collected in a case study are;

- 1) **Personal documents**-They contain the description of the remarkable events of the life of the narrator as well as his reactions towards them. Therefore from these personal documents, one can study the writer's personality, social relationship and philosophy of life.
- 2) **Life history**-Through interviews with a respondent, his life history can be known. This is an objective study in which various events of respondent's life are studied with an attempt to find their significance for the society

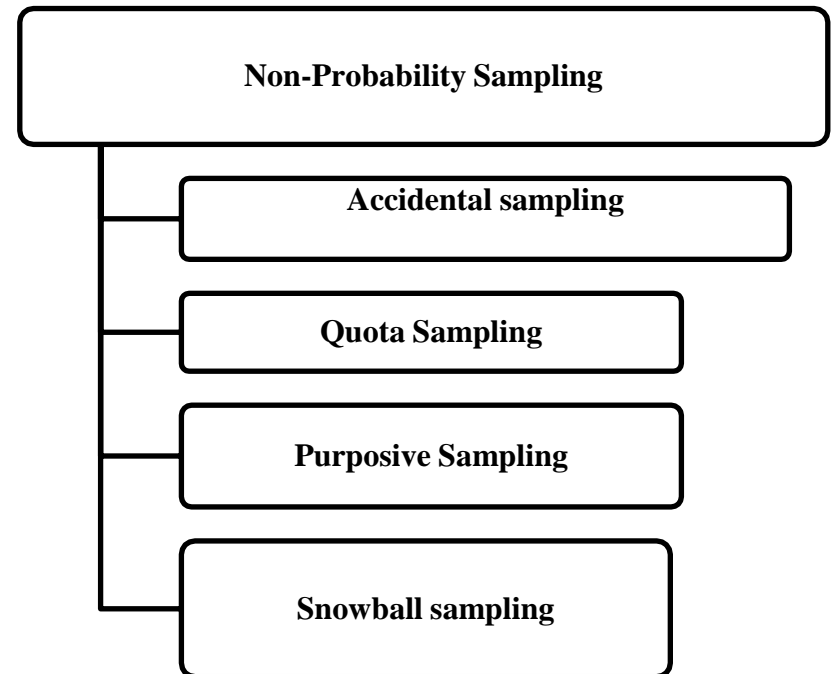
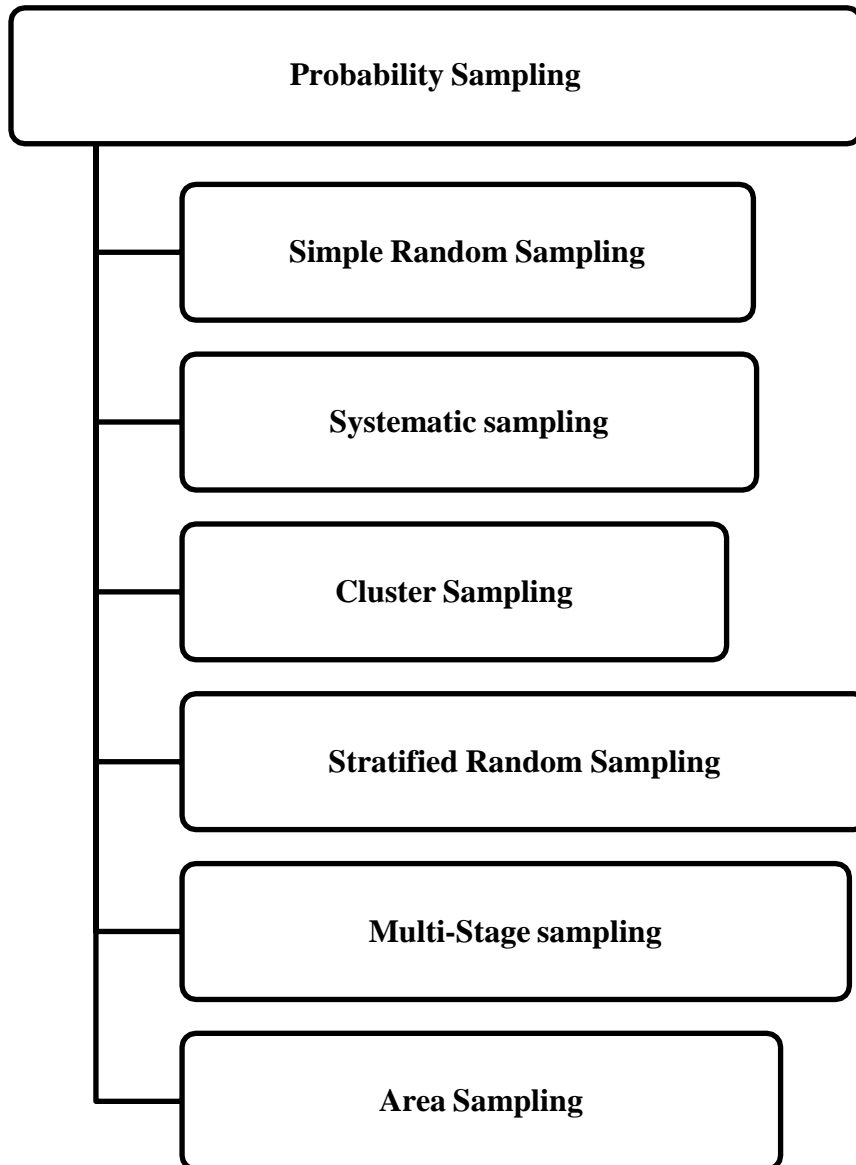
Phases of Case Study

