

Unit I: Introduction to Research and Project Work

1. Meaning and Definition of Research

Research means to search or study about a phenomenon. The word research is composed by 're' and 'search' where "re" means repeatedly or "again and again", and search means to investigate or find. Generally, research is an effort to search new fact, knowledge, principle and scientific manner. The research is the process of obtaining the answers to the questions: What, Why, when, how, where and who.

Research in Common manner of speaking refers to Search of Knowledge. Research is the one of the ways to find answers to your questions. One can also define research as scientific and systematic search for pertinent information in a specific topic. In fact research is an art of scientific investigation. In short, the search of knowledge through objective and systematic method of finding solution to a problem is research. The systematic approach concerning generalization and the formulation of theory is also research

1.1 Some definitions of research:

The Advanced learner dictionary defines research as "a careful investigation or inquiry especially through search of new facts in any branch of knowledge."

According to Kerlinger: Research is a systematic, controlled, empirical and critical investigation of hypothetical proposition about the presumed relations among natural phenomena

According to C.R. Kothari: Research refers to the systematic method consisting of enunciating the problem, formulating hypothesis, collecting the facts or data, analyzing the facts and reaching certain conclusions either in the form of solutions towards the concerned problem or in certain generalization for some theoretical formulation.

According to Sekaran: Research is an organized, systematic, data based, critical, scientific inquiry or investigation into a specific problem, undertaken with the objective of finding answers or solution to it.

According to M.L. Singh: Research is a systematic, careful inquiry or investigation done to discover new relationships and to expand, verify existing knowledge for some specific purpose. The specific purpose may be academic(i.e. a problem of theory) or applied(i.e. problem or practice) or both.

Thus research is

- Involves gathering data from primary or firsthand sources or using existing data for a new purpose
- Is based upon observable experiences or empirical evidences
- Demands accurate observation and description
- Is directed towards solution of the problem
- Involves the quest for answers to unsolved problems.

In nutshell, Research is systematic investigation of any topic, subject or area, requiring solutions to a problem or creation of new knowledge by gathering, recording, analyzing and interpreting data in organized manner. The process of searching again and again to come closer and closer to the truth is known as research.

2 Nature and Purpose of Research

The purpose of research is to discover answers to questions through the application of scientific procedure. The main aim of research is to find out the truth which is hidden and which has not been discovered yet. Broadly Speaking, the nature and purpose of research can be outlined as following broad groups:

- I. To gain familiarity with the Phenomenon or to achieve new insights into it {studies with this purpose in view are termed as exploratory or formulate research studies}
- II. To highlight the Characteristics of a particular individual situation or a group [studies with this purpose in view are known as descriptive research studies]
- III. To provide explanation why and how there is relationship between two aspects or phenomenon (studies with this object in view are known as explanatory research studies)
- IV. To test a hypothesis of a causal relationship between variables (Such studies are known as hypothesis- testing research studies)

According to M.L. Singh the **Objectives of Researches** are out outlined as follows:

1. Researches are carried out for a number of good reasons. Some of the reasons are:
2. Generating new knowledge i.e., uncovering new facts or phenomenon or establishing new relationship of various variables.
3. Improving Understanding i.e., helping to explain situation or shed light on misunderstood phenomenon or concepts.
4. Application testing i.e., trying out concepts and approaches in the real world to see if they work.
5. Comparing best practices- that is gathering information about successful of subject in different circumstances and looking for explanation of their successes, and
6. Helping with decision making- that is generating information, concepts, framework and approaches that help executives or planners to make better and more effective decisions.

Types of Research

The basic types of research are as follows:

- I. **Applied vs. Fundamental:** Research can be either be applied (or action) research or fundamental (to be basic or pure) research. Applied research aims at finding a solution for an immediate problem facing an industrial/ business organization. The major purpose of applied research is to answer practical and useful question about policies, programs, projects, procedures or organizations. Applied research is concerned with the knowledge that has immediate applications; it is also called decisional research. The defining quality of applied research is that researcher attempts to conduct a study whose results can be applied directly to specific situation. for example , a research on the tapping the water from the surrounding hills of Kathmandu valley for water supply to growing population of Kathmandu valley is such type of research

II.

Difference between Basic and Applied Research:

Basis of	Fundamental Research	Applied Research
Objective	Expand knowledge processes business and management	Improve understanding of particular business or problems
Focus	Research is done on the interest and knowledge of the researcher	Focuses on the existing problem of the society and organization
Time Limit	Flexible time scales	Tight time scales
Generalization	Seeks generalization	Studies individual cases without objectives to generalize
Practical	Theories Cannot be used instantly in behavior	Finding are applicable instantly
Analysis	Requires mainly technical judgment	Requires also sense of what the situation and personalities bear.

Fundamental research is mainly concerned with the generalizations and with the formulations of the theory. Gathering Knowledge for knowledge sake's sake is termed as pure or basic or fundamental research. Fundamental research is undertaken to improve our understanding of certain problems that commonly occur in organizational setting, and how to solve them. The research works of professors,

scholars and other researchers devoted to generate new knowledge in particular areas of their interest can be called fundamental research. The purpose of fundamental research is not to apply the findings to solve an immediate problem at hand, but rather to generate more knowledge and understanding of the phenomena and problems that occur in several organizations, and to build theories based on the research results. The main purpose of conducting basic research is thus to advance the level of scientific knowledge.

2. Descriptive Vs. Analytical: Descriptive research is description of the state of affairs as it exists at present. In business research often we use *Ex post facto research* for descriptive research studies. In analytical, researcher has to use facts or information already available, and analyze these to make a critical evaluation of the material.

3. Quantitative Vs, Qualitative: Quantitative research is based on the measurement of quantity or amount. Qualitative research is concerned with the qualitative phenomenon i.e. phenomenon relating to or involving quality or kind.

4. Conceptual Vs, empirical: conceptual research is that related to some abstract idea(s) or theory. Empirical research relies on experience or observation alone. Often without due regard for system or theory.

Scientific research Process

Scientific research is step by step, logical, organized and rigorous method to identify problems, gather data, analyze the data, and draw the valid conclusion about the data. It is not based on hunches, experience and intuition alone. It refers to the philosophy that is common to all research methods and techniques, irrespective of the branch of study. That's its primary goal is to pursuit of truth as determined by logical considerations.

There are Eight Steps in Scientific Research Process which is more or less common to all research methods and techniques:

- I. Sensing or Realizing Problem
- II. Problem Identification
- III. Theoretical framework
- IV. Hypothesis Formulation
- V. Research Design
- VI. Collection of Data
- VII. Analysis of Data
- VIII. Interpretation of Data
- IX.

Step I: Sensing or Realizing problem

Observing the situation or sensing the problem is the first and foremost step of scientific research process. The researcher sense about the new problems emerged and development emerging in the environment. Actually the researcher is not familiar about the problems but sense them in terms of what, why and how is happening.

Step II: Problem Identification

After having well awareness about the environment, the researcher focuses on the problem and the associated factors through further search of information. In this steps the problem existing in the situation are identified and chosen for solution.

Step III: Theoretical Frame work

Theoretical Framework attempts to integrate the information logically so that the reason for the problem can be conceptualized. In this step, the critical variables are examined and the association among them is identified. A theoretical framework is developed to put all the variables and their association together.

Step IV: Hypothesis formulation

Hypothesis is logically conjectured relationship between two variables expressed in the form of testable statements. Hypothesis formulation for the study is determined on the basis of theoretical framework.

Step V: Research design

The research design is the strategy for conducting research work, which describes the general framework for collection for collection, analysis and evaluation of identified data. It also provides basis about what the researcher wants to know and why has to be dealt with in order to obtain required information, research design sheds light on the methodology employed for collection, analysis and evaluation of facts(or data)

Step VI: Collection Of data:

Data collection also called field work is the implementation of research design. In this method, the researcher adopts the method and instrument like observation, questionnaire, schedule, interview etc to gather data.

Step VII: Data Analysis

Data analysis is the statistical analysis of collected, edited and coded and tabulated data. It is specially important in cases where the researcher has collected large amount of information from many respondents. The validity of collected is also tested by using different statistical tests.

Step VIII: Generalization

The final Step of scientific research process involves interpretation and generalization of findings about the phenomenon. For applied research, specific implementation strategy is proposed to solve the problem identified by the study.

By carefully following the major step outlined above, the researcher reduces the possibility of making major errors and increases the possibility that meaningful research results will be obtained. Scientific research helps researchers to state their findings more accurately and with confidence

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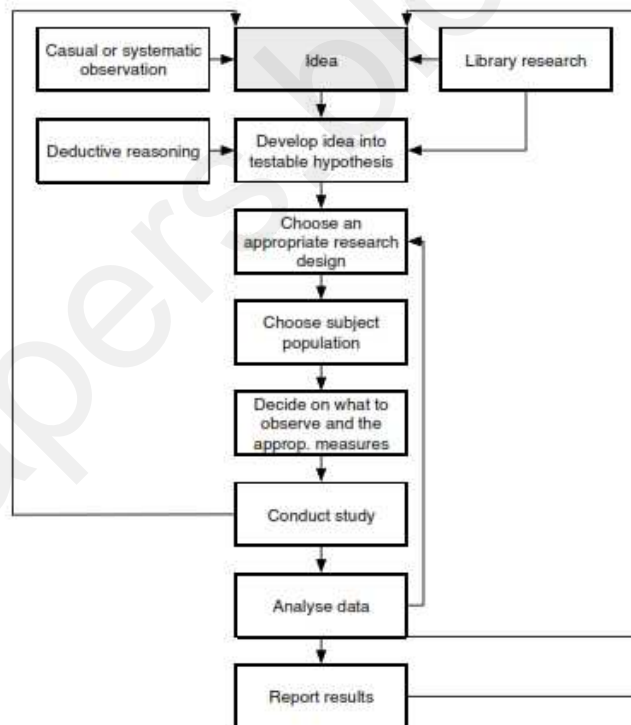


Figure 1. Research process by Borden & Abbott (2007, p. 24)

Fig: Scientific research Process

Characteristics of Research

A scientific research has some characteristics, which it must satisfy. In evaluating the quality of scientific research, there are some key characteristics to consider: Purposiveness, verifiability, testability, replicability, objectivity, rigour, systematic and generalizability

Purposiveness

Scientific investigation must have a focus or a specific purpose. It forms the basis for your procedures, influences your methods of executing it, and affects the interpretation of your findings.

Verifiability:

This concept implies that whatever you conclude on the basis of your finding is correct and can be verified by you and others.

Testability

The purpose of scientific research is to develop and test the hypotheses. Research studies, which do not develop and test hypotheses, do not meet the criteria for scientific research.

Replicability

Scientific research must be replicable. The research results which are replicable have more acceptability and confidence being scientific. In other words, by using similar procedures of data collection and analysis as followed by the previous study, the other studies must also come out with similar results.

Objectivity

The more objective the analysis and interpretation of data, the more scientific the research investigation becomes. Though you might start with some initial subjective values and beliefs, your interpretation of data should be stripped of personal values and biases. Facts should determine your conclusions. Objectivity is essential because it is necessary that others be able to understand and replicate a finding before it is considered dependable

Rigour

Rigour connotes carefulness, scrupulousness and degree of exactitude in research investigation. Scientific research is definitely a rigorous process. It involves good theory base and carefully thought methodology. Lack of rigour in research may lead to selection of faulty research design, in appropriate or biased collection and interpretation of data, and wrong conclusions.

Systematic

This implies that the procedures adopted to undertake an investigation follow a certain logical sequence. The different steps cannot be taken in a haphazard way. Some procedures must follow others.

Generalizability

Scientific research aims at making generalization. By generalization we mean wider applicability of the research finding. For wider generalizability, the research sampling design has to be logically developed, and a number of other meticulous details in the data collection methods needed to be followed. The more generalizable the research, the greater is its usefulness and value.

The above characteristics of research investigation together form the bases and criteria of scientific research.

Meaning of Management Research and stages in management process**Managerial Value of Research**

Managers are basically involved in problem solving and decision making activities. They have to be continuously deciding as to what policies and programs be adopted for organizational effectiveness and how

to execute them to get desired results. They must also decide what feedback mechanisms be established to get informed about the ongoing programs and also evaluate them to help their decision making in future. Thus manager's job is to achieve stated goals and the degree of his success in this regard is directly dependent upon his making the right decisions at the right time.

The decision making process associated with development and implementation of a strategy involves four interrelated stages:

- Identifying problems and opportunities
- Diagnosing and assessing problems and opportunities
- Selecting and implementing course of action
- Evaluating the course of action.

Management research, by supplying managers with pertinent information, may play a important role by reducing managerial uncertainty. The knowledge of research methods help them to identify the problems and find out more about the situation before the problems get out of control.

Management Research Defined

Management research has been basically conceived as the systematic and objective collection and evaluation of information about the specific aspects of business problems in order to assist managers to make effective decisions. Its main purpose is to facilitate decision making process and reduces uncertainty when business strategy is being planned, and to monitor performance after the strategy has been put into operation.

Some important definition of Management research is

Sekran: Business research is a systematic and organized investigation conducted to resolve problematic issues in, or interrelated among, the different areas of management.

Zikmund: Management Research is the systematic and objective process of gathering, recording and analyzing data and in making business decisions.

Sekran (2000) identifies the benefits of research knowledge to managers as follows

- Identify and solve problems in the work setting.
- Know how to discriminate good and bad research.
- Appreciate and constantly remember the multiple influences and multiple effects of factors impinging on a situation
- Take calculated risks in decision making, knowing full well the probabilities attached to different/ possible outcomes.
- Prevent possible vested interests from operating in a situation
- Relate to hired researcher and consultants more effectively

Role of Research in Management

There are different stages in the process of management. For the present purpose four stage Viz. analysis, planning, execution and control are considered as the components of management process.

1. **Analysis** is the initial stage in the management process in which attempts are made to recognize opportunities and problems. In this stage, the decision maker is essentially interested in understanding the nature and scope of a given problem.
2. **Planning** involves development and selection from the alternatives as necessary courses of action to achieve an objective. It is an evaluation of plans and policies in order to predict or estimate the information under the study. Planning is process, which determines courses of actions and guide for future decision making.
3. **Execution** implies implementation of the plans. In other words, the selected courses of action and ideas are translated into reality.
4. **Control** is the final stage in the management cycle in which performance against plans is made. In other words attempt is made to measure the extent to which a given action or activity has achieved its original objectives and corrections of [performance deviation is achieved if required.

Management Research Methods:

1. Action Research:

Kurt Lewin, Then professor At MIT, first coined the term” action research in about 1944”. Action research involves a continuous gathering and analyzing of research data during the normal on-going operation of an organization. It is concerned more with the execution of a specific management programs. Action research is form of study designed to provide continuous feedback regarding the performance of management activity and to improve that performance through direct form of investigation.

Action research is a methodology that combines “action” and “research” together. During a study, the researcher is repeating the process of performing an action, reflecting on what has happened and using this information to plan the next action. The following are the basic features of action research:

- *Addresses practical Problem:* based on real problem and situation. It generally involves identification of practical problems in a specific context and attempts to seek and implement solutions within the context.
- *Generates Knew Knowledge:* It relies on both the generation of knowledge to produce change and enacting to produce knowledge.
- *Enacts Change:* It works towards situation improvement by implementing the new knowledge in practice.
- *Is participatory:* Action research calls for participation of, and collaboration between researchers, practitioners and any other interested stake holders.
- *Relies on cyclical process:* This research is undertaken through cycles of observation, reflection, planning and action

2. Evaluation Research

It is oriented towards formal and objective measurement of the extent which is a given action, activity or program has achieved its original objective. This research is closely related with policy research in which policies; objectives, strategies and programs are examined. Its real contribution lies on the fact that it helps management to determine how far the programs have initiated by it has been successful and also analyses the underlying causes of failure, if any.

Evaluation research can be broken down into two general types: formative and Summative evaluation.

