

PHOENIX RESEARCH INSTITUTE

SOCIAL SCIENCES

RESEARCH METHODOLOGY

RESEARCH METHODOLOGY

Definition:

Young - defines research as a scientific undertaking which by means of logical, systematic, way of doing a research which tries to find out the real solution of a problem.

According to Robert Ross – research is essentially an investigation a recording and analyzing the evidence for the purpose of gaining knowledge.

According to Clifford – research comprise of defining, and redefining the problems, formulating hypothesis, organizing and evaluating data and providing appropriate conclusion.

Characteristics of a Research:

1. Research is directed towards the solution of a problems
2. Research emphasis the development of generation of principles and theories
3. Research is based on the observable experience or empirical evidence
4. Research demands accurate observation and descriptions
5. Research involves gathering data from primary or firsthand information or from a secondary data from the existing ones
6. Research activities are characterized by the desired designs, procedures and always applying righteous analysis.

CRITERIA OF GOOD RESEARCH:

Whatever may be the types of research works and studies, one thing that is important is that they all meet on the common ground of scientific method employed by them. One expects scientific research to satisfy the following criteria:

- The purpose of the research should be clearly defined and common concepts be used.

- The research procedure used should be described in sufficient detail to permit another researcher to repeat the research for further advancement, keeping the continuity of what has already been attained.
- The procedural design of the research should be carefully planned to yield results that are as objective as possible.
- The researcher should report with complete frankness, flaws in procedural design and estimate their effects upon the findings.
- The analysis of data should be sufficiently adequate to reveal its significance and the methods of analysis used should be appropriate. The validity and reliability of the data should be checked carefully.
- Conclusions should be confined to those justified by the data of the research and limited to those for which the data provide an adequate basis.
- Greater confidence in research is warranted if the researcher is experienced, has a good reputation in research and is a person of integrity.

In other words, we can state the qualities of a good research as under:

- *Good research is systematic:* It means that research is **structured with specified steps** to be taken in a specified sequence in accordance with the **well defined set of rules**. Systematic characteristic of the research does

not rule out creative thinking but it certainly does **reject the use of guessing and intuition** in arriving at conclusions.

- *Good research is logical:* This implies that research is guided by the rules of logical reasoning and the logical process of induction and deduction are of great value in carrying out research. Induction is the process of reasoning