- The researcher has to select the problem had to study the problem.
- The researcher ha to describe the course of events.
- Materials about each of the units or aspects are collected.
- There are certain factors which are responsible for every event. They must be identified and studied.
- The role of the factors responsible for the events is analyzed and conclusions are drawn about the effect ofthe factors.

TECHNIQUE FOR COLLECTION OF DATA

- **Census:** Data collected from each and every unit of population is called census method
- **Sampling-** A few units in the universe or a segment of the population selected to represent the population as a whole. i.e. instead of studying each and every unit of population only a few (part) unit of population (universe) are studied and conclusion is drawn for entire population is called sampling. Two advantages of sampling are that the cost is lower and data collection is faster.
- **A Sample design** -is a definite plan for obtaining a sample from a given population
- **Sample Unit-**Unit in relation to which data are collected. E.g. (a) Geographical- state, district, village etc. (b) Construction unit- House, flat etc (c) Social unit- family, club, school or individual.
- **Sample size-** the number of items to be selected from the universe to constitute a sample. It is denoted by (n)

Methods of sampling/Type of Sampling..



1. Probability Sampling...

- A probability sampling is one in which every unit in the population has a chance of being selected in the sample.
- Types of probability sampling
 - 1) **Simple random sample**- Every member of the population has a known and equal chance of being selected. This sample technique gives each element an equal and independent chance or probability of selection. For example in a population of 25 students in a college under master of commerce studies each student has $1/25^{\text{th}}$ chance of being selected. This method can be used for populations of any size with homogenous character. Three methods can be used to draw sample in this approach-
 - a) **lottery method,**
 - b) **use of random table number and**
 - c) **Computers.**

2) Systematic Sampling/Fixed interval sampling

2) **Systematic Sampling/Fixed interval sampling**-The entire list of items of the population are given serial numbers. Thereafter the sample items are selected with equal intervals, then the first unit of a sample is selected randomly and the remaining units at the fixed interval (K^{th} element) in a given series. In this case, $k = (\text{population size}/\text{sample size})$. For example in a population of 25 students in a college under master of commerce studies. The management is going to select 5 students out of 25 then the **process is**

- **Starting number:** Select the starting number randomly for this purpose researcher can use lottery method taking 1-3 number ($k = \text{population size}/\text{sample size}$ $25/5=5$ is the k^{th} number)
- **Interval:** The researcher picks second number taking interval of k^{th} ($k=5$) which will serve as the constant difference between any two consecutive numbers in the progression till the sample size.
- **Selection of Sample-** first sample number selected randomly by using lottery method is 3 the second sample is $(3+k^{th}$ i.e. $3+5=8$) then and so on. E.g.sample is 3, 8, 13, 18 and so on till sample size of 5 students

3) Cluster Sampling

- 3) **Cluster Sampling**-is a sampling technique where the entire population is divided into groups, or clusters, and a random sample of these clusters are selected. All observations in the selected clusters are included in the sample. The most common cluster used in research is a geographical cluster. (E.g. household, income levels, etc) .For example, a researcher wants to survey academic performance of high school students in Ramanagaram district. The process is
- **Divide in to groups/cluster**-First the Research can divide the entire population (high schools of Ramanagaram) into different clusters (taluk).
 - **Select cluster**-Then the researcher selects a number of clusters (taluk) through simple or systematic random sampling.
 - **Selected cluster include all the element**-Then, from the selected clusters (randomly selected Taluk) the researcher can either include all the high school students as subjects or he can select a number of subjects from each cluster through simple or systematic random sampling