- a. **Formative Evaluation:** A study which is primarily seeking to gather information during the process of implementation, with the view to informing the development of the program is called formative evaluation. That is why it is called process or progress evaluation. It seeks answers to questions about the process of implementation.
- b. **Summative Evaluation:** A study which is primarily seeking to gather information on the effectiveness of program after it has been implemented is termed as summative evaluation. It is also called outcome or impact evaluation.

3. Managerial Research

Managerial research is related to the specific problem of the limited scope for which management has need of additional information on which to a base decision. This type of research is focused on one particular activity, scheme, or project launched by the management. When analysis of the going project indicates that all is not going as planned, managerial research may be required explain why something went wrong with the project.

Managerial research has one feature. It concerns seeking of solutions as to what should be done to solve the given problem and how to implement the solution.

5. Policy research: Not mentioned in syllabus

The purpose of this research is to support planning and decision making in forming policies within the context of political, social and economic realities of time and setting. Policy research is concerned with the analysis of overall organizational situation with the purpose of formulating major policy proposals and establishing their priorities.

Attributes of a good management research

- Purpose clearly defined

- Research process and work plan details
- Research design thoroughly planned
- High ethical standards applied
- Limitation frankly revealed
- Findings presented unambiguously
- Conclusion justified researchers experience reflected

Meaning of Project work

The project work assignment is an off-the- classroom and field based study project under taken by a student. The project work can de described as systematic and organized effort to study and observe a specified situation at hand.

We can define project work as an organized, systematic, and data based investigation into a specific situation undertaken with the objective of gathering information that enables the student to gain familiarity with the situation or reality and generate more knowledge about the phenomenon under the investigation.

Objective/Purpose of the project work

- To expose students to business or social reality by providing opportunity to get information and actual knowledge about the working of an organization, system, or a situation.
- Promote student- centered learning by encouraging you to take the initiative to become self directed learners and thinkers
- Provide opportunity to you to work on those particular issues or problems, which are of particular interest to you.
- Develop interpersonal and communication skills by encouraging you to interact with the practitioners.
- Develop data- processing and report- writing skills to explore, analyze and describe a business situation or a social phenomenon.

Criteria for project- based learning

- Projects are central, not peripheral to the teaching of a course.
- Projects are focused on problems or questions.
- Projects involve students in a constructive investigation.
- Projects are student driven.
- Projects are realistic with practical relevance.

Methods Of Project Work

Projects work can be either exploratory in nature or descriptive. The exploratory and descriptive designs can further be classified into three broad categories:

- Small – Scale Survey
- Case Studies and
- Feasibility studies

It should, however noted that these types of project work are not mutually exclusive and that a combination of all three could also be used, if necessary.

Exploratory and Descriptive Studies

Exploratory study is a preliminary step in which the main focus is on achieving a clear view of the subject under the investigation. Such studies are taken when we do not know much about the situation. These are not formal designs. This research is conducted by one of or more of three approaches:

- Examining existing literatures
- Questioning individuals and
- Examining a few selected cases.

A **Descriptive study** is one that simply describes something. That “something” could, for example be the demographic characteristics of employees, or a profile of suppliers etc. Thus descriptive research might describe:

- The demographic characteristics of employees in term of their age, gender, education, family income, etc, or
- The profile of suppliers in the term of the quality of supplies, rejections, regularity, demands for advance payments and so on.

This study is undertaken in order to describe the different aspects of a situation. Descriptive studies that present data in meaningful form thus help us to:

- Understand the features and aspects in the situation under study,
- Offer ideas for further investigation and research, and
- Help in identifying problems and make certain simple decisions

Small Scale Survey

The word survey has been derived from sur or sor and veir or veior, which means over and seeing respectively. Literal meaning of survey is to take a look over something from a high place. However, in scientific investigation, the word survey is used for the technique of investigation by direct observation of a phenomenon or collection of information through interviews.

It is the most common and oldest research method known to man. *A survey study is the systematic gathering of information from respondents for the purpose of understanding and/or predicting some aspects of the behavior of the population interest.* The objectives of a survey study are not only to ascertain status but also to determine the adequacy of status by comparing it with established standards.

Survey studies are usually more extensive. They involve the careful identification of the population, the selection of the sample for that population, and the collection of comparable data to make qualified generalizations.

Surveys emphasize systematic collection of information directly from the respondents by using any of the following methods:

- *Telephone Interviews*--- collection of information from the respondents via telephone.
- *Mail Surveys*--- collection of information from respondents via mail or similar other techniques.
- *Personal interviews*---- collection of information in a face-to-face situation
- *Home interviews*- personal interviews in the respondent's house or office.
- *Intercept interview*--- personnel interview in central location, generally shopping centre, *haat bazaar* etc.

Case Study

A case study is the most appropriate method of project work. A study unit is selected and a detailed study, by using different research methods, is made of the unit. A case study covers the relevant aspects related to the unit under study. A case study is an intensive investigation and description of the study unit.

A case study is similar to survey, but instead of gathering data for large number of study units, the investigator, in case study, makes an intensive study of limited number of units. Thus, a case study is narrower in scope but more exhaustive and qualitative in nature than survey.

Feasibility Study

A feasibility study is undertaken to assess the potential of new scheme or ideas, and provides a base for an investment decision. Feasibility studies define and analyze the critical elements that relate to: operational aspects, technical aspects, markets, legal implications and cost- benefit analysis of the given scheme or idea together with alternative approaches to such scheme or idea. Feasibility study ranges from simple, informal observation to complex, formal analysis.. Feasibility studies may be conducted within an organization or in a field.

In conducting a simple feasibility study, the following aspects should be studied and assessed as methods of analysis: a) environmental factors b) market factors, c) investment requirements, d) technical issues and e) cost-benefit estimates.

Questions

1. Describe clearly the explorative and descriptive type of research design.
2. Define research. Describe the process of scientific research.
3. What is project work? Explain the objective and importance of project work.
4. Describe the main characteristics of research.
5. Distinguish between Fundamental and applied research.
6. Describe the management research methods with suitable examples.
7. Managers cannot be successful managers unless they are equipped with knowledge of Research. Explain.

UNIT II: Research Design

Concept of Research Design

Decisions regarding what, where, when how much, by what means concerning an inquiry or a research study constitute a research design. A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to research purpose with economy procedure. In fact research design is the conceptual structure within the research is conducted: it constitutes the blue print for the collection, measurement and analysis of data.

Some definition of research design:

Young(1966): “ Research design is the logical and systematic planning and directing a piece of research”

Kerlinger(1986): “ Research Design is the plan, structure and strategy

of investigation conceived so as to obtain answers to research questions. The plan is the overall scheme or program of the research. It includes an outline of what the investigator will do from writing hypotheses and their operational implications to the final analysis of data.”

Zikmund(2007): Research design is a master plan specifying the methods and procedures for collecting and analyzing the needed information.

A research design is clearly planned procedure for carrying out research. The design generally incorporates answers to the following questions:

- a) What is the study about?
- b) Why is the study being made?
- c) Where will the study carried about?
- d) What type of the data is required?
- e) Where can the required data are found?
- f) What periods of time will the study include?
- g) What will be the sample design?
- h) What techniques of data collection will be used?
- i) How will be the data analyzed?
- j) In what style will be the report prepared?

Keeping in view the above stated designs, one may split the overall research design into the following parts:

- A) The sampling Design which deals with the method of selecting items to be observed for the given study;
- B) The observational design which relates to the conditions under which the observations are to be made;
- C) The statistical design which concerns with the question of how many items are to be observed and how the information and data gathered are to be analyzed: and
- D) The operational design which deals with the techniques by which the procedure specified in the sampling, statistical and observational designs can be carried out?

From what has been stated above, we can state the important features of research design as under:

- i) It is a plan that specifies the sources and types of information relevant to research problem
- ii) It is a strategy specifying which approach will be used for gathering and analyzing the data
- iii) It also includes the time and cost budgets since most studies are done under these two constraints.

In brief, research design must at least contain—(a) a clear statement of the research problem (b) procedures and techniques to be used for gathering information (c) the population to be studied and (d) methods to be used in processing and analyzing data.

What are the essential elements of a good research design?

- A research design is an overall plan for the activities to be undertaken during the course of a research study.
- The research design serves as framework for the study, guiding the collection and analysis of the data, the research instruments to be utilized, and the sampling plan to be followed
- It is an organized and integrated system that guides the researcher in formulating, implementing and controlling the study.
- The research design is a blueprint specifying the method to be adopted for gathering and analyzing data.
- The research design is a strategy of obtaining information for the purpose of conducting study and making generalizations about the population

In planning a research investigation, choices have to be made about research strategy (experimental Vs Non-experimental), research setting (laboratory Vs natural setting), measures (questionnaires, observations, interviews), the data analysis strategies (descriptive Vs inferential statistics), and a host of other factors. A research design thus includes all these essential factors of an investigation.

Need for Research Design

Research design is needed because it facilitates the smooth sailing of the various research operations thereby making research as efficient as possible yielding maximal information with minimal expenditure of effort, time and money. Preparation of research design should be done with great care as any error in it may upset the entire project. The design helps the researcher to organize his ideas in a form whereby it will be possible for him to look for flaw and inadequacies.

Elements of Research Design

The basic elements of research design are (a) problem, (b) the methodology, (c) data Gathering, (d) data analysis, and (e) report writing. A good research design considers all these elements. The first element of a research design is to answer the research question or test research hypothesis.



Fig : Elements of Research Design

Every research work usually requires an explanation of the methodology and the sample description. What methods were used to choose sample? Why these methods were chosen and how they were applied? Next there should be an explanation of what the variables are in the hypothesis and how they were measured. Furthermore, the details of the data collection must be explained and a discussion on the reliability and validity of the measurement included. Finally, it is necessary to explain how the data were analyzed.

(Note: the elements of research elements will be explained in other units)

Types of Research Designs

Several typologies have been suggested for classifying a wide variety of research designs used in social science research. Mc Grath has suggested five models of different types of research designs: a) controlled experiment) study(,C) survey (d) investigation and e) action research. Seltiz, wrightman, cook (1981) suggest three broad categories of research designs: (a) formative or exploratory studies (b) descriptive studies and (c) studies testing casual hypotheses. Coper and Schindler (2003) suggest four categories of research designs a) exploratory, (B) descriptive, (C Causal, and (d) experimental. These classification are not however mutually exclusive. There is considerable overlapping among these research designs.

- P.R. Pant: With view to giving more detailed information about research designs, we will classify research studies into five categories but still they are not mutually exclusive:
- Exploratory Research designs
- **Descriptive Research designs**
 - Historical research
 - Descriptive research
 - Developmental research
 - Survey research
 - Case study research
- **Comparative Research Design**
 - Correlational research
 - Causal- comparative research
- Interventional Research Design
 - True experimental Design
 - Quasi- experimental research
- Qualitative research design

Descriptive Research Designs

Descriptive research describes phenomena as they exist. These studies attempt to obtain a complete and accurate description of a situation.

Historical Research

Historical research is concerned with the past phenomena. It can be defined as “the systematic and objective location and evaluation and synthesis of evidence in order to establish facts and draw conclusions about the past events. It is a process of collecting, evaluating, verifying and synthesizing past evidences systematically and objectively to reach a conclusion. The main purpose of conducting historical research is to show relevance of the past events to the present.

Accuracy of gathered information is the main ingredient of success in the historical research. There are two main sources of collecting past evidence i.e. primary and secondary source. Primary source is the original repository of historical datum like an original record kept of an important occasion, an eye witness description of an event photograph, minutes of organization meeting etc. A secondary source is an account or record of an historical event or

circumstances one or more step removed from an original repository, instead of the minutes of an organizational meeting e.g. one uses of news paper account of meeting.

Historical research is not based purely on scientific method. Its uniqueness is that data being studied are usually not available for your direct scrutiny. There has no opportunity to replicate the study. However, it should share many of the disciplines of scientific method, such as objectivity and minimizing bias and distortion.

The steps involved in historical research are:

- Selection of the problem
- Statement of the objective
- Collection of data/facts
- Criticism of data/facts
- Presentation of data by time reference

Limitations

- Non availability of life size writing history
- Presence of biasness of the historians
- Lack of verification of the reliability and authenticity of the available data, which relates to the distant pasts.
- The events cannot be measured and observed directly and as such the researcher has to exercise personal judgment
- Lack of agencies, which stores the data adequately.

Essential Requirements of historical Method

Research worker must possess following qualities

Insight: The research worker should have adequate insight of the phenomenon to understand the cause effect relationship of various variables or events.

Historical Perspective: The facts and events should be understood in the historical perspectives so that the researcher can draw correct conclusions.

Dispassionate attitude: while conducting historical research, the researcher should study the authentic facts and events. Misguided by guess work, pre-conceived notions, biases, emotions etc are completely avoided.

Imaginative Capacity: the researcher should be capable of understanding the topic discussed by the history. He/she should have fertile imagination to draw a complete picture of the study.

Capacity to select and analyze: Generally, historical facts are scattered and the researcher should possess the ability to select and analyze useful and relevant materials and reject the unwanted ones.

Knowledge of the study area: the researcher should have complete knowledge about the field study to collect, search, and draw useful and factual conclusions.

Descriptive Research

Descriptive research is a fact finding operation searching for adequate information. It is type of study which is generally conducted to assess the opinions, behaviors, or characteristics of a given population and to describe the situation and events occurring at present. The research involves gathering of data that describes events and then organizes, tabulates, depicts and describes the data collection. Descriptive statistics is used to reduce the data to manageable form. Studies concerned with specific predictions, with narration of facts and characteristics concerning individual, group or situation are all examples of descriptive research studies. Descriptive research is a process of accumulating facts. It does not necessarily seek to explain relationships, test hypotheses, make predictions or get at meaning and implications of a study. Descriptive studies simply portray an accurate profile of organizations, events, or situation. Investigators collect, classify and correlate data to describe what exists. However, they do not fully analyze and explain phenomenon behave as they do.

Purposes of Descriptive studies

- To collect detailed factual information that describes existing phenomena
- To identify problems or justify current conditions and practices
- To make comparisons and evaluations
- To determine what others are doing with similar problems or situations and benefit from these experiences in making plans and decisions.

The general steps of descriptive study are:

- Formulation of objectives of the study
- Defining population and selecting sample
- Designing the method of data collection
- Analysis and interpretation of the data/ facts.

Limitation:

1. The descriptive method has certain limitations, because all problems cannot satisfy each of the required criteria. Some of them are:
2. Research may make description an end itself
3. Research is essentially creative and demands the discovery of facts in order to lead to a solution of the problem
4. It dominates statistical tools to present the facts in terms of average correlation coefficient; dispersion may not always be either necessary or welcome.

Development Research

Developmental research is conducted for the purpose of predicting future trends. It concentrates study on the study of variables, their rates of change, directions, sequences and other inter-related factors over a period of time. There are several methods of development research. The nature of these different forms of developmental research design is shown in Fig.

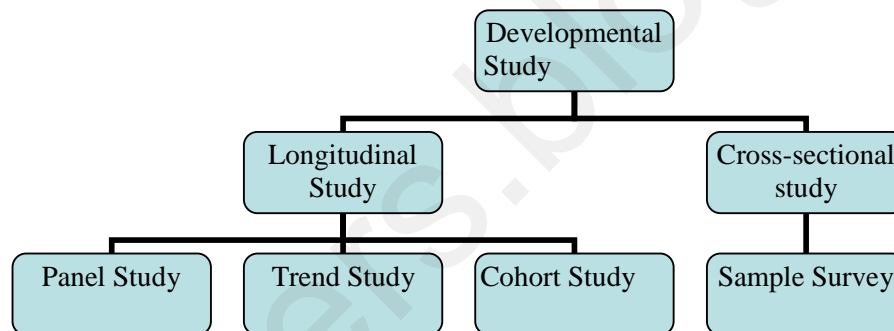


Fig: Forms of Development Research

Cross- Sectional Growth Studies:

This type of study is also known as cross-sectional analysis. In this study, whatever is being studied is being observed at a single point in time, as if a section of time were being cut for observation. It involves observation of items of the population all at the same time. This study basically measures the rates of changes by drawing samples from cross section of society. It focuses on comparing and describing groups.