4) Stratified Random Sampling

4) **Stratified Random Sampling**- The researcher divides the entire heterogeneous population into different non- overlapping homogeneous subgroups or strata, and sample items are selected from each stratum (group) randomly, all the units drawn from each stratum is called sample size. The most common strata used in stratified random sampling are age, gender, socioeconomic status, religion, nationality and educational attainment. The **process is**

- divide members of the population into homogeneous subgroups (stratum)
- The strata should be mutually exclusive (i.e. every element in the population must be assigned to only one stratum)
- Then simple or systematic sampling is applied within each stratum
- The units drawn from each stratum is called sample size.

Types of stratified sampling

a) Proportionate stratified sampling-the sample are drawn from each stratum in the same proportion as they occur in the universe.

Example; 50 pupils in a school of a 1000 pupils were asked to select

Sample size for each Strata = $\frac{\text{size of whole sample}}{\text{size of population}} \times \text{size of Strata}$

Years	Number of pupils	Solution: The proportion of pupils from each of the other year groups would be as follows	
17	180	17	$\frac{50}{1000} \times 180 = 9$
18	200	18	$\frac{50}{1000} \times 200 = 10$
19	240	19	$\frac{50}{1000} \times 240 = 12$
20	220	20	$\frac{50}{1000} \times 220 = 11$
21	160	21	$\frac{50}{1000} \times 160 = \underline{8}$
	N=1000		50

b) Disproportionate Stratified Sampling- the number of elements drawn from the various strata is independent of the size of strata, is called disproportionate stratified sampling

5) Multi-Stage sampling

- **Multi-Stage sampling**-Using all the sample elements in all the selected clusters may be expensive or unnecessary. Under these circumstances, multistage cluster/stage sampling becomes useful. Instead of using all the elements contained in the selected clusters, the researcher randomly selects elements from each cluster. **The process** is
 - Constructing the clusters is the first stage.
 - Deciding what elements within the cluster to use is the second stage.
- ✓ The technique is used frequently when a complete list of all members of the population does not exist and is inappropriate

6) Area Sampling/ geographical cluster

sampling

- **Area Sampling/ geographical cluster sampling**-A method in which the area to be sampled is subdivided into smaller blocks which are selected at random and then sub- sampled or fully surveyed; method is used when a complete frame of reference is not available

2. Non-probability sampling

- 1) **Accidental sampling**-It is known as grab or convenience sampling or opportunity sampling. the sample being drawn from that part of the population that is close to hand. That is, sample populations selected because it is readily available and convenient, as researchers are drawing on relationships or networks to which they have easy access.

2) Quota Sampling

- **Quota Sampling** –Quota sampling is a non-probability sampling technique wherein the assembled sample has the same proportions of individuals as the entire population with respect to known characteristics, traits or focused phenomenon. **The process is**
 - Population is first segmented into mutually exclusive sub- groups,
 - Then judgment is used to select the subjects or units from each segment based on a specified proportion.
- For example, an interviewer may be told to sample 200 females and 300 males between the age of 25 and 40.
- The sample is representative of the entire population. It also allows the researcher to study traits and characteristics that are noted for each subgroup.

3) Purposive Sampling/Judgmental

sampling

- **Purposive Sampling/Judgmental sampling**- the researcher chooses the sample based on who they think would be appropriate for the study. This is used primarily when there is a limited number of people that have expertise in the area being researched.

4) Snowball sampling

- **Snowball sampling**- it is also known as chain sampling, chain-referral sampling, referral sampling. It is used by researchers to identify potential subjects in studies where subjects are hard to locate. After observing the initial subject, the researcher asks for assistance from the subject to help identify people with a similar trait of interest. The sample group appears to grow like a rolling snowball. For example a researcher is studying environmental engineers but can only find five. The researcher asks these engineers if they know any more. They give several further referrals, which in turn provide additional contacts. In this way, researcher manages to contact sufficient engineers.