In this study, data are gathered just over a period of time in order to answer a research question. Such studies are also known as one-shot studies. Cross- sectional study often employs survey strategy. The fundamental difference between a cross sectional study and longitudinal study is that a cross sectional study takes place at a single point of time and that longitudinal study involves a series of measurements taken over a period of time.

Longitudinal Growth Study:

In a longitudinal study data are collected at more than one point in time. This type of study measures the nature and rate of change in a sample at different stages of development. The phenomena are studied over time either continuously or repeatedly. There are primarily three types of longitudinal design: trend study, cohort study, panel study.

Trend Study:

When data are collected at intervals of spread over a period of time, it is called a trend study. This type of research samples different groups of people at different points in time from same population. It is designed to establish patterns of change in past in order to predict future patterns or conditions. Trend studies do not have to be conducted by just one researcher or research project. We can combine data from several studies of the same population in order to show a trend. Marketing firms, for example, compile trend studies that chart fluctuations in consumption level for a certain product. Frequently regression analysis is used for trend analysis.

A Cohort Study:

A cohort is a group of people who share a common characteristics or experience within a defined period. Thus, a cohort study is a study of specific group, such as those born on a day or in a particular period, or group of students graduating from college, education, employment and the like.

A sample of the selected cohort group is then studied at different points of time. A cohort study is a systematic follow-up of a group of people for a defined period of time or until a specified event. To form cohort studies, data are compiled for the same population over time. Such studies are therefore rare because of the difficulty of maintaining contact with members of cohort from year to year.

A Panel Study:

A panel is a group of individuals that have agreed to provide information to a researcher over a period of time. In panel study we take the same people and study their attitudes towards a particular phenomenon over time. We measure the same sample of respondents at different points in time

Steps:

- Define the research problem/ Statement of objective
- Collection of Data
- Evaluation and analysis of data
- Interpretation

Limitations:

1. Based on regression analysis.
2. Availability of reliable information is not justifiable and future pattern is not universal/ truth

Case Study

A case study is fairly intensive examination of a single unit viz. a person, a family, an institution, a commodity, a district or any single event. Case study enables us to explore, unravel and understand problems, issues and relationships in a particular situation.

Case studies are written summaries or synthesis of real life cases based upon data and research. A case study is thus defined as “a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within a real-life context using multiple sources of evidence”. Rather than using samples to examine a limited number of variables, case study methods involve in in-depth, longitudinal examination of a single instance or event (case). A case study not only uses the sources and techniques of historical study but also employs several techniques and sources of data for examining the current aspects of the phenomena under study. A case study could be conducted in the field as well as a non- field setting. The

investigator gathers pertinent data about the present status, past experiences and environmental forces that contribute to the individuality and behavior of the unit. Case study are particularly useful as background information for planning major investigations because of intensive in nature and bring about light on important variables , processes and interactions.

In case study two types of studies are carried out: i) Exploratory study: It seeks to establish what is to discover significant variables and relation between them. II) Hypothesis Testing: the study tests the relationship between variables predicted from first type of study.

Assumptions

- The unit is representative of total
- The total phenomenon is much complex and the study of which neither advisable nor practicable
- The unit is studies as a whole
- Time factor has its impact on social phenomena

Steps

- State the objective
- Determine and define research questions
- Design case study
- Conduct the case study and collect the data in field
- Organize and analyze the case study evidences, well integrated description of the unit of study
- Repot the results in terms of conclusions, recommendations and implications

Limitations

- A case study is more expensive because of its exploratory nature
- A generalization drawn from single case cannot be applied to all cases in a given population
- There is some element of subjectivity. You must guard against permitting personal biases and standards to influence your interpretation.

Correlational Research

Correlation research is concerned to ascertain the extent of relationship between the phenomenons under investigation. It describes the association between phenomenons. In a correlationship, changes in one variable accompany changes in another, but the proper tests have not been conducted to show that either variable actually influences the other. Thus, all that is known is that relationship exists between them exists. When changes in one variable tend to be accompanied by specific changes in another, two variables are said to be covary.

In a coorrelational research, the researcher's main interest is to determine whether two or more variables covary, and if so, to establish the direction, magnitude, and form of the observed relationships. The relationship between variables may be high, moderate or unrelated.

There are three types of correlations:

- Positive correlation exists when increase in one variable is accompanied by an increase in another. For example, increase in benefits to workers increases productivity
- Negative correlation exists when two variables are inversely related. An increase in one variable would result in a decrease in another. For example, an increase in absence rate of employees could result in decrease in production
- No correlation exists when change in one variable does not affect other variable.

For perfect correlation the value of correlation coefficient is 1 and the sign is +ve for positive correlation and -ve for negative correlation. The value of correlation coefficient for uncorrelated variables is zero.

Since the correlation coefficient ia a ration and free from unit of measurement. It explains the relationship in terms of numerical value and cannot measure the cause effect relationship between the variables.

Steps

- Formulation of the problem
- Identification of the variables
- Collection of data
- Analysis and interpretation

Limitations

- It only identifies what goes with what- it does not necessarily identify cause-and effect relationship
- It is less rigorous than experimental approach because it exercises less control over independent variables
- The relational patterns are often arbitrary and ambiguous

Causal- Comparative Research

Studies that establish causal relationships between variables may be termed explanatory studies. It is also called regression method investigates the possible causes affecting a particular situation by observing existing consequences and searching for the possible factors leading to these results. The emphasis thus on studying a situation or a problem in order to explain the relationships between two variables. This method also predicts the dependent variable on the basis of independent variables. In causal comparative research, the investigator takes one or more dependent variables and examines the data through backward movement to examine causes, relationships, and their meaning. In other words the researcher search likeliness and the differences among the selected topic to obtain clues about what might cause or contribute to the occurrence of particular phenomena.

This research is also known as 'ex post facto' (Latin for after the fact) research. This is because both the effect and alleged causes have already occurs and must be studied in retrospect. Kerlinger (1980) explains ex post facto research as follows:

Ex post facto research is that research in which the independent variable or variables have already occurred and in which the researcher starts with the observation of a dependent variable or variables. He then studies the independent variable in retrospect for their possible relations to, and effect on, the dependent variable or variables.

There are three important characteristics of causal comparative research:

- There is a control or comparison group
- There is intact group
- The treatment is not manipulated, it has already occurred.

It should be noted that causal comparative research is not experimental research. The independent variable is not manipulated and subjects are not randomly assigned to treatment. Statistics are extremely used in causal-comparative research. The most commonly used statistics include measures in relations such as spearman's rank order coefficient, Regression etc.

Strengths

- The casual- comparative method is appropriate in many circumstances where the more powerful experimental method in not possible: When it is not always possible to select, control, and manipulate the factors necessarily to study cause and effect relations directly
- When the laboratory controls for many research purposes would be impractical, costly, or ethically questionable
- It yields useful information concerning the nature of phenomena: what goes with what, under what conditions, in what sequences and patterns and the like.

Weakness

- The main weakness of any post facto design is the lack of control over independent variables
- The difficulty in being certain that the relevant causative factor is actually included among the many factors under the study.

- A phenomenon may result not only from multiple causes but also from one cause in one instance and from another cause in another instance
- When relationship between two variables is discovered, determining which is the cause and which the effect may be difficult

Steps

- Formulation of the problem
- Statement of hypothesis
- Data collection
- Analysis and generalization
- Interpretation

Action Research Design

Action Research comprises two components: Action and research. Research is a means to action, either to improve your practice or to take action to deal with a problem or an issue. Since action research is guided by the design per se. It is related with to current activity of immediate practical situation or practical value. It discovers what, how and why of actual life. It is carried out to identify areas of concern, develop and test alternatives, and experiments with new approaches new skills or approaches of a particular project or problem.

Action research, in common with participatory research and collaborative inquiry, is based upon a philosophy of community development that seeks the involvement of community members.

There are two focuses of action research:

- An existing program or intervention is studied in order to identify possible areas of improvement in terms of enhanced efficacy and/or efficiency. The finding becomes the basis of bringing about the changes.
- This is where a professional thinks that there is an unattended problem or unexplained issue in the community or among a client group. Through research, evidence is gathered to justify the introduction of a new service or intervention. Research techniques establish the prevalence of the problem or the importance of an issue so that appropriate action can be taken to deal with it.

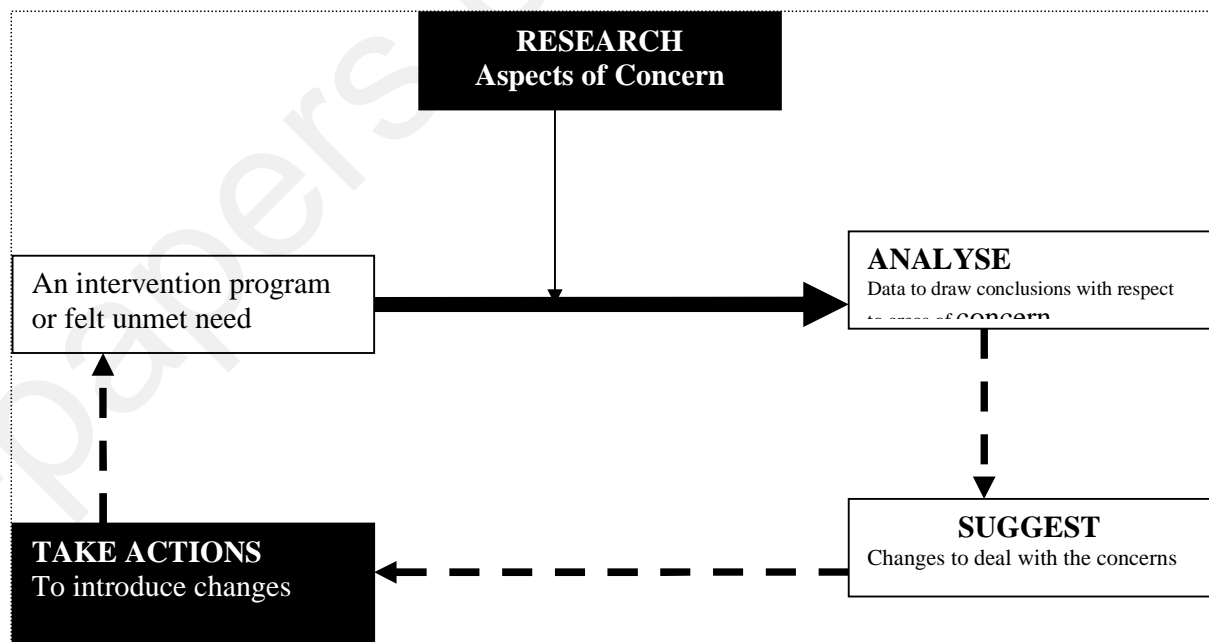


Fig: Action Research Design

Steps

- Define the problem
- Setting the objectives

- Collection of data
- Analysis and evaluation of the outcomes

Limitations:

- Generalizations cannot acquire a universal validity
- The applicability of findings to other class problem and areas is quite doubtful
- Sometimes it produces wrong and unverifiable conclusions

The difference between Explorative and Descriptive research design are as follows:

Research Design	Type of Study	
	Exploratory Design	Descriptive Design
Overall design	Flexible design(design must provide opportunity for considering different aspects of the problem)	Rigid design(design must make enough provisions for protection against bias and must maximize reliability)
i) Sampling design	Non probability sampling design Purposive or judgmental sampling)	Probability sampling design(random sampling)
ii) Statistical design	No pre-planned design for analysis	Preplanned design for analysis
iii) Observational design	Unstructured instruments for collection of data. No fixed decisions about the operational procedures.	Structured or well thought out instruments for collection of data Advanced decisions about operational designs
iv) Operational Design		

Questions

What is research design? Explain the action research design with steps.

Explain the elements of research design.

Unit III: SAMPLING PROCESS AND DATA COLLECTION

Sampling And its Significance in Research:

Sampling is the process by which inference is made to the whole by examining only a part. It is woven in to the fabric of our personal and public lives. For instance, with a single grain of rice a village housewife tests all the rice in the pot has boiled; from a cup of tea, a tea taster determines the quality of the brand of the tea.

In many empirical studies, data are to be collected from the population under the study. The population consists of number of units (elements) usually very large and sometimes infinitely many. In many cases, it is practically not possible to include all units of the population for investigation. Therefore **a few** of the population units are selected as a **representative of the whole population**. The few selected units are called **Sample** and the method is called **Sampling technique**.

Sampling may be defined as the selection of some part of an aggregate or totality on the basis of which a judgment or inference about the aggregate or totality is done. In other words, it is the process of obtaining information about an entire population by examining only a part of it.

So, Sampling is simply the process of learning about the population on the basis of sample drawn from it. Thus, in the sample technique instead of every unit of the population only a part of the population is studied and the conclusions are drawn on that basis for the entire population.

Some merits of sampling methods are:

- i) The sample can save money.
- ii) The sample can save time.
- iii) For given resources, the sample can broaden the scope of the studied.
- iv) Because the research process is sometimes destructive, the sample can save product.
- v) If accessing the population is impossible, the sample is only the option.

Some fundamental definitions:

Population and sample:

The population is the collection of units (people, objects or whatever) that researchers are interested in knowing about. The number of individuals in a population is called population size. A sample is a smaller collections of units selected from the population i.e. a finite subset of individuals in a population is called a sample and the number of individuals in a sample is called sample size. Population may be finite or infinite. In finite population the number of items is certain, but in case of infinite population the number of items are infinite, i.e. we cannot have any idea about the total number of items. The population of city, the numbers of officers in Nepal Rastra bank etc. is the examples of finite population whereas customers of united Trade center, number of stars in sky, listeners of specific radio program etc. are examples of infinite population.

Sampling Frame (Source List):

The sampling frame is the list of items in the population (universe) from which sample is to be drawn. If sampling frame is not available, researcher has to prepare it. Such a list should be correct, comprehensive, reliable and appropriate.

Sample design:

A sample design is a definite plan for obtaining a sample from a given population. It refers to the technique or the procedure the researcher would adopt in selecting items from the sample. Sample design is determined before the data are collected.

In designing a sample, the researcher must consider three things:

- i. the sampling frame
- ii. technique of selection of sample
- iii. Sample size

The sampling frame is the list of items in the population (Universe) from which sample is to be drawn. Thus it may be all the employees at Nepal Rastra Bank, all account holders having ATM cards etc. After determining the sample frame, the researcher must decide how sample will be selected. Some sampling techniques, which are commonly used are Simple random sampling, Stratified sampling, Systematic sampling, Cluster sampling, Multistage sampling, Convenience sampling, quota sampling, judgmental sampling, snowball sampling.

Finally, the size of sample must be determined. This refers to the number of items to be selected from the universe to constitute a sample. The size of sample should neither be excessively large, nor too small. It should be optimum. Thus, basic components of a sample design are

- i. choosing the sample units (who are to be surveyed)
- ii. choosing the sample size (how many to be surveyed)
- iii. choosing the sample procedure (how to ensure that those who are to be interviewed are included in sample)
- iv. choosing the sample media (how to reach respondents in the sample- through mail survey, personal interview or telephone interview)

Parameters and statistics:

Mathematically, we can describe samples and populations by using measures such as mean, median, mode and standard deviation etc. When these terms describe the characteristics of population, they are called parameters. When they describe about characteristics of sample, they are called sample statistics (estimators).

A Statistic is a characteristic of a sample and a parameter is a characteristic of population.

	Population	Sample
Definition	Collection of all items under study	Part or portion of population chosen for study
Characteristics	Parameters	Statistics
Symbols	Population size = N	Sample size = n
	Population mean = μ	Sample mean = \bar{x}
	Population standard deviation = σ	Sample standard deviation = S
	Population correlation coeff. = ρ	Sample correlation coeff. = r

Census:

Under the census or complete enumeration survey method, data are collected for each and every unit (person, household, shop, organization etc.) of the population.

A census is appropriate when

- The universe is small
- The population is heterogeneous
- Hundred percent accuracy is required
- The population frame is incomplete.