Attitude measurement techniques

- **Attitude measurement techniques-** the qualitative variable/information like knowledge, performance, character (feelings, attitude, opinions) etc. must be converted into numerical form for further analysis. This is possible through measurement and scale techniques.
- **Measurement:** - the process of observing and recording the observations that are collected as part of research. The recording of observations may be in the form of numbers or symbols are called measurement.
- **Scaling:** - is the assignment of objects to numbers according to rule. In scaling the objects are text statements, usually statement of attitude, opinion or feeling

Scale Classification- Level of Measurement

- **Nominal scales**- Numbers or letters assigned to objects which serve as labels for identification or classification. They are Scales “in name only” for e.g. labelling men as 1 and women as 2.
- **Ordinal scales**-Arranges objects or alternatives according to their magnitude in an ordered relationship i.e. Ranking. E.g. rating career opportunities as excellent,good, average poor or very poor.
- **Interval scales**-An interval scale has all the characteristics of an ordinal scale. In addition, it uses a unit of measurement with an arbitrary starting and terminating points. For example, Celsius scale: 0°C to 100°C Attitudinal scales: 10-20, 21-30 31-40 etc.
- **Ratio scale**-A ratio scale has all the properties of nominal, ordinal and interval scales plus its own property: the zero point of a ratio scale is fixed, which means it has a fixed starting point. Since the difference between intervals is always measured from a zero point. The measurement of variables like income, age, time, height and weight are examples of this scale. A person who is 40 year old is twice as old as one who is 20 year old
- **Lickert Scale**- Respondents indicate their attitude by checking how strongly they agree or disagree with carefully constructed statements that range from the very positive to the very negative towards the attitudinal object. Individuals generally choose from five alternatives: strongly agree (SA), agree (A), Neutral (N), disagree(DA) and strongly disagree (SDA)

E.g. Without Govt. regulation the firms would exploit the customers

SA A N DA SDA

SOCIO-METRY

- A technique for analyzing/quantitative measuring the pattern of relationships among group members- especially hierarchies, friendship networks and cliques . It enable the researcher to get a comprehensive picture structure of social relationship.
 - Sociometric test-
 - This is a test under which each member in the group with whom he/she would like to or would not like to engage in some activity that is relevant to the life of the group. for eg. Depending on the character of the group, the members may be asked to indicate whom (from among the other members of the group) he/she would like to be associated or not like to be associated with, in play, studies, problem-solving, dinner, lending and borrowing, etc
 - What type of interactions among members become the focus of the researcher's attention depends, besides his objectives, on the nature and functions of the group. Generally, sociometric studies employ observation, questionnaires and interview schedules

Check list

- Checklists are the documents/planned list used to verify that a number of specific lines of inquiry, steps, methods, tools and technique to be followed or actions are being taken, or have been taken etc, by a researcher during the course of research. It helps the researcher to ensure consistency and completeness in carrying out a research work

DATA PROCESSIING

- **DATA PROCESSIING**-Processing data involves a number of closely related operations which are performed with the purpose of summarizing the collected data and organizing these in a manner that they answer the research questions (objectives)
- **Processing stages/operations**-There are four importantstages in the processing of data. They are;
 - Editing
 - Coding
 - Classification
 - Tabulation

Editing

- **Editing**- a process of examining the collected raw data to detect errors and omissions and to correct these when possible
- **Practical guidelines for editing**- While editing care has to be taken to see that the data are as accurate and complete as possible. The following points are to be noted;
 - The editor should familiarize with the copy of instructions given to the interviewers.
 - The original entry, if found incorrect, should not be destroyed or erased. On the other hand it should be crossed out in such a manner that it is still eligible
 - Any, modification to the original entry by the editor must be specifically indicated
 - All completed schedules must bear signature of the editor and the date
 - Incorrect answer to the questions can be corrected only if the editor is absolutely sure of the answer, otherwise leave it as such.
 - Inconsistent, incomplete or missing answers should not be used.
- Sure that all numerical answers are converted to same units

Coding & Classification

- **Coding-** This process of assigning numerals or symbols to the responses is called coding; It facilitates efficient analysis of the collected data and helps in reducing several replies to a small number of classes.
- **Classification-** a process of arranging data in groups or classes on the basis of common characteristics depending on the nature of phenomenon involved

– Types of classification

A. Classification according to external characteristics- this classification, data may be classified either on geographical basis or periodical basis

➤ **Classifications on geographical basis-** In this type of classification, the data that are collected from different places are placed in different classes.