Some merits of census method are:

- i. data are obtained from each and every unit of the population
- ii. The results obtained are likely to be more representative, accurate and reliable.
- iii. It is an appropriate method obtaining information on rare events such as the number of persons of certain age groups, their distribution by sex, educational level of people etc.
- iv. Data of complete enumeration census can be widely used as a basis for various surveys.

Some demerits of census Methods:

- i. Expensive method because it examines each and every unit of the universe.
- ii. It takes long time and consumes much energy.
- iii. It is unsuitable in certain cases whose scope of the problem is infinite. For example, if one wishes to study the sexual habit of man kind it's not quite possible to approach each individual.

Precision:

Precision is the range within which the population average (or other parameter) will lie in accordance with the reliability specified in the confidence level as a percentage of the estimate \pm or numerical quantity. For instance, if the estimate is Rs 4000 and the precision desired is $\pm 4\%$, then the true value will be no less than Rs 3840 and no more than Rs 4160. This is the range (Rs 3840 to Rs 4160) within which the true answer should lie. But if we desire that the estimate should not deviate from the actual value by more than Rs 200 in either direction, in that case the range would be rs 3800 to rs 4200.

Confidence level and significance level:

The confidence level or reliability is the expected percentage of times that the actual value will fall within the stated precision limits. Thus, if we take a confidence level of 95 %, then we mean there are 95 chances in 100(or .95 in 1) that the sample results represent the true condition of the population within a specified precision range against 5 chances in 100(or .05 in 1) that it does not. Precision is the range within which the answer may vary and still be acceptable: confidence level indicates the likelihood that the answer will fall within the range, and the significance level indicates the likelihood that the answer will fall outside that range. We can always remember that if the confidence level is 95 %, then the significance level will be (100- 5) i.e., 5 %: if the confidence level is 99 %, the significance level is (100 -99) i.e., 1 % and so on.

Sampling Process (steps in sample design):

Define the population:

The first step in developing any sampling process is to clearly define the set of objects called population. Population must be defined in terms of elements, sampling units, extent and time. Defining a population incorrectly may render the results of the study, meaningless or even misleading. It is sometimes difficult to define population properly. At times in research project required to define the population before the study for which it is to be used can begin.

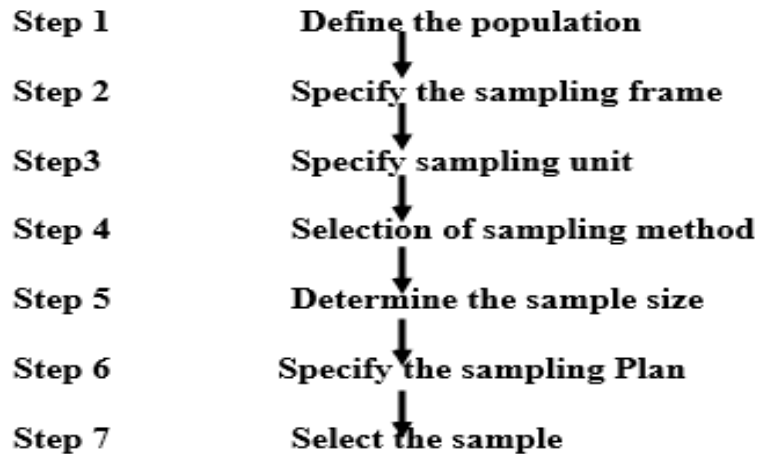


Fig: sampling Process

Specify the sampling Frame:

It is the list of elements from which the sample is accurately drawn. Ideally, it is a complete and correct list of population members only. A sampling frame may be telephone directory, an employee roster, voter list, or list of all students attending a college. Thus a perfect sampling frame is one in which every element of the population is represented.

Specify sampling unit:

A decision has to be taken concerning a sampling unit before selecting sample. The sampling unit is the basic unit containing the elements of the population to be sampled. The sampling selected is often dependent upon the sampling frame. Sampling unit may be a geographical one such as a state, district, village etc or a construction unit such as house, flat etc or it may be a social unit such as family, club, and school. Etc or it may be an individual.

Selection of sampling method:

The researcher must decide the type of sample he will use i.e. he must decide about the technique to be used in selecting the items for the sample. The researcher faces a basic choice: a probability or non probability sample. With probability sample, a researcher can make probability based confidence estimates of various parameters that can be made with non probability samples. Choosing a probability sampling technique has several consequences. A researcher must follow appropriate procedures so that:

- Interviewers or others cannot modify the selections made.
- Only the selected elements from the original sampling frame are included.
- Substitutions are excluded except as clearly specified and controlled according to predetermined decision rules.

Determination of the sample size:

This refers to the number of items to be selected from the universe to constitute a sample. This is a major problem before a research. The size of sample should neither be excessively large, nor too small. It should be optimum. An optimum sample is one which fulfills the requirements of efficiency, representativeness, reliability and flexibility. While

deciding the size of sample, researcher must determine the desired precision and also an acceptable confidence level for estimate.

Specify the sampling plan:

The sampling plan involves the specification of how each of the decisions made thus far is to be implemented. This operational procedure for selection of sampling units is thus selected.

Select the sample:

The final step in the sampling process is the actual selection of the sample elements. This requires a substantial amount of office and field work, particularly if personnel interviews are involved.

Principles of sampling:

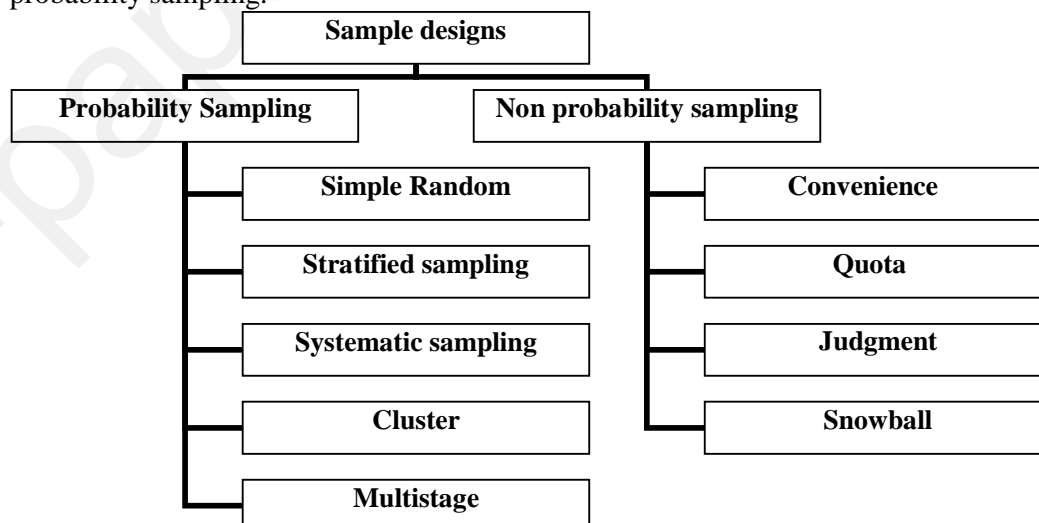
There are three main principles of sampling.

- In majority of cases of sampling, there will be a difference between the sample statistics and the true population mean, which is attributable to the selection of the units in the sample.
- The greater the sample size, the more accurate will be the estimate of the true population mean.
- The greater the difference in the variable under study in a population for a given sample size, the greater will be the difference between the sample statistics and the population mean.

Methods of sampling (Types, Techniques):

Sampling is widely used in business as means of gathering useful information about a population. Data are gathered from samples and conclusions are drawn about the population as a part of inferential statistics process.

Random and non random samplings are two main two types of sampling. In **random sampling** every unit of the population has the same chance of being selected into the sample. Random sampling implies that chance enters in the process of selection. So, sometimes it is also called probability sampling. In **non random sampling** not every unit in the population has the same chance of being selected into the sample. Members of non random samples are not selected by chance so it is sometimes also called as non probability sampling.



A. Probability Sampling

1. Simple Random Sampling

The required number of sampling units is selected at random from the population in such a manner that each population elements has equal chances of being selected for the sample in a probability sampling procedure. Each choice of a sampling unit must be independent of all other choices. One of the most acceptable methods for selecting a simple random sampling is to use a table of random numbers, which can be either computer-generated or found in a statistical textbook. The numbers in a random number have been generated in such a way that there is no pattern. The same probability exists that any digit will follow any other digit, and each selection is an independent choice. To obtain the simple random sample, first list each of the population elements, and then assign consecutive numbers to each of these elements. Then referring to table of random numbers, arbitrarily start at any point in the table and proceed in any direction to identify enough tabled numbers to associate with the population elements units the desired sample has been selected. Rather than using a table of random numbers, it is also possible to select a sample by drawing numbers from a box. The names of the target population elements are written on pieces of paper that are then folded, placed in a container, and mixed well. The first name chosen is assigned to the sample but because the probability associated with subsequent choices is not constants, the slip should be replaced in the container each time a name is selected to approach random selection more fully.

One of the problems in using simple random sampling is the difficulty of obtaining or compiling a list of each of the population elements, either because they are not known or because, for a large population, the listing proves prohibitively long.

This sampling technique gives each element an equal and independent chance of being selected. An equal chance means each probability of selection e.g in a population of 300 each element theoretically has 1/300th chance of being selected. An independent chance means that the draw of one element will not affect the chances of other elements being selected.

This sampling technique gives each element an equal and independent chance of being selected.

The procedure of drawing a simple random sample consist of :

- Enumeration of all elements in the population.
- Preparation of a list of all elements, giving them numbers in a serial order 1,2,3,.....so on and Drawing sample numbers by using a) Lottery method, b) a table of random numbers or a computer.

The simple random sampling is suitable only for a small homogeneous population. However, this sampling method is not suitable for drawing a sample from large heterogeneous population; as it may not yield a representative sample of such population. it may yield a representation in a following conditions:

- Where the population is a homogeneous group with reference to the specified characteristics
- Where a population is relatively small
- Where a computer list of all elements is available or can be prepared.

Merits :

- All elements in the population have an equal chance of being selected.
- It does not require a prior knowledge of the true composition of the population.
- The method is free from classification errors

- Sampling errors can be easily computed and the accuracy of the estimate easily assessed.

Demerits:

- This method does not make use of the knowledge about the population which researcher may have.
- The size of the sample required to ensure statistical reliability is usually large under stratified sampling.
- From the point of view of field survey, it has been claimed that cases selected by random sampling tend to be too widely dispersed geographically and that the time and cost of collecting data because too large.

2. Stratified Random Sampling:

It is also sometimes called proportional or quota random sampling, involves dividing your population into homogeneous subgroups and then taking a simple random sample in each subgroup. This is improved type of random or probability sampling. In a method the population is sub- divided into homogeneous groups or strata and from each stratum, random sample is drawn. For example, university students may be divided based on discipline, and each discipline group may again be divided into sex, juniors and seniors.

Stratification is necessary for: A) **increasing a sample's statistical efficiency** .B) **providing adequate data for analyzing the various sub- populations**, and c) **applying different methods to different strata**. This sampling method ensures representation to all relevant sub- groups of the population. It is thus more efficient statistically than simple random sampling. Moreover, stratification is essential when the researcher wants to study the characteristics of population sub-groups. In a word, it is appropriate for a large heterogeneous population.

Stratified random sampling is a probability sampling procedure that is a variation of the simple random sample. The population is divided into two or more strata or groups with different categories of a characteristic. A simple random sample is taken from each group. This procedure is used when the composition of a population is known with respect to some characteristic or characteristics. The variables (characteristics) chosen to stratify the population must be those that are important to the study. For example, a population of 500 human elements may be stratified based on gender. Then half of the sampling unit may be chosen from the male category and the other half from the female category by simple random sampling. This ensures that the sample will consist of equal allocations of males and females from each population stratum. A population may be divided into other strata or categories, such as age, educational background, occupation, ethnicity and so on depending on their importance of study.

Merits:

- A stratified random sampling is superior to a simple random sample, because it ensures representation of all groups and is thus more representative of the population which is being sampled.
- A random stratified sample can be kept small in size without losing its accuracy.
- Characteristics of each stratum can be estimated, and hence comparison can be made.

Demerits:

- Proportionate stratification requires accurate information on proportion of population in each stratum.
- It is very costly to prepare stratified lists of all members.

- There is always a possibility of faulty classification, and hence increase in variability.

Systematic Random Sampling

A systematic random sampling is formed selecting every n th item for the universe where n refers to the sampling interval. The sampling interval can be determined by dividing the size of the universe by the size of the sample to be chosen. For example if we wish to draw a sample of 320 traveling expense vouchers from the universe of 32000 vouchers, the sampling interval would be 100; that is, every 100th voucher will have to be selected. We may start the sample selection anywhere between the first and the 100th voucher. A random start is always preferable, that is, a start determined by chance, if this number is 5, the sample is composed of the numbers, 5, 105, 205, 305,

Here are the steps you need to follow in order to achieve a systematic random sample:

Number the units in the population from 1 to N .

Decide on the n (sample size) that you want or need

$k = N/n =$ the interval size

randomly select an integer between 1 to k

then take every k th unit

$N = 100$

want $n = 20$

$N/n = 5$

**select a random number from 1-5:
chose 4**

start with #4 and take every 5th unit

1	26	51	76
2	27	52	77
3	23	53	78
4	20	54	79
5	30	55	80
6	31	56	81
7	32	57	82
8	33	58	83
9	34	59	84
10	35	60	85
11	36	61	86
12	37	62	87
13	38	63	88
14	39	64	89
15	40	65	90
16	41	66	91
17	42	67	92
18	43	68	93
19	44	69	94
20	45	70	95
21	46	71	96
22	47	72	97
23	48	73	98
24	49	74	99
25	50	75	100

All of this will be much clearer with an example. Let us assume that we have a population that only has $N=100$ people in it and that you want to take a sample of $n=20$. To use systematic sampling, the population must be listed in a random order. The sampling

fraction would be $f = 20/100 = 20\%$. In this case, the interval size, k , is equal to $N/n = 100/20 = 5$. Now, select a random integer from 1 to 5. In our example, imagine that you chose 4. Now, to select the sample, start with the 4th unit in the list and take every k -th unit (every 5th, because $k=5$). You would be sampling units 4, 9, 14, 19, and so on to 100 and you would wind up with 20 units in your sample.

Merits:

- This method is simple to follow
- This method distributes the sample more evenly over the entire listed population.

Demerits:

- This method is not truly random. All items selected for the sample (except the first item) are pre determined by the constant interval.
- This method may sometimes result into a badly biased sample. For example, if by chance every 10th, 23th, 25th, and 50th expense voucher in the universe were one made

out by an executive, the sample drawn would over-represent the expenses by executives, which may have certain special characteristics.

3. Cluster (Area) Random Sampling

Cluster sampling means random selection of sampling units consisting of population elements. Each such sampling unit is a cluster of population elements. Then from each selected sampling unit, a sample of population element is drawn by either simple random selection or stratified random selection.

A probability sampling procedure progresses in stages from larger sampling units. Cluster random sampling is most often used in large-scale studies in which the population is geographically spread out. The sampling unit is the cluster consisting of a groups rather than individuals, all of whom have the same characteristic. Alternatively, where the population elements are scattered over a wider area and a list of population elements is not readily available, the use of simple or stratified random sampling would be too expensive and time consuming. In such case, cluster sampling is usually adopted.

Under this method sample is prepared by stages. The population is divided into a number of large sampling units, each of which in turn is divided into smaller unit and so on. A random sample is taken of the large units at first stage and from those selected a further random sample, i.e. the second stage is collected of the smaller units. Suppose we want to take a sample of 5000 households from western development region of Nepal. At the first stage, the region may be divided into a number of districts and a few districts selected randomly. At the second stage, each district may be sub-divided into a numbers of village development committees and sample of VDC may be taken at randomly. At the third stage, 5000 households may be selected from the VDC selected at the second stage.

- Sampling list, identification and numbering are required only for units selected in the sample at each stage and not for all the unit of population.
- If sampling units at each stage are geographically defined (such as district, village etc) this method cut down field costs.
- Errors increase as the number of sampling units selected decreases.

Cluster sampling consists of first selecting, at random natural groups of units (called clusters) from the universe. Then all of some of units within each cluster are chosen to make up the sample. Cluster sampling is diametrically opposed to stratify sampling.

In cluster sampling for best results i) the units within each cluster should be as heterogeneous as possible and ii) there should be as small a difference as possible between the clusters. A cluster is a correct representation of the parent population. This is because the requirement of heterogeneity of the element within a cluster is rarely fulfilled. The tendency is for the birds of the same feather to cluster together. Therefore, estimates about the parent population based in cluster sampling are often in accurate.

The problem with random sampling methods when we have to sample a population that is disbursed across a wide geographic region is that you will have to cover a lot of ground geographically in order to get to each of the units you sampled.

The applications of the cluster sampling in social science are extensive, particularly in socio-economic survey, rural credit survey, demographic studies, ecological studies, public opinion polls, and large-scale survey of political and social behavior, attitude survey and so on.

Merits:

- This method is much easier and more convenient to apply when large populations are studied or large geographical areas are covered. Even a ready list of population is not necessary. A researcher can simply draw a random sample of geographical sections and adopt single or multistage sampling depending on the vastness of the area covered by the study.
- Cost and time effectiveness
- Units of the study can be readily substituted for other, units within the same random section.
- This method is flexible. Where it involves multistage sampling, it is possible to employ different types of sampling in successive stage.

Demerits:

- The cluster sizes may vary and this variation could increase the bias of the resulting sample. For example if the researcher were to interview all adults in household in each selected street, the number of adults would vary from house to house. There would be certain bias resulting from the large coverage of big families.
- The sampling error in this method is greater. Thus, this method is statistically less efficient than other probability sampling methods.

Comparison between cluster and stratified sampling.

BASIS FOR COMPARISON	STRATIFIED SAMPLING	CLUSTER SAMPLING
Meaning	Stratified sampling is one, in which the population is divided into homogeneous segments, and then the sample is randomly taken from the segments.	Cluster sampling refers to a sampling method wherein the members of the population are selected at random, from naturally occurring groups called 'cluster'.
Sample	Randomly selected individuals are taken from all the strata.	All the individuals are taken from randomly selected clusters.
Selection of population elements	Individually	Collectively
Homogeneity	Within group	Between groups
Heterogeneity	Between groups	Within group
Bifurcation	Imposed by the researcher	Naturally occurring groups
Objective	To increase precision and representation.	To reduce cost and improve efficiency.

4. Multistage sampling:

Multistage sampling is a further development of the principle of the cluster sampling. Instead of enumerating all the sample units in the selected clusters one can obtain better and more efficient estimators by resorting to sub sampling within the clusters. This type of sampling which consists of first selecting the clusters and then selecting specified number of elements from each selected cluster is known as sub sampling or two stage sampling. In such sampling designs, clusters which form the units of sampling the first stage are called first stage units or primary sampling units and the elements within clusters are called second stage units. This procedure can be generalized to three or more stages and termed multistage sampling.

Merits

- It is easier to administer than most single stage designs mainly because of the fact that sampling frame under multi-stage sampling is developed in partial units
- A large number of units can be sampled for a given cost under multistage sampling because of sequential clustering, where as this is not possible in most of the sample designs.

5. Sequential sampling:

This sampling design is somewhat complex design. The ultimate size of the sample under this technique is not fixed in advance, but is determined according to mathematical decisional rules on the basis of information yielded as survey progresses. This is usually adopted in case of acceptance sampling plan in context of statistical quality control. When a particular lot is to be accepted or rejected on a basis of single sample, it is known as single sampling; when the decision is to be taken on the basis of two samples, it is known as double sampling and in case the decision rests on the basis of more than two samples, it is known as double sampling and in case the decision rests on the basis of two samples but the number of samples is certain and decided in advance, the sampling is known as multistage sampling. But when the number of samples is more than two but is neither certain or decided in advance, this type of system is often referred to as sequential sampling. Thus, in brief, we can say that sequential sampling; one can go on taking samples one after another as long as one desires to do so.

B. Non-probability sampling

a sampling process in which every member of the available population has no equal probability of being selected. Due to lack of randomization, the non-probability sampling strategy and it tends to produce less representative sample. Such samples are more feasible for the researcher to obtain, however and many samples- in all research disciplines are non-probability samples. When a non-probability sample is carefully chosen to reflect the target population, through the careful use of inclusion and exclusion criteria, the research consumer can have more confidence in the representativeness of the sample and the external validity of the finding.

The difference between non-probability and Probability sampling is that non-probability sampling does not involve random selection and probability sampling does. Non-probability sample does not give a representative sample of the population. The primary methods of the non probability sampling are:

1) **Convenient sampling**: In this method, the researcher selects those units of the population in the sample, which appear convenient to him or to the management of the organization where he is conducting research. Convenient sampling refers to samples selected not by judgment or probability techniques but because the elements in a fraction of the population can be reached conveniently. It also termed accidental sampling in which the sampling units are selected simply because they are available-they are in the right place at right time that is convenient for the investigator's purpose.

These samples are therefore called "accidental", "man in the street", or "haphazard" sample. There is no attempt made to have a representative sample. Selection of the sample is totally based on the convenience of the researcher.

For example: if you have conduct "man on the street" interviews, you probably use convenient sampling. You stand up in a corner of a street and interview the desired number of passer-by.

Advantages:

- It is useful if the time and money is limited for the researcher
- It does not require a list of population
- It does not require any statistical expertise.

Disadvantages:

- It is highly biased, because of the researcher's subjectivity and so it does not yield a representative sample.
- It is the least reliable sampling method. There is no way of estimating the representativeness of the sample.
- The finding cannot be generalized
- Non-probability sampling plan does not perform inferential function i.e, the population parameters cannot be estimated from the sample value.
- It suffers from sampling bias, which will distort result.

Practical reason for using

- When there is no other feasible alternative due to non-availability of a list of population, non-availability of some population element for collection of data.
- When the study does not aim at generalizing the finding to the population, but simply at feeling the range of the conditions or nature of phenomena
- When cost and time required for probability sampling may be too large, and benefit expected from it is not commensurate with such costs.
-

2. Purposive or judgmental sampling:

In purposive sampling, we sample with a *purpose* in mind. We usually would have one or more specific predefined groups we are seeking. Researcher establishes certain criteria thought to be representative of the target population are deliberately select subject according to these criteria.

This method means deliberate selection of sample units that conform to some predetermined criteria. This is also known as judgment sampling. This involves selection of cases which researcher judges as the most appropriate ones for the given study. It is based on the judgment of the researcher or some expert. It does not aim at securing a cross section of a population.

For instance, have you ever run into people in a mall or on the street who are carrying a clipboard and who are stopping various people and asking if they could interview them? Most likely, they are conducting a purposive sample (and most likely, they are engaged in market research).

Purposive sampling can be very useful for situations where researcher need to reach a targeted sample quickly and where sampling for proportionality is not the primary concern. With a purposive sample, you are likely to get the opinions of your target population, but you are also likely to overweight subgroups in your population that are more readily accessible.

Advantage:

- It is very simple to draw. People often use it in exploratory investigation, which precede major surveys.
- It is less costly and involves less fieldwork since those units can be selected which are close to each other.
- It is more representative of typical conditions than the random sampling if the size of sample is small.

Demerits:

- It is not always reliable. The human mind has difficulty in recognizing typical item.
- It requires from the researcher considerable knowledge about the population, which he usually does not process.

3) Quota sampling:

This is a form of convenient sampling involving selection of quota group of accessible exemplifying units by traits such as sex, age, social class, etc, when the population is known to consist of various categories by sex. Age religion, social class, et, in specific proportion, each investigator may be given an assignment of quota groups specified by pre determined traits in specific proportions. He can then select accessible persons, belonging to those quota groups in the area assigned to him. In another word in quota, sampling researcher uses knowledge about the population to build some representativeness into the sampling plan. The quota sampling is one in which the researcher identifies the strata of the population and specifies the proportions of elements needed for the various segments of the population. By using information about the composition of the population, the investigator can ensure that diverse segments are represented in the sample. Quota sampling gets its name from the procedure of establishing quotas for the various strata from which data are to be collected.

Merits:

- It is considerably less costly and less time consuming than probability sampling
- There is no need for a list of population. thus, quota sampling is a suitable method of sampling a population for which no suitable frame is available
- Fieldwork can easily be organized. Strict supervision need not be required.

Demerits:

- It is not possible to estimate sampling errors because quota sampling does not meet the basic requirement of randomness
- It may not provide a representative sample of respondents despite there being instructions to, and constraints on, interviewers to guard against the main dangers of selection bias.
- In this type of sample investigator vary often select those respondents whom he knows.

4) Snowball Sampling:

Snowball is a special non-probability method used when the desired sample characteristic is rare. This sampling design is widely used in applications where respondents are difficult to identify and are best located through referral network. In snowball sampling, researcher begins by identifying someone who meets the criteria for inclusion in your study. Then ask them to recommend others who they may know who also meet the criteria. Although this method would hardly lead to representative samples, there are times when it may be the best method available. Snowball sampling is especially useful when you are trying to reach populations that are inaccessible or hard to find. For instance, if you are studying the homeless, you are not likely to be able to find good lists of homeless people within a specific geographical area. However, if you go to that area and identify one or two, you may find that they know very well who the other homeless people in their vicinity are and how you can find them. This sampling is particularly used to study drug cultures, teenage gang activities, community relations, political activities and other applications where respondents are difficult to identify and contacts.

Merits:

- It is very useful in studying social groups, informal group in a formal organization, and diffusion of information among professionals of various kinds.
- It is useful for smaller populations for which no framers are readily available.

Demerits:

- It does not allow the use of probability statistical methods. Elements included are dependent on the subjective choice of the original selected respondents.
- It is difficult to apply this method when the population is large
- It does not ensure the inclusion of all elements in the list

Choosing non probability versus sampling:

In probability sampling every element in the population has non zero probability of selection. For this complete list of population element (sampling frame) is required. In certain cases, the complete list can not be formed (customer satisfaction survey of kathmandu mall), at such case non probability sampling technique is used instead of probability sampling technique.

The choice between non probability and probability samples should be based on considerations such as nature of the research, relative magnitude of non sampling versus sampling errors. Variability in the populations, as well as statistical and operational considerations as following tables

FACTORS	Conditions favoring the use of	
	Non-probability sampling	Probability sampling
Sampling frame is available or not	Frame is unavailable	Frame is available
Nature of research	Exploratory	Conclusive i.e. descriptive and causal
Relative magnitude of sampling and non sampling errors	Non sampling errors are larger	Sampling errors are larger
Variability in the population	Homogenous(low)	Heterogeneous(High)
Statistical consideration	Unfavourable	Favorable
Operational considerations	Favourable	Unfavourable

For example, in exploratory research, the findings are treated as preliminary and the use of probability sampling may not be warranted. On the other hand, in conclusive research where the researcher wishes to use the results to estimate overall population characteristics, probability sampling is favored. Probability samples allow statistical projection of the result to a target population.

For some research problems, highly accurate estimates of population characteristics are required. In these situations, the elimination of selection bias and the ability to calculate sampling error make probability sampling desirable. However, probability sampling will not always result in more accurate results. If non sampling errors are likely to be an important factor, then non probability sampling may be preferable, as the use of judgment may allow greater control over the sampling process.

Another consideration is the homogeneity of the population with respect to the variables of interest. A more heterogeneous population would favor probability sampling, because it would be more important to secure a representative sample. Probability sampling is preferable from a statistical view point, as it is basis of the most statistical techniques.

However, probability sampling is sophisticated and requires statistical trained researchers. It generally costs more and takes longer than non probability sampling. In many research projects, it is difficult to justify the additional time and expenses.

Therefore, in practice, the objectives of the study dictate which sampling method will be used.

ERRORS IN STATISTICS:

An 'error' refers to the difference between the true value of a population parameter and its estimate provided by an appropriate sample statistic computed by some statistical device. It should be distinguished from mistakes or inaccuracies, which may be committed in the course of making observations, counting, calculations etc. these errors in statistics arise due to as number of factors such as:

- i. Approximations in measurement
- ii. Approximation in rounding of the figures to the nearest integer
- iii. The biases due to faulty collection, presentation, analysis and interpretation of the results
- iv. Personal biases of the investigators etc.

In statistical investigation, these discrepancies (errors) between the estimated and the actual values are the net effect of a multiplicity of factors and can be broadly classified into the following two groups.

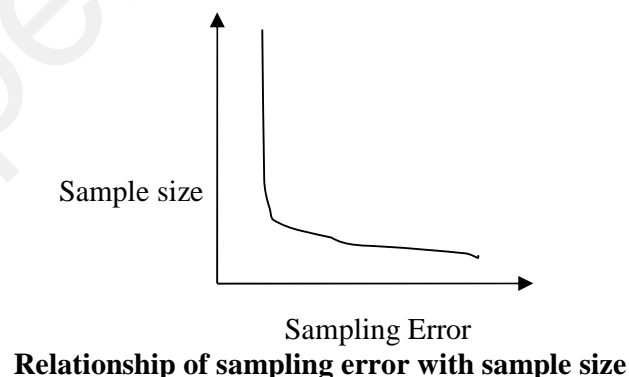
SAMPLING ERROR VERSUS NON SAMPLING ERROR

The inaccuracies or errors in any statistical investigation i.e. in collection, processing and analysis of data may be broadly classified as follows.

- i. sampling error
- ii. Non sampling error

Sampling Error:

In sample surveys, since only a small portion of the population is studied, its results are bound to differ from census results and thus have a certain amount of error. Thus, the error arises due to estimating population parameter only by selecting few units (sample) is called sampling error. This error is inherent and unavoidable in any and every sampling scheme. A sample with the smallest sampling error is considered to be a good representative of the population. Increasing the sample size of the sample can reduce sampling error i.e. the sampling error is inversely proportional to the sample size. The error can be completely eliminated by increasing the sample to include every item of the population.



The sampling errors committed due to

- i. Faulty selection of the sample.
- ii. Substitution of convenient unit of the population.
- iii. Faulty demarcation of sampling units.
- iv. Improper choice of the statistics for estimating the population parameter.

Non-Sampling Errors:

Non sampling errors are not attributed to chance and are a consequence of certain factors, which are within human control. In other words, they are due to certain causes, which can be traced and may arise at any stage of the inquiry such as planning and execution of the survey and collection and processing and analysis of the data. Non sampling errors are thus present both in census surveys as well as sample surveys. Thus, the data obtained in a complete enumeration; although free from sampling errors would still be subject to non sampling errors where as data obtained in a sample survey would be subject to both sampling and non sampling errors.

Non sampling errors can occur at every stage of the planning or execution of census or sample survey. The preparation of exhaustive list of all the sources of non sampling errors is a very difficult task. However, a careful examination of the major phases of survey (enumeration of sample) indicates that some of the more important non sampling errors arise from the following factors.

Faulty Planning or Definitions:

The planning of a survey consists in explicitly stating objectives of the survey and these objectives are then translated into i) a set of definitions of the characteristics for which data are to be collected, and the ii) into a set of specifications for collection, processing and publishing. Here non sampling error can be due to:

- A) Data specification being inadequate and inconsistent with the respect to the objectives of the survey.
- B) Errors due to location of the units and actual measurement of the characteristics errors in recording the measurements, errors due to ill designed questionnaire etc.
- C) Lack of trained and qualified investigators and lack of adequate supervisory staffs

Response errors:

These errors are introduced as a result of the responses furnished by the respondents and may be due to any of the following reasons:

- i) Response errors may be accidental
- ii) Prestige bias
- iii) Self-interest
- iv) Bias due to the interviewer
- v) Failure of respondent memory

Non-response bias:

In house-to-house survey, non-response usually results if the respondent is not found at home even after repeated calls, or if he is unable to furnish the information on all the questions or if he refuses to answer certain questions.

Errors of Coverage;

If the objectives of the survey are not precisely stated, this may result i) the inclusion in the survey of certain units which are not to be included, or ii) the exclusion of certain units which were to be included in the under the objectives.

Compiling errors:

Various operations of data processing such as editing and coding of the responses, punching of cards, tabulation and summarizing the original observations made in survey are potential sources of error.