E. g District Sales (Rs in lakhs)

- Bangalore 400
- Tumkur 250
- Mysore 200 etc

➤ **Classification on periodical basis (chronological classification)-** In this type of classification, the data belonging to a particular time or period are put under one class. This type of classification is based on period. E.g

 year Sales (Rs In lakhs)

- 2016 500
- 2017 400
- 2018 300

B. Classification according to internal

characteristics

- **Classification according to internal characteristics**-Data may be classified either according to attributes or according to the magnitude of variables
- **Classification according to Attributes**-In this type data are classified on the basis of common characteristic. E.g descriptive such as literacy, sex, religion etc. or numerical such as weight, height, income etc
- **Simple Classification**-If the classification is based on one particular attribute only it is called simple classification. Eg; classification on the basis of sex- Eg population



Male female

- **Manifold Classification**-If the classification is based on more than one or

several attribute it is called manifold or multiple classifications, in this data are classified in several groups. E.g



Literate illiterate Lit illt. Lit. illit. Lit.

illiterate

Classification According Variables

- **Classification according variables-** Here the data are classified to some characteristics that can be measured. Data are classified on the basis of quantitative characteristics such as age, height; weight etc.
- quantitative variables are grouped in to two
 - a) Discrete variable- the variables can take only exact value, it is called discrete variable. E.g 20, 25, 30, 35, 40, 45, 50
 - b) Continuous variables-the variables that can take any numerical value within a specified range are called continuous variable. E.g 10-20, 20-30

Characteristics of an ideal

classification

- **Characteristics of an ideal classification**
 - Unambiguity- Classification should be unambiguous. The various classes should be defined properly.
 - Stable- it should not change from enquiry to enquiry
 - Flexibility- classification should have the capacity of adjustment to new situations and circumstances.
 - Homogeneity- each class should contain homogenous items.
 - Suitability- it should be suitable to objects of any statistical enquiry.
 - Exhaustiveness- there should be no item which does not find a class

Tabulation

- **Tabulation**-It is an orderly arrangement of data in rows and columns. It is defined as the “Measurement of data in columns and rows. It is a stage between classification of data and final analysis
- **Objectives of Tabulation**
 - To clarify the purpose of enquiry
 - To make the significance of data clear
 - To express the data in least possible space
 - To enable comparative study
 - To eliminate unnecessary data
 - To help in further analysis of the data
- Tabulation may also be classified as simple and complex tabulation.
- **Simple tabulation** :generally results in one-way tables which supply answers to questions about one characteristic of data only.
- **Complex tabulation**: usually results on two-way tables (which give information about two inter-related characteristics of data), three –way tables or still higher order tables, also known as manifold tables

Parts of a statistical table

- **Title of the table**
- **Caption or title of the column**-It is also termed as “boxhead”. There may be sub- captions under the main caption.
- **Stub (row heading)**-Stub refers to the title given to rows
- **Body (main data)**-This is the main body of information needed for the research work.
- **End note (foot note)**-This is placed below the table to convey the expansions of abbreviations to caption, stub or main body.
- **Source note**-If the table is based on outside information, it should be mentioned in the source note below

Common Descriptive Techniques

- **Common Descriptive Techniques**-The most common descriptive statistics used in research consist of percentages and frequency tables
- **Percentages**-Percentages are a popular method of displaying distribution. Percentages are the most powerful in making comparisons. In percentages, we simplify the data by reducing all numbers in a range of 10 to 100.
- **Frequency Tables**-One of the most common ways to describe a single variable is with a frequency distribution. Frequency distribution can be depicted in two ways, as table or as a graph. If the frequency distribution is depicted in the form of a table, we call it frequency table. If the frequency distribution is depicted in the form of a graph like histogram, cumulative (ogive) etc, we call it frequency graph.
- **Contingency Tables**-A Contingency table shows the relationship between two variables in tabular form. The term Contingency table was first used by the statistician Karl Pearson in 1904. Contingency tables are especially used in Chi-square test.