Publication errors:

Publications errors i.e. the errors committed during presentation and printings of tabulated results are basically due to two sources. The first refers to the mechanics of publication- the proofing error. The other, which is of more serious nature, lies in the failure of the survey organization to point out the limitations of the statistics.

A census method involves only non-sampling error while a sample survey contains both sampling and non-sampling errors.

In sample survey, non-sampling error can be efficiently controlled by:

- Employing qualified and trained personnel for planning and execution of the survey
- Using more sophisticated statistical techniques and equipment for the processing and analysis of the data
- Providing adequate supervisory checks on the field work
- Pre testing or conducting a pilot survey
- Through editing and scrutiny of the results
- Effective checking of all the steps in the processing and analysis of data
- More effective follow up of non-response cases
- Imparting through training to the investigators for efficient conduct of the inquiry
- By providing adequate motivational and awareness program

Moreover, the sampling error in a sample survey can be minimized by taking an adequately large samples selected by appropriate sampling plan.

Determining sample size:

In economic and business research determining the proper sample size is a complicated procedure, subject to the constraints of budget, time, ease of selection and required precision. What factors should be considered while determining the size of sample? We should try to select a sample that includes enough participants to ensure a valid research investigation.

Sample Size determination for the mean:

To determine the sample size for the mean, researcher must know three factors:

1. The desired confidence level, which determines the value of Z, the critical value from the standardized normal distribution.
2. The acceptable sampling error 'e'. where $(e = \bar{x} - \mu \text{ or } e = Z \sigma / \sqrt{n})$
3. The estimated value of standard deviation

Then the sample size (n) for the mean is equal to the product of the Z values squared and the variance divided by the sampling error e squared.

In case of infinite population

$$n = Z^2 \sigma^2 / e^2$$

In case of finite population

$$n = Z^2 N \sigma^2 / e^2 (N-1) + Z^2 N \sigma^2$$

The question of acceptable error arises because most samples deviate to some degree from the population. This deviation of sample characteristics from those of the population is called sampling error. Hence, the acceptable amount of sampling error has to be decided when determining sample size. On the other hand, the estimation of the standard deviation can be based on experience, the results of the exploratory or pilot survey or other equivalent estimates. Once we determine the acceptable error and estimate of variance. We can calculate the size of sample needed.

Sample size determination for a proportion:

To determine the sample size for a proportion, researcher must know three factors;

1. The desired level of confidence that determines the value of Z.

2. The acceptance sampling error e . (where $e = p - P$) or $e = Z \cdot \sqrt{p(1-p)} / n$
3. The estimated value of proportion p .

$$\text{In case of infinite population} \\ n = Z^2 p (1-p) / e^2$$

$$\text{In case of finite population} \\ n = Z^2 p (1-p) N / e^2 (N - 1) + Z^2 p (1-p)$$

Then sample size (n) for a proportion is equal to the estimated value of proportion p . times 1 minus p . divided by the sampling error squared.

Copper and Schinder state some principles that influence the sample size:

- The greater the dispersion or variance within the population, the larger the sample must be to provide estimation precision.
- The greater the desired precision of the estimates, the larger the sample must be.
- The higher the confidence level in the estimate, the larger the sample must be.
- The greater the number of sub- groups of interest within a sample. The greater the sample size must be, as each group must meet minimum sample size requirements.

Sample size determination (exercise):

1. If the quality control manager wants to estimate the mean life of light bulbs to within ± 20 hours with 95 % confidence and also assumes that process standard deviation is 100 hours. What sample size is needed?
2. An advertising agency that serves a major radio station wants to estimate the mean amount of the time that the station's audience spends listening to the radio on a daily basis. From past studies, the standard deviation is estimated as 45 minutes.
 - a. What sample size is needed if the agency wants to be 90% confidence of being correct with ± 5 minutes?
 - b. If 90% confidence is desired, what sample is necessary?
3. Suppose you want to estimate the population mean force required to break the insulator to within ± 25 pounds with 95 % confidence. on the basis of a study taken previous year, you believe that the standard deviation is 100 pounds. Find the sample size needed.
4. You want to have 90 % confidence of estimating the population of workers who respond to email within an hour to within ± 0.05 . Because you have not previously undertaken such a study, there is no information available from past data. Determine the sample size needed.
5. determine the size of sample for estimating the true weight of cereal containers for the universe with $N = 500$ on the basis of following information
 1. The variance of weight = 4 ounces on the basis of past records.
 2. Estimates should be within 0.8 ounces of the true average weight with 99 % probability.
6. if you want be 95 % confident of estimating the population mean within a sampling error of ± 5 and the standard deviation is assumed to be 15, what sample size is required?
7. If you want to be 99 % confident of estimating the population proportion to within sample error of ± 0.04 , what sample size is needed?
8. If you want to be 95 % confident of estimating the population proportion to within a sampling error of ± 0.02 and there is historical evidence that the population proportion is approximately 0.40, what sample size is needed?
9. A researcher wants to estimate universe mean by using sampling technique. What should be the sample size when the permissible error between parameter value and sample statistic in 95 % of chances will not be more than 1.5 and population standard deviation is 15.

10. in a study of time motion pf factory, the supervisor estimates standard deviation to be 0.45 seconds. If you want be 95 % confident that error will not exceed 0.01 second. What should the size of sample to estimate population mean?
11. if the population proportion of success is 0.65 and $n = 100$, what will be the value of sampling error when the acceptance region is 0.95?
12. From a sample of 400 computed mean and standard error or mean found to be 125 and 2.5 respectively. What should be taken to insure 99 % confidence that the population mean lies within more or less 5 of the sample mean?
13. the inspection division of Nepal standard and meteorology department wants to estimate the mean amount of soft drink fill in 2 liter bottle to within ± 0.01 liter with 95 % confidence. He assumes that the s.d. is 0.05 liter, what sample size the department need to survey?

DATA COLLECTION

Why data are needed?

Obtaining appropriate information is essential to conduct research. Data contain information needed to make a more informed decision in particular situation of any research.

Some examples:

- A market researcher needs to assess product characteristics to distinguish one product to another.
- An operations manager wants to monitor an assembly process on regular basis to find out whether the quality of the product is being produced is conforming to company standards.
- A potential investor wants to determine what firms within what industries are likely to have accelerated growth in a period of economic recovery.
- An auditor wants to review the financial transaction of a company in order to ascertain whether or not it compliance with generally accepted accounting principles.

Reasons for obtaining Data:

(Data are facts figures that are collected, analyzed and summarized)

- To provide the necessary input to a survey.
- To provide the necessary input to a study.
- To measure performance of an ongoing service or production process.
- To evaluate conformance to standards.
- To assist in formulating alternative courses of action in a decision making process.
- To satisfy our curiosity.

Methods of data collection (sources of data):

The task of data collection begins after a research problem has been defined and research design/plan chalked out. While deciding about the method of data collection to be used for the study, the researcher should keep in mind two types of data viz. primary and secondary data. The primary data are those which are collected afresh and for the first time, and thus happen to be original in character. The secondary data, on the other hand, are those which have already been collected by someone else and which have already been passed through statistical process.

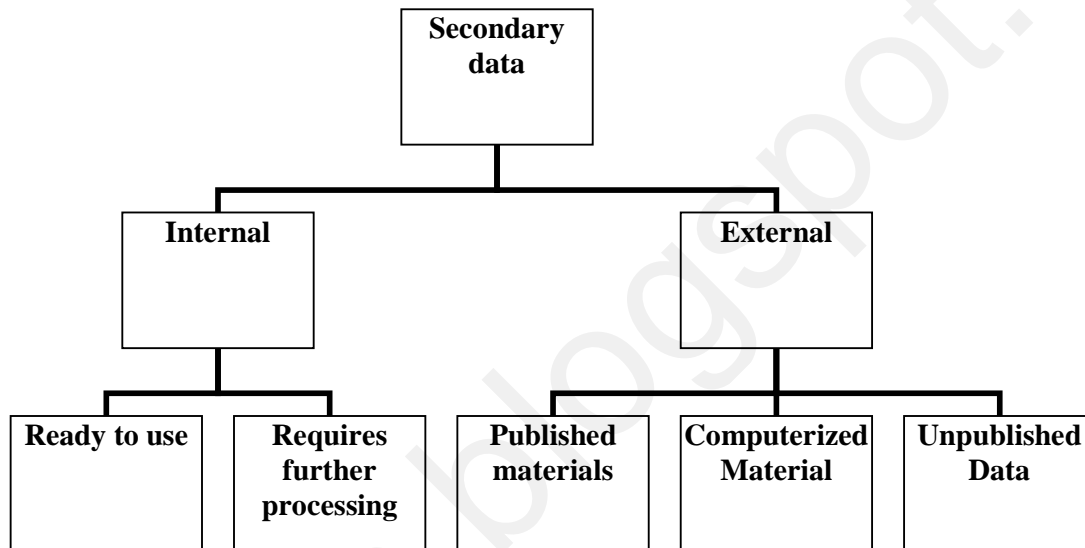
Methods of collecting Secondary data:

Secondary data are collected from sources which have been already created for the purpose of first time use and future uses. They are one of the cheapest and easiest means of access to information. Hence, first thing a researcher should do is search for secondary data available on the topic. The amount of secondary data available is overwhelming and researchers have to locate and utilize the data that are relevant to their research.

Sometimes use of primary data in any research is not always practicable due to availability of time, money, effort, and so on. So, in such cases the investigator uses data which have already been collected and used by others.

Classification of secondary data:

Following figure presents a classification of secondary data:



Secondary data may be classified as internal or external. **Internal data** are those generated within the organization (company's internal records) for which the research is being conducted. But these data may require considerable processing before they are useful to the researcher.

Examples: no of branches, total no of employees? Staffs, sales invoices, sales by specific stores, annual report etc.

External Data, on the other hand are those generated by sources outside the organization. These data may exist in the form of published material, online database, or information made available by syndicated services.

Published sources: The various sources of secondary data are a) reports and official publications b) semi-official publications c) private publications.

b) reports and official publications: the following are the publications made by international agencies:

international bodies such as International Monetary fund, International finance corporation, United Nations organization, world health organization, world bank etc.

The following are the publications made by Government organizations:

Population census carried by central Bureau of Statistics, publications made by different ministries such as ministry of industry and commerce, ministry of education ministry of health etc.

- c) Semi-official publications: Very useful information can be obtained from the publications of the semi government organization such as Nepal food corporations, NIDC etc.
- d) Un official or private publication: some of the private organization from which the secondary data can be obtained are mentioned below:
 - Trade and professional organizations such as Nepal chamber of commerce
 - Financial and economic journals
 - Trade associations brought out by research agencies and research scholars.

Computerized Databases:

Computerized databases consist of information that has been made available in computer readable form for electronic distribution. Computerized databases may be classified as online, internet or offline. Online databases consist of central data bank, which is accessed with the computer via telecommunication networks. Internet databases can be accessed, searched and analyzed on internet. It is also possible to download data from internet and stores them in computer or auxiliary storage devices. Offline databases make the information available on diskettes and CD-ROM disks.

Uses of Secondary Data

Secondary data can be used by researchers in many ways. Some of them are

1. Secondary data actually provide enough information to resolve the problem being investigated.
2. Secondary data can be a valuable source of new ideas that can be explored later through primary research.
3. Examining available secondary data is a prerequisite to collecting primary data. It helps to define the problem and formulate hypothesis about its solution. It will almost always provide a better understanding of the problem and its context frequently will suggest solutions not considered previously.
4. Secondary data is of use in the collection of primary data. Examining the methodology and techniques by other investigators in similar studies may be useful in planning the present one. It may also suggest better methods.
5. Secondary data can also serve as a reference base against which to compare the validity or accuracy of primary data.

Benefits and Limitations of Secondary Data

Benefits	Limitations
<ol style="list-style-type: none"> 1. Low cost 2. less effort expended 3. less time taken 4. sometimes more accurate than primary 5. some information can be 6. obtained only from secondary data 	<ol style="list-style-type: none"> 1. collected for some other purpose 2. no control over data collection 3. may not be accurate 4. may not be reported in the required form 5. may be outdated 6. may not meet data requirement 7. a number of assumptions to be made

Some popular secondary sources of Nepal

1. report of Nepal living standard survey(CBS)
2. report of Nepal household budget survey(NRB)
3. macro economic indicators(NRB)
4. population Monograph(CBS)
5. Economic survey(MOF)

Methods of collecting primary data:

Primary data are original data gathered by the researcher expressly to solve the problem under consideration at that time. These data have not been previously collected or assembled for any other known project. In short, they are data that did not previously exist in organized fashion. There are several ways of gathering primary data. These data sources can be classified into three categories:

- i. questionnaire
- ii. interviews
- iii. observations

Questionnaire:

The main tool that is used in survey research is questionnaire. *A questionnaire is a formal list of designed to gather responses from respondents on a given topic.* Thus, questionnaire is an efficient data collecting mechanism when the researcher knows exactly what is required and how to measure the variables of interest.

A questionnaire involves several steps, including writing question items, organizing the question items on a questionnaire, administering the questionnaire and so on. We should remember that a collection of question does not make a questionnaire. The questions must be organized into coherent, visually pleasing format. This process involves paying attention to the design of the questionnaire. An organized questionnaire is much easier and more enjoyable for the respondent to complete. This may also increase the response and completion rates.

A questionnaire can be designed to secure different types of primary data from the respondents: i. *intentions*, ii. *Attitudes and opinions*, iii. *Activities and behavior* and iv. *Demographic characteristic*. However, we should pay particular attention to what information we would like to seek from the respondents. The issue of questionnaire design is also for quality data collection. The keys to successful questionnaire design are: order, wording, layout, length and appearance.

Questionnaire administering techniques:

- i. Questionnaire through the mail
- ii. Questionnaire through the post
- iii. Questionnaire through the online
- iv.
- v. Questionnaire through the SMS

Questionnaire design

A good questionnaire accomplishes the researcher's objectives. Surveys must be custom-built to the specification of a given research purposes, and they are much more than a collection of unambiguous questions. A number of constraints are imposed on the development of an appropriate questionnaire. For example, the number, form and

ordering of the specific questions are partly determined by the data collection method. The respondent's willingness and ability to answer also influences the final questionnaire method. The wording and sequencing of questions can facilitate recall and motivate accurate responses.

Although each questionnaire must be designed with the specific research objectives in mind, there is sequence of logical steps that every researcher must follow to develop a questionnaire:

1. Plan what to measure
 - Revisit the research objectives
 - decide on the research issue of your questionnaire
 - get additional information on the research issue from secondary data sources and exploratory research
 - decide on what is to be asked under the research issue
2. Formulate questions to obtain the needed information
 - In each issue, determine the content of each question
 - Decide on the format of each question
3. Decide on the order and wording of question and on layout of the questionnaire
 - Determine how the question to be worded
 - Evaluate each research question on the basis of comprehensibility, knowledge and ability, willingness/inclination of atypical respondent to answer the question
 - Lay out the questions in each subtopic to get a single questionnaire
 - Group all questions in each subtopic to get a single questionnaire
4. Using a small sample, test the questionnaire for omission and ambiguity:
 - Read through the whole questionnaire to check whether it makes sense and measures what is suppose to measure (validity)
 - Check the questionnaire for error
 - Check the physical appearance
 - Pretest the questionnaire
5. Correct the questions (and pretest again, if necessary) and give a final shape.

A questionnaire can be designed to secure different types of primary data from the respondents: as mentioned above. So the questionnaire design that draws out accurate information, that can be completed easily by the interviewer, that flows well, and that leaves the respondents feel satisfied for their worth while participation in that research, can be described as an effective design.

Information desired:

What information would we want to collect? We should make a plan of our information requirements. Collecting unnecessary information may consume more our time and resources. The respondents are also irritated by long questionnaires. We should also avoid questions that are too personal. If one question antagonizes a respondent, he or she is quite likely not to answer any of them.

Type and form of question:

One of major decision area in question decision area in question design is the degree and form of structure imposed on the participant. The various strategies offer options that include unstructured response (or open ended response, the free choice of words) and structured response (or closed response, specified alternatives provided). Open ended

questions allow respondents to answer them in any way they choose. A closed question, in contrast, would restrict the respondents within the alternative given.

Length:

Simple, short questions are preferable than long ones. The longer is the questionnaire the more it costs to administer to interpret the data obtained. Long questions consume more time of respondents. This may discourage the respondents to complete the questionnaire.

Wording

A great precaution is necessary in wording the questions. Proper wording and proper language are absolutely essential. The words should be simple, clear and unambiguous.

Order:

The related questions should be logically ordered. Question order is especially important when multiple choice questions are used. Good questionnaire are funnel-shaped. They move from general to particular. Well organized questionnaire keeps the respondent's attention on one issue at a time, rather than jumping from issue to issue. The order and flow of questions should be logical to the respondents.

Physical appearance:

Attention should be paid to in order to give a good physical appearance to the questionnaire so as to get good response from the respondents. The matters that require special attention include quality and size of paper, quality of typing or printing, attractive presentation of question items, including margins and spacing.

Components of a questionnaire:

The major components of questionnaire fall into three basic categories:

- i. explanation of information(administrative questions)
- ii. basic information (target questions)
- iii. classification information(classification questions)

These sections in questionnaire will appear normally appear in the order listed.

Explanation of information:

The researcher provides explanation information to the respondents to explain the purpose of the study. This basic information is usually given at the beginning of the questionnaire in the form of letter or instructions. Explanation information states i. purpose of the study, ii. Makes an appeal for responses, and iii. Provides information on completion the questionnaire properly.

Basic information:

This is the main part of questionnaire. Basic information desired from the study, of course, refers to that information which is needed to solve the problem, which prompted the study to be undertaken. This part of the questionnaire thus covers all necessary subjects under investigation adequately. The basic information section may be only a few questions in length or it may be several pages, depending on the amount of data sought.

Classification information:

Classification questions usually cover sociological-demographic variables that allow participants answers too be grouped so that patterns are revealed and can be studied. These questions usually appear at the end of a survey. Most of the commonly gathered classification information includes age, gender, education, marital status, family income, occupation etc. this information can be used for segmenting the samples by various characteristics and attributes of interest. Classification information thus enables the researcher to analyze the data obtained through tabulation. Such information is also important for drawing profile of respondents and determining significant differences between groups of respondents.

Methods of administering questionnaires:

Self administered	• Online questionnaire
	• Postal questionnaire
	• Delivery of and collection of questionnaire
Interviewer administered	• Telephone questionnaire
	• Structured interview

Measuring the questionnaire Administering:

The researcher's performance in the questionnaire administration can be measured usually with respect to four aspects. These are:

Contact rate: making contacts with the respondents could be a problem in some cases. The proportion of addresses or eligible names with which the researcher makes contact measures this rate.

Response rate: non response could be a also problem in some research studies. The proportion of contacts that result in interviews measures the response rate.

Completeness rate: questionnaires returned incomplete are useless. The proportion of information obtained to that desired measures the completeness rate.

Accuracy rate: the accuracy rate is defined as the ratio of measured to true values.

Requisites of a good question:

- No hard and fast rules can be given for the nature of the questions because it all depends upon the individuals, nature of the study, types of the respondents, quality of field workers etc. however some guidelines are:
- The question should be few, short, clearly worded, simple and easy to reply.
- They should be within the information scope of respondents i.e. the respondent is in the position to reply
- They should have direct bearing with objectives of the investigation/research problem.
- Units or technical terms used in the schedules should be kept as far as possible the same have been in some previous enquiries unless otherwise required. The questions should be inter-related with each other so that the sequence may be maintained and checking can be made easily possible.
- Cross checking question may be given to avoid any manipulation by the respondent.
- As far as possible, only impersonal questions are to be included.
- The questions should be so framed that there is minimum of writing works.
- The question should be free from ambiguity
- In questions dealing with the degree of intensity of feeling or conviction, the words-why, what, when, how questions should also be included.
- Tabulation plan must be kept in mind while framing questions. Code numbers for each question and their expected answers are highly appreciated because they facilitate the classification and tabulation of data.

OBSERVATION:

Another method of eliciting the information is to observe the phenomenon and the method is probably the oldest used by man kind in scientific investigation. Literally, observation is watching, listening and reading. In concise oxford dictionary observation has been defined as "accurate watching, noting of phenomenon as they occur in nature with regard to cause and effect and natural relationship." In the words of P.V. Young "observation may be defined as systematic viewing, coupled with consideration of seen phenomena."

In observation method, the investigator will collect data through personal observations. thus observation is the process of recognizing and noting people, objects and occurrence rather asking for information.

Direct observations have the advantage of putting researchers into first hand contact with reality. The research based on observation involves observing and recording the behavior of subjects. This can be done either in the field or in laboratory. However, observation represents a time consuming and expensive way of gathering data. As such, unless extensive funds or time is available, it is usually possible to observe only small number of individuals or groups.

Observation involves three processes viz. sensation, attention and perception. Sensation is gained through the sense organs, which depends upon the physical alertness of the observation. Attention on concentration, which largely a matter of habit, and perception enable the mind to recognize the facts.

Why use of Observation?

- Observation allows you to study people in their natural setting without their behavior being influenced by your presence
- Observational data usually consists of detailed information about the particular groups or situations. This kind of data can 'fill out' and provide a deeper, richer, understanding than survey work which tends to produce less detailed information about a large number of people.
- A lot of what people do, they take for granted. They do it naturally. They are not aware of it.
- Some methods only allow for the study of one individual at a time. Observation enables you to study groups of people together, that is, it allows for the study of interaction between members of a group.
- An interview, for instance only shows a persons view at one time. Observation involves the study of group or situation over time, thus revealing changes.
- Some groups of people may not agree to cooperate with methods of research such as interviews. Hence observation is the only way of finding out about such groups.
- Observational research findings are considered strong in validity because you can collect depth information about a particular behavior.

Merits:

- i. Subjective bias is eliminated
- ii. Information obtained relates to what is currently happening
- iii. It is not complicated by either the past behavior or future intentions or attitudes
- iv. It is independent of willingness to respond.
- v. Suitable in studies which deal with respondents who are not giving verbal reports of their feelings.

Limitations:

- i. It is expensive methods
- ii. Information provided by this method is very limited
- iii. Sometimes unforeseen factors may interfere with the observational task

Kinds of observation:

There are various types of observations classified according to the control exercised. The main types of observation method are: Participant observation and non participant observation. This distinction depends upon the observer's sharing or not sharing the life of group he is observing.

Participant observation

Participant observation is qualitative. This technique is unstructured and unsystematic. In this method researcher observes only one group over a long period of time. The observation technique that they use is called participant observation. They may use one of three different types of participant observation: i) the researcher is or becomes a member of the group he/she studies, ii) the researcher may act as member of the group; although he/she is really not one, and iii) he/she may join in the role of a person who is there only to observe a group.

Merits:

- i) The researcher is enabled to record the natural behavior of the group.
- ii) The researcher can even gather information which could not be easily obtained if he observes in a disinterested fashion.
- iii) The researcher can verify the truth statements made by information in the context of questionnaire or schedule.

Demerits:

- i. lack or loss of objectivity due to emotional participation
- ii. Longer time required
- iii. Range of experience is narrowed down
- iv. Greater resources required
- v. Active participation is not possible in criminal gang or prison inmates

Non-Participating Observation:

When the observer does not actually participate in the activities of the group but simply observes them from a distance, the observation of this type is known as non-participant observation.. Purely non –participant observation is extremely difficult for a person to be present but not to participate in the activities.

Merits:

- i. Objectivity and purely scientific outlook can be maintained
- ii. Even minute things would be observed which otherwise would be neglected
- iii. The observer remains unattached and impartial without having any prejudices.

Demerits:

- i. Fails to find or appreciate the significance of a number of actions and activities
- ii. observes only those activities that take place before him which is always a part of many activities,
- iii. People normally do not behave in natural way in presence of a stranger.

Interview:

The technique of collecting primary data is used widely in research. Interviewing has become a very popular tool for conducting research in fields that do not demand experimental work. It is well established, practicable and reliable method of data collection. Interviews can be held in the respondent's home or place of employment or in any other suitable place. The researcher may ask questions on the issues of his or her research interest and record the answers of the respondents in a sheet of paper. The information thus collected would provide valuable insights into the phenomena under investigation.

There are different types of interviews. The interviewers may ask questions and then suggest a list of possible answers, this is a *structured interview*. On the other hand, if a data collector did not know what exact information he or she could obtain, then he or she could ask questions letting the interviewee answer them in his her own style. The latter technique is called and *unstructured or open interview*.

Types of research interviews:

The research interviews can be different according to the level of structure and standardization adopted. Different types of interviews are used for different purposes. The most common classifications of interview are:

1. Face-to-face interview:

The most common method of obtaining survey data is the face to face interview. In this method, the interviewer talks to the respondent directly. This can be done in the respondent's home or place of employment or in any other suitable place. Quality of data is the first basic requirement of any research. The face to face interview encounters achieve quality of data in number of ways. First, all face to face interviews involve interaction between interviewer and the respondents. One benefit of this interaction is the depth and reliability of information the interviewer can achieve. Non verbal communication also aids understanding gestures and facial expressions. The tone of voice can further meaning to respondents' answers.

2. Telephone interview:

Telephone interview today is a well established technique of data collection. With the telephone becoming more and more widespread, there is also growth in the number of research being conducted through the telephone. In telephone interviewing, the interviewer contacts respondents by telephone rather than by mail. The questions asked are more or less structured in nature. The interviewer uses a structured interview schedule to be administered. This type of interviewing is the best suited when many respondents are to be researched over a wide geographical area and the time available for interview is very short.

3. Focus group Interviews:

Group interviews involve two or more interviews. A focus group generally involves 6-10 persons. They are brought together at one place to discuss the topic of interest. This type of interview is more suitable for gathering information about certain specific issues. Particularly, the inner feeling and emotional attitudes of the interviewees with respect to a given problem or situation are studied. When the focus group is organized, the interviewer (moderator) provides a brief general comment on the purpose of the meeting and suggests a specific topic to open the discussion. From this discussion, the moderator may move the group to talk about how they feel about the subject or issue of interest and move them to a discussion of their attitudes and opinions towards the issue. The moderator does not interfere too often during the discussions. The moderator intervenes when a topic has been exhausted or to bring the discussion back to the main issue when it goes outside the theme of discussion.

Focus group interviews are usually taped so that the moderator can concentrate on keeping the discussion on track without fear of losing any information. When tape recorded, the moderator can analyze the results later at his or her convenience.

4. Individual-In-depth Interview:

Individual in-depth interviews are interviews that are conducted face to face with the respondent, in which the subject matter of the interview is explored in detail. There are two basic types of in-depth interviews. They are non directive interviews and semi structured, and the difference lies in the amount of guidance the interviewer provides. In **non directive interviews** the respondent is given maximum freedom to respond, with the bound topics of interest to the interviewer. Success depends on (1) establishing a relaxed and sympathetic relationship (2) the ability to probe in order to clarify and elaborate on interesting responses, without biasing the content of responses and (3) the skill of guiding the discussion back to the

topic outline when digressions are unfruitful. In **semi structured** or focused individual interviews the interviewer attempts to cover a specific list of topics or sub areas. The timing, exact wording and the time allocating to each question area are left to the interviewer's discretion.

Guidelines on Interviewing:

Each interviewer is to follow these techniques for good interviewing:

1. Provide his or her full name, if asked by the respondents, as well as a phone number for the research firm.
2. Read each question exactly as written. Report any problems to the supervisor as soon as possible
3. Read the questions in the order indicated in the questionnaire, following the skip sequences.
4. Clarify any question to the respondent in neutral way.
5. Do not mislead respondent as to length of the interview
6. Do not reveal the identity of the ultimate client instructed to do so.
7. Keep a tally on each terminated interview and reason for each termination.
8. Remain neutral in interviewing. Do not indicate agreement or disagreement with the respondents.
9. Speak slowly and distinctly so that words will be understood.
10. Record all replies verbatim, not paraphrased.
11. Avoid unnecessary conversations with the respondents.
12. Probe and clarify for additional comments on all open-ended questions, unless otherwise instructed. Probe and clarify in neutral way.
13. Write neatly and legibly.
14. Check all work for thoroughness before turning in to the supervisor.
15. When terminating a respondent, do so in neutral way such as "thank you".
16. Keep all studies, materials and confidential.
17. Do not falsify any interviews or any answers to any questions
18. Thank the respondents for participation in the study.

Advantages of the interview:

- i. the interview is more appropriate for complex situations
- ii. It is useful for collecting in-depth information.
- iii. Information can be supplemented
- iv. Questions can be explained
- v. Interviewing has a wider application.

Disadvantages of the interview:

- i. Interviewing is time-consuming and expensive
- ii. The quality of data depends upon the quality of interaction.
- iii. The quality of data depends upon the quality of the interviewer
- iv. The quality of data may vary when many interviewers are used
- v. The researcher may introduce his/her bias
- vi. The interviewer may be biased

Unit V: Writing A Research Report

Introduction:

The final step of the research process is the publication of the finding, that is, the dissemination of information gathered during the investigation. This is an important step because it informs the readers/ audience/ clients/sponsors/ community/government etc in the area of study, findings and act upon them.

The research report is 'the face of the investigation'. Hence, reports must be prepared in a manner that will present the findings clearly and as constructively as possible.

A research report is an oral presentation and /or a written statement that has a purpose of communicating research findings, recommendations for courses of action, and other findings to sponsor management or other specific audiences. Actually, report preparation and presentation constitute the final step in a research project. It follows problem definition, approach development, research design formulation, fieldwork and data presentation and analysis.

A report is simply a statement or description of things that have already occurred. It is concise clear communication of the important findings of the research work. Reports communicate information which has been compiled as a result of research and analysis of data and of issues. Report focus on transmitting information with a clear purpose, to a specific audience. Good reports are documents that are accurate, objective and complete. They should be well – written clearly structured and expressed in a way that it holds the reader's attention and meets their expectations.

The research report enables you to demonstrate your understanding of, and ability to, use techniques in methods of analysis and provides you the opportunity to significantly develop your management skills.

Research reports vary in scope and treatment. Each university might set own format and style of thesis writing for its research students. The funding organizations supporting research demand a certain way of reporting. The editorial board of each research journal may lay down its own guidelines for research papers publish by them. While there may be minor changes in these, their main intention is to enable the researcher to communicate his ideas and results efficiently to the reader. In order to achieve efficient communication there are certain conventions followed in form and style.

The main difference between research and other writing is in the degree of control, rigorousness and caution required. Research writing is controlled in the sense that you need to be extremely careful about what you write, the words you choose, the way ideas are expressed, and the validity and verifiability of the bases for the conclusions you draw. What most distinguishes research writing is the high degree of intellectual rigour required.

Importance or Purpose of writing a Report and Presentation:

The report must tell readers what they need and wish to know. Typically, executives are interested in results and must be convinced of the usefulness of the findings. They must be able to act on the report while recognizing the caveats entailed in the results. This means that they must sufficiently appreciate the method to recognize its weakness and bounds of error. The researcher must convey the limitations and necessarily details of the method to allow this appreciation. However, the researcher must do it in a way that is understandable and useful, and this is often easier said than done.

Some importance:

- a) It is a means whereby the data, analysis and conclusions are placed in an organized form. These information can be used both for academic and application purposes.
- b) Management decisions are guided by report and presentation. If all steps in the project are carefully conducted but adequate attention is paid to the report writing, the value of the project to management will be greatly diminished.
- c) The involvement of many managers in the project is limited to the written report and the oral presentation. These managers evaluate the quality of the report and presentation.
- d) Management's decision to undertake business research in the future or to use the particular research supplier again will be influenced by the perceived usefulness of the report and presentation.
- e) They are tangible products of the research efforts.
- f)

Importance of Reports for Research Students:

- To see whether you are on target with your work, so that any problem can be spotted in time to be attended to.
- To provide an opportunity for you to reflect on progress, consolidate arguments and identify gaps in knowledge, data or methodology.
- To help you to develop an appreciation of standards and hence to learn to monitor your own progress. To provide practice in academic report writing and academic discourse, so that any additional training which may be necessary in this report can be supplied at an early stage.
- To form basis, in due course, for your thesis and possible journal article.