Graphs and Diagrams

- **Graphs and Diagrams-** is one of the methods presenting data in which simplifies the complexity of quantitative data and make them easily intelligible.
- **Uses of Graphs and Diagrams**
 - They help in presenting quantitative facts in simple, clear and effective pictures.
 - They make the whole data readily intelligible.
 - They can be used for comparison purpose.
 - They are useful in analyzing complex economic theories.
 - They save much time in understanding data.
 - Facts can be understood without doing mathematical calculations.
 - They help in locating statistical measures such as median, Quartile, mode etc

Types of Graphs

- **Types of Graphs-** The following graphs are commonly used to represent data
 - Charts or line graphs
 - Bar charts
 - Circle charts or pie diagram
 - Pictograms

BRM

Module – 4

- **Analysis of data; Simple statistical techniques and their uses. Testing of Hypothesis, Research Applications – market survey. Report – Writing: Planning report writing work-target audience, type of report, style of writing synoptically outline of chapters; steps in drafting the report**

Analysis of data

- Mean's critical examination of the data for studying the characteristics of the object under study and for determining the patterns of relationship among the variables relating to it's using both quantitative and qualitative methods. Data can be analysed either manually or with the help of a computer
- **Manual Data Analysis:** This can be done if the number of respondents is reasonably small, and there are not many variables to analyse
- **Data Analysis Using a Computer:-**If you want to analyse data using computer, you should be familiar with the appropriate program. In this area, knowledge of computer and statistics plays an important role. The most common software is SPSS for windows

Steps in Analysis

- **Different** steps in research analysis consist of the following.
 - **Construction of statistical distribution**-The first step involves construction of statistical distributions and calculation of simple measures like averages, percentages, etc.
 - **Compare two or more distribution**-The second step is to compare two or more distributions or two or more subgroups within a distribution.
 - **Study the nature of relationship of variable**-Third step is to study the nature of relationships among variables.
 - **Find the factor affect the variable**-Next step is to find out the factors which affect the relationship between a set of variables
 - **Inferences**-Testing the validity of inferences drawn from sample survey by using parametric tests of significance

Types of Analysis---

- Statistical analysis may broadly classified as descriptive analysis and inferential analysis
 - a) **Descriptive Analysis-** quantitatively describing the main features of a collection of data. They provide simple summaries about the sample and the measures. In descriptive analysis there are-
 - 1) **Univariate analysis:** Describing the distribution of a single variable by using statistical method /tools e.g. Central tendency (mean, median, and mode) dispersion (range and quartiles, standard deviation and skewness and kurtosis). Characteristics of a variable's distribution may also be depicted in graphical or tabular format, histograms
 - 2) **Bivariate analysis-**the analysis of two variables (often denoted as X , Y), for the purpose of determining the empirical relationship between them. E.g. ratios, percentage table or a scatter plot graph and simple correlation coefficient.
 - 3) **Multivariate analysis-** involves observation and analysis of more than one statistical outcome variable at a time. I.e. Multiple relations between multiple variables are examined simultaneously

Types of Analysis

- b) Inferential analysis**-is concerned with making predictions or inferences or judgement about a population from observations and analyses of a sample. That is, we can take the results of an analysis using a sample and can generalize it to the larger population that the sample represents. There are two areas of statistical inferences
- i. Statistical estimation and
 - ii. Testing of hypothesis.

Testing of Hypothesis

- A **Statistical hypothesis** is an assumption about a population parameter. This assumption may or may not be true. A parameter is a measurable characteristic of a population, such as a mean or a standard deviation.
- **Hypothesis testing** refers to the formal procedures used by statisticians to accept or reject statistical hypotheses. The best way to determine whether a statistical hypothesis is true would be to examine the entire population. Since that is often impractical, researchers typically examine a random sample from the population. If sample data are not consistent with the statistical hypothesis, the hypothesis is rejected.

Testing of Hypothesis procedure...

- **Hypothesis testing**- consists of *five* steps.
 - 1) **State the hypotheses.**- The hypotheses are stated in such a way that they are mutually exclusive. That is, if one is true, the other must be false. There are *two types* of statistical **hypotheses**.
 - a) **Null hypothesis.**- Statement about the value of a population parameter. The null hypothesis, denoted by H_0 ,
 - b) **Alternative hypothesis**- if the evidence proves null hypothesis to be false. Then the alternative hypothesis is accepted and null hypothesis is rejected. The alternative hypothesis, denoted by H_1 or H_a ,
 - 2) **Formulate an analysis plan to find the value of the test statistic** (mean score, proportion, t statistic, z-score, etc.) - The analysis plan describes how to use sample data to evaluate the null hypothesis.
 - a) **When testing a hypothesis of a proportion** , we use z-statistic or z-test

Testing of Hypothesis procedure...