Writing Criteria:**Style and Composition of the Report:**

The research report should be written in clear, logical and concise manner. The style should be simple, with short sentences, the main objective explanation and description.

Figures, charts and tables should be captioned carefully and concisely and must be numbered serially from the first to last. Statistics are best presented using

(i) semi-tabular presentation (ii) tabular presentation and (iii) graphs. Graphs include line graph, area charts, pie charts, and 3D charts etc.

Generally, in reports statistical formulae and computations are not presented. Errors of spelling, agreement of subject with predicate, wrong use of articles, inconsistency in tense should be avoided by revising the manuscript.

In particular, the report should be complete, accurate, clear and concise. These criteria are intimately related.

Completeness: a report is complete when it provides all the information readers need in language they understand. This means that the writer must continually ask whether every question in the original assignment has been addressed. What alternatives were examined? What was found? An incomplete report implies that supplementary reports, which are annoying and delay in action, will be forth coming.

The report may be incomplete because it is too brief or too long. The writer may omit necessary definitions and short explanations. Alternatively the report may be heavy because it is lengthy but not profound. Report writers tend not to waste collected information. However presenting information outside the interest of intended readers may distract them from the main issue. If the report is big, it may discourage from even attempting to digest its contents.

Accuracy: The previous steps in research process are not only determinants of accuracy. The complete report cannot be accurate when the basic input is inaccurate. But even with accurate input, the researcher report may generate in accuracies because of careless in handling the data, illogical reasoning or inept phrasing. Thus, accuracy is another writing criterion.

Clarity: Clear and logical thinking and precise expression produce clarity. When the underlying logic is fuzzy or the presentation imprecise, readers have difficulty in understanding what they read.

Conciseness: Although the report must be complete, it must also be concise. This means that the writers must be selective about what is included. The researcher must avoid trying to impress the reader with all that has been found. If something does not pertain directly to the subject, it should be omitted. The writer must also avoid lengthy discussions of commonly known methods.

Objectivity: objectivity should be maintained in research methods and interpretations. Facts should determine conclusions. Objectivity is essential because it is necessary that others be able to understand and replicate a finding before it is considered dependable. Hence extra caution should be taken to keep the research reporting process bias free.

Focus to the study objectives: the main purpose of the research investigation is to answer the questions that derive from the statement of objectives the findings or simple piece of writing without reference to the objective may be futile exercise. Merely to report the findings without reference to the objectives is to produce a sterile piece of writing.

Principles of report writing

- i) **Make direct and positive statement:** Report should be written naturally and directly using familiar words, short sentences with simple constructions.

- ii) **Presentation:** charts, sections, subsections tables should be labeled adequately. The report should be coherent whole” it must be a tightly oven fabric of facts and ideas-of subsection, sections paragraphs and sentences. The introduction, data analysis and finding are to be in the past tense: conclusion in the present tense: and recommendation in the future tense.
- iii) **Use of The third Person:** the report is to be written in the third person. The pronouns such as I, My, Mine, our, ours we, us and me should be eliminate from the report.
- iv) **Use Gender –neutral language:** when writing a report, it is very important to select terminology which treats both genders equally. It should not make assumptions about one gender as opposed to the other.
- v) **Avoid emotional terms:** you should be content with stating what facts are. Emotional terms introduce the possibility of bias in the research as well as bias in the reporting.
- vi) **Label opinions:** Generally facts are strongly preferred over opinions. Sometimes, however, opinions add assurance. The opinions of specialist may be available when facts from research are not available
- vii) **Non English Terms and Expression:** non English terms are used sometimes in report the terms which are not regularly used in English should be italicized.

Types of Reports:

The reports used in business situation may be various types. These reports could be classified as:

- a) Formal- informal
- b) Written-oral
- c) Internal- external
- d) Short- long
- e) Informational-analytical
- f) Technical- popular

All of these different reports have their own formats and conventions. For the purpose of thesis assignment, the reports can be classified into two functional groups:

- a) Descriptive, and
- b) Analytical.

A. Descriptive reports:

Descriptive reports are mere description of facts or opinions gathered by the student during his or her field study. The presentation of facts in an organized way may be of real value in properly understanding the situation. These reports indicate the nature of the problems facing the organization under study and also indicate the reforms required to overcome problems.

B. Analytical Reports

Analytical reports go one step further than descriptive reports. These reports, in addition too presenting facts and statistics, interpret this information in relation to the problem under consideration. Focused on a single or limited area of the problem, these reports

follow the process of scientific investigation and reporting. These reports also recommend the actions to be taken for improvements in the situation.

The students may choose any one of these types of reports. However, the choice of these types would depend on the nature of investigation. Some of these reports may include the features of both these types of reports.

The use of Quotations:

A quotation is a group of words which are repeated by someone other than the original author or writer.

There are two types of quotation:

A Direct Quotation : A direct quotation is an exact copy of the original. A direct quotation is shown by placing it between quotation marks.

some examples of direct quotations. Remember, direct quotations are exact copies of the original.

1. "I find that the harder I work, the more luck I seem to have." (Thomas Jefferson, 1743-1826)
2. "Never interrupt your enemy when he is making a mistake." (Napoleon Bonaparte, 1769-1821)

An Indirect Quotation : An indirect quotation is close copy of the original, but it is paraphrased to fit its surroundings. An indirect quotation does not have quotation marks.

some examples of indirect quotations. Remember, these have been paraphrased.

1. Thomas Jefferson once said that the harder he worked, the more luck he seemed to have.
2. According to Napoleon, you should never interrupt your enemy when he is making a mistake.

When to quote?

The decision of when to quote depends on your judgment. However, there are a number of guidelines, which can assist you in reach in a decision.

- A direct quote is an exact, word for word copy of the original source.
- Direct quotations would be used when the words of the author add force to validate the argument of the report.
- Direct quotations may be used for presenting the major arguments where a reference would not suffice.
- Direct quotations may be used when you wish to comment upon, refute to analyze ideas expressed by the author.
- Direct quotations may be used when changes might causes misunderstanding of the original idea or expression. Such quotation may be used in citing words of law, extracts or official government publications.
- Direct quotations should be used when citing mathematical and other formulas.

How to quote?

There are number of procedures to follow in quoting:

Short Quote VS. Long Quote

The basic form of quotations is initially determined by its length.

1. short quotation (up to three lines)

- a) in corporate the quotation into a sentence or paragraphs, without disrupting the flow of text.
- b) Use double quotation marks at the beginning and end of the quotation.
- c) Use same spacing as the rest of text.

2. Long Quotation (for four or more lines)

- a) Use no quotation marks at the beginning and end of the quotation.
- b) Use single line spacing
- c) Indent the quotation five spaces from the left margin

Ellipses (Abbreviations or Shortcuts Words).

To avoid long quotations that are not completely relevant, it is impossible to omit(Neglect or remove) part of a quotation.

The ellipsis is indicated by three full stops with space before and after each full stop. If ellipse is used, the meaning of the original version should not be altered in much way.

Indirect Quotations.

To avoid the possibility of a long quotation, it is sometimes not necessary to paraphrase the writer's words. The exact words are not used in the quotation marks, but are nevertheless acknowledged.

Abbreviations:

Several Latin and English abbreviations are frequently used in the reports. These abbreviations are used by the researcher so as to minimize the space and tedious repetition. Some of the commonly used abbreviations are:

<u>Abbreviations</u>	<u>Latin words</u>	<u>Meaning</u>
<u>et al.</u>	<u>Et alii</u>	<u>And others</u>
<u>Ibid.</u>	<u>Ibidem</u>	<u>In the same place; from the same work given immediately before</u>
<u>Loc.cit.</u>	<u>Loco citato</u>	<u>In the place cited; in the message last referred to</u>
<u>Op.cit</u>	<u>Opera citato</u>	<u>In the work cited.</u>
<u>Bk., bks.</u>		<u>Books(s)</u>
<u>Ef.</u>		<u>Confer, compare</u>
<u>e.g.</u>		<u>For example</u>
<u>Ed.</u>		<u>edition</u>
<u>Eds.</u>		<u>editors</u>

<u>N.B.</u>		<u>'nota bene', note well</u>
<u>n.d.</u>		<u>No date of publication</u>
<u>n.n</u>		<u>No name</u>
<u>n.p.</u>		<u>No place of publication</u>
<u>No. nos.</u>		<u>Number(s)</u>
<u>p. pp.</u>		<u>Page(s)</u>
<u>Viz</u>		<u>Namely</u>
<u>Vol., vols</u>		<u>Volume(s)</u>
<u>Vs.</u>		<u>'versus'; against</u>
<u>Anon.,</u>		<u>anonymous</u>

Presenting Data, Tables and Figures in Report

A table is a presentation of data in column form. The term “figure” usually includes graphs, maps, drawings and charts.

Tables:

The presentation of the tables is concerned with labeling techniques to make the content clear. The following practices should be used in table construction:

1. In a small report, the tables should be numbered consecutively throughout the report. While referring to the tables, the students should write Table 5.1” instead of writing “the following table” or “table” on the following page”.
2. Each table should be given a title that complete enough to clarify what is included in the table. The title of a table can be written in all capital letters for emphasis.
3. Columns of data should be labeled clearly enough to identify the items. Column heading should be short. Lengthy heading would create problems of arranging data.
4. Rows in a table can be arranged without any difficulty. In case of need, two lines can be used for giving row headings.
5. Sometimes, explanations are needed for one or more elements in a table. If required, such explanations should be placed immediately after the table in footnote fashion.
6. If the source of information in the table is to be identified, it should be placed below the table in the same format as the footnote. To number the table footnotes, an asterisk could also be used.
7. The report writer can use abbreviations if necessary. These abbreviations should however be explained in footnotes below the table.

Figures

In reports graphic forms like bar charts, pie charts, maps, and programs are often presented. The presentations help to clarify and understand data at a glance. The report writers should however ask the following questions to themselves with regard to use of graphic forms in the report

1. To what extent does the graphic presentation contribute to the overall understanding of the data? If the graphic presentations do not assist the reader in understanding the subject, these should not be used in a report.

2. Can the data convey the meaning to the reader in a better way by using the graphic presentation? Graphics often facilitate communication which is difficult to explain in words alone.
3. is the graphic easily understood? Use of complicated symbols, confusing art techniques, and usual combinations of type faces only detract from the impact of the material presented.
4. is the graphic honest? The hand is often quicker than the eyes: and data can be distorted rather easily.
5. in a small report, the figures should be numbered consecutively throughout the report. While referring to the figures, the students should write Figure 5” instead of writing “the following Figure” or “Figure” on the following page”.

Rules of Typography (Typing the report)

Now, the word-processing equipment is becoming common, reports can be typed quickly and efficiently from relatively rough drafts. Word processors can make typing work easy and fast. The following guidelines are given for typing the report:

Paper:

For the purpose of typing white Xerox paper may be used. The size of paper should be 8.6 by 11 inches. Only one side of the paper is to be used.

Chapter Page

The chapter number is centered about two inches from the top of the page. Following to spaces below should be title of the chapter in capital letters. The first line of the text should begin four spaces below that title.

Margins

Margins indicate the boundaries of the text. Margins of 1.6 inches on the left and one inch on the right- hand side of the page are commonly used. The last line of writing should be one inch above the bottom edge of the page. Where as APA specifies 1-inch margin all around (top, bottom, left and right).

Spacing

The text of the report should be doubled spaced. Indented, quotations and foot notes should be single spaced. Same style and size of font should be used through out the report. Usually trend of using Times New roman font with font size 12 is common.

Page Number

Page number should come at the top right hand corner of the page, one inch from the top edge and one inch from the right hand edge of the page. The first line of the text should be two spaces below the page number.

Pagination

Pages should be numbered consecutively in Arabic numerals from the first page of the text to the end of the manuscript (including the appendices). The pages in the introductory sections(preface, table of contents etc.) should be numbered with small

Roman numerals, ii, iii ,iv, etc one inch from bottom of the page. All page numbers should stand alone without periods, hyphens, or dashes.

Proof Reading

The manuscript should be read critically, searching for inaccurate statements, wrong eateries, omissions and inconsistencies. After verifying and locating errors in quotations, footnotes, tables, figures, paragraphing, sentence structure, heading, spelling, style, bibliography, mark the copy to provide the typist with necessary direction for providing a satisfactory transcript. For doing this, the student must have some idea of proof reading symbols. (Neupane, 2016)

These details should include:

- surname(s) and initial(s) of the author(s);
- the date of publication;
- the title of the text;
- if it is a paper, the title of the journal and volume number;
- if it is a chapter of an edited book, the book's title and editor(s)
the publisher and place of publication*;
- the first and last page numbers if it is a journal article or a chapter in an edited book.

Basic Structure or Format of Research Report

1. Title Page
2. Acknowledgement
3. Abstract or Summary
4. Table Of Contents or Contents
5. Introduction

6. Methodology
7. Results or Findings
8. Discussion
9. Conclusion and Recommendations
10. References
11. Appendices



Figure : Simple Format of Research Report

All reports have a beginning, a body and an ending. Reports based on research generally include the following sections:

1. Beginning (*Title Page, Acknowledgement, Abstract or Summary, Contents, Introduction*)

- **Title page**
This includes the title of report, your name and date.
- **Executive summary or Abstract or Summary**
The executive summary is a summary of the whole report. It usually contains one sentence summarising each major section of the report.
- **Introduction**
The introduction provides context and background and clearly states the purpose of the report. It also outlines what will be covered in the following sections so the reader knows what to expect.

2. Body (*Methodology, Results or Findings, Discussion*)

Body covers what you found and what it means.

3. Ending (*Conclusion and Recommendations, References, Appendices*)

Conclusion and recommendations. Sums up what you found and makes recommendations.

Unit IV: Testing of statistical Hypothesis

Hypothesis

- may be any hunch, guess, imaginative idea, which becomes the basis for action or investigation
- A hypothesis is a hypothetical statement, of the relationship between two or more variables.
- In the sciences, the hypothesis is the beginning of a theory
- The hypothesis is formulated, tested and if acceptable then, becomes a theory.

Criteria for good Hypothesis

- Statements about the relationship between variables.
- Statements carrying clear implication for testing of stated relations.

Null Hypothesis (H₀):

A statement about the value of a population parameter developed for the purpose of testing numerical evidence

The difference is caused by random chance.

The H0 always states there is “no significant difference.” In this case, we mean that there is no significant difference between the population mean and the sample mean.

Alternative hypothesis (H1): A statement that is accepted if the sample data provide sufficient evidence that the null hypothesis is false.

“The difference is real”.

(H1) always reverses the H0.

One (and only one) of these explanations must be true. Which one?

Level of Significance

- Also known as alpha (α) level
- specifies the probability level for the evidence to be an unreasonable estimate
- Unreasonable means that the estimate should not have taken its particular value unless some non-chance factor(s) had operated to alter the nature of the sample such that it was no longer representative of the population of interest.
- The researcher has complete control over the value of this significance level.
- In case we take significance level at 5 %. Then this implies that H0 will be rejected when the sampling result has less than 0.05 probability of occurring if H0 is true
- It is maximum value of probability of rejecting H0 when it is true

PARAMETRIC TEST vs NONPARAMETRIC TEST

Comparison Chart

S/N	BASIS FOR COMPARISON	PARAMETRIC TEST	NONPARAMETRIC TEST
1	Meaning	A statistical test, in which specific assumptions are made about the population parameter is known as parametric test.	A statistical test used in the case of non-metric independent variables, is called non-parametric test.
2	Basis of test statistic	Distribution	Arbitrary
3	Measurement level	Interval or ratio	Nominal or ordinal
4	Measure of central tendency	Mean	Median
5	Information about population	Completely known	Unavailable
6	Applicability	Variables	Variables and Attributes
7	Correlation test	Pearson	Spearman