- b) **When testing a hypothesis of a mean**, we use the **z-statistic** or we use the **t-statistic** according to the following conditions.
- i. If the population **standard deviation, (σ) is known** and either the data is normally distributed or the sample size $n > 30$, we use the normal distribution (z-statistic).
 - ii. When the population **standard deviation, (σ) is unknown** and either the data is normally distributed or the sample size is greater than 30 ($n > 30$), we use the t-distribution (t-statistic).
 - iii. the level of significance is as follows: (a) the 0.10 level for political polling, (b) the 0.05 level for consumer research projects, and (c) the 0.01 level for quality assurance work

Testing of Hypothesis procedure...

- 3) **Decision rule**-statisticians describe decision rules in **two ways** - with reference to P-value or with reference to a region of acceptance.
- a) **P-value.** The strength of evidence in support of a null hypothesis is measured by the **P-value**. Suppose the test statistic is equal to S . The P-value is the probability of observing a test statistic as extreme as S , assuming the null hypothesis is true. If the P-value is less than the significance level, we reject the null hypothesis.
 - b) **Region of acceptance.** The **region of acceptance** is a range of values. If the test statistic falls within the region of acceptance, the null hypothesis is not rejected. The region of acceptance is defined so that the chance of making a Type I error is equal to the significance level. The set of values outside the region of acceptance is called the **region of rejection**. If the test statistic falls within the region of rejection, the null hypothesis is rejected. In such cases, we say that the hypothesis has been rejected at the α level of significance.
- Some statistics texts use the P-value approach; others use the region of acceptance approach.

Testing of Hypothesis procedure...

- **One-Tailed and Two-Tailed**

- a) one-tailed test- Tests-**A test of a statistical hypothesis, where the region of rejection is on only one side of the sampling distribution is called a one tailed test. For example, suppose the null hypothesis states that the mean is less than or equal to 10. The alternative hypothesis would be that the mean is greater than 10. The region of rejection would consist of a range of numbers located on the right side of sampling distribution; that is, a set of numbers greater than 10.
- b) two-tailed test-** A test of a statistical hypothesis, where the region of rejection is on both sides of the sampling distribution, is called a **two-tailed test**. For example, suppose the null hypothesis states that the mean is equal to 10. The alternative hypothesis would be that the mean is less than 10 or greater than 10. The region of rejection would consist of a range of numbers located on both sides of sampling distribution; that is, the region of rejection would consist partly of numbers that were less than 10 and partly of numbers that were greater than 10.

Testing of Hypothesis procedure...

- 4) **Make Decision** -The decision rules state the conditions under which the null hypothesis will be accepted or rejected. The critical value for the test-statistic is determined by the level of significance. The critical value is the value that divides the non-reject region from the reject region.
 - *Two types of errors can result from a hypothesis test.*
 - a) **Type I error.** A Type I error occurs when the researcher rejects a null hypothesis when it is true. The probability of committing a Type I error is called the **significance level**. This probability is also called **alpha**, and is often denoted by α .
 - b) **Type II error.** A Type II error occurs when the researcher fails to reject a null hypothesis that is false. The probability of committing a Type II error is called **Beta**, and is often denoted by β . The probability of *not* committing a Type II error is called the **Power** of the test.
- 5) **Interpret the decision**-Compare the computed test statistic with critical value. If the computed value is within the rejection region(s), we reject the null hypothesis; otherwise, we do not reject the null hypothesis

Report – Writing,

- **Meaning:** A research report is the formal statement of the research process and its results. It is the end product of a research activity, it narrates the problems studied, methods used for studying and the findings and conclusions of the study. The purpose of research report is to inform the world what you have done, what you have discovered and what conclusions you have drawn from your findings. The report should be written in an academic style. Language should be formal and not journalistic
- **Characteristics of the Report:**
 - Research report is a narrative but not authoritative document
 - It is non-persuasive as form of communication
 - It is simple readable and accurate form of communication

Types of Reports...

- a) **Technical Report-** is used in industry to communicate technical information. These reports help businesses make decisions, for example, in selecting and purchasing equipment, or finding solutions to technical problems. Engineering and applied sciences subjects often set assignment tasks that require technical report writing. E.g. solve a design problem; investigate and evaluate the solutions to an environmental problem; develop a program or an information management plan for a specific issue or company

- b) **Business reports-** are practical learning tasks where you apply the theories you have been studying to real world (or realistic) situations. Reporting financial information, marketing and management strategies and issues to others is an important component of business studies

Types of Reports...

- c) **Abstract or Executive Summary** - An abstract is a brief summary of a research article, thesis review, conference proceeding. The whole traditional report divisions: objective, method, discussion, conclusions in a concise paragraph of about 200-300 words. It emphasizes the objective and the analysis of the results in a precise and specific summary. It is submitted before submitting full article or thesis.
- d) **Interim report**- In research, the research timing is long; an interim report is often compiled to analyze how the research work is proceeding, before its final completion.
- e) **Research article**- this is designed for publication in a professional journal. A research article must be clearly written in concise and lucid language. It must be logically organized progressing from statement of problem and the purpose of the study, through analysis and evidence, to the conclusions and implications.

Qualities of a Good Report

- a) Clarity
- b) Continuity
- c) Consistency
- d) Readability
- e) Interest and Appeal
- f) Judicious Selection of Materials
- g) Avoiding personal opinion
- h) Concentrate on Central Ideas
- i) Proper Reference

Planning/Steps in Report Writing

1. **Plan the project in advance**; fix the target and final date of completing the report
2. **The time of report** writing should be planned in advance.
3. **Arrange the data**, documents, bibliography etc. in conformity with the structure of the report.
4. **The outline** should be based on all main points and sub points.
5. **Prepare a rough report** of what one has done in his studies. He has to write down the procedure adopted by him in collecting the material, the technique or analysis adopted by him, the broad findings and generalizations and his suggestions.
6. **Revising the rough report**-Keep the rough report for few days for careful reading and then revising it on the basis of thinking and discussing with others. It is an appropriate to get help of some experienced and knowledgeable person at this stage.
7. **Rewrite the report** on the basis of the revision made and corrections effected on the report.
8. **Prepare final bibliography**. Bibliography may contain two parts, first containing name of the books and pamphlets, second containing the names of magazines/ journals and newspaper articles and web link
9. **Last step is writing of a final draft of the report**. The final draft should be written in a concise and objective style and in simple language

Style/Parts/Components Of A Research Report..

- 1) Prefatory Items
- 2) Chapter Part
- 3) Bibliography-Reference of books or Journals etc
- 4) Appendices-questionnaires, working papers, Co. B/ sheet

1) **Prefatory Items**

- Title Page
- Researcher's Declaration
- Certificate of the Research/Supervisor's Guide
- College Certificate
- Acknowledgements
- Contents
- List of Abbreviations
- List of Tables
- List of Figures/Charts
- List of Appendices/Appendixes

Style/Parts/Components Of A Research Report..

2) Chapter Part

- **Chapter- 1** Introduction- explanation about the topic selected
- **Chapter-2 Research design**
 - a) Statement of the Research Problem
 - b) Significance of the Study
 - c) Review of Previous Studies/Literature
 - d) Scope and Area of the Study/Research gap
 - e) Objectives of the Study
 - f) Hypotheses to be tested
 - g) Operational Definitions of Concepts
 - h) Methodology and Data Base**
 - » Type of research/Method of Study E.g. Descriptive, Analytical
 - » Sources of data- Primary Data and Secondary data
 - » **Tools/instruments for Data Collection-**
 - Interview Schedule
 - Questionnaire-mail
 - Observation

Style/Parts/Components Of A Research Report..

- i) Technique used for data collection- Sampling or census
 - Specify the sampling method e.g. Random sampling
 - Determine the sample size
 - Select the final sample
- j) Method adopted for the analysis of the Data-descriptive or inferential
 - Tools for the analysis- Mathematical and Statistical
- k) Time Frame and Resource Requirements
- l) Period of Reference/study
- m) Limitations of the Study
- n) Chapter Scheme of Presentation of the Study

Style/Parts/Components Of A Research Report..

- **Chapter -3** Company /Respondent /product profile
 - Details of the company which you are studying including product
 - In case of free launcher project- data collected from respondent-then details about respondent profile
- **Chapter -4** Analysis and interpretation/Results of The Work/Discussion
 - chapters based on the objectives of the Study
 - Use of Tables/Graphs/Diagrams for effective representation - Title, Source etc
 - Presentation style – Simple & Lucid Style with the help of application Mathematical & Statistical Tools.
 - Testing of Hypotheses
- **Chapter-5** Findings and Conclusion- End Items/Terminal Items
 - Summary of Findings- numbering each of the finding
 - Conclusions- should be given so as to justify the objectives of the study.
- **Chapter-6** Recommendations/Suggestions
 - Recommendation/Model developed for improvement of operation-specific recommendations/suggestions to each of the objectives of the study. These recommendations should be specific, acceptable/practical and clear
 - Scope for further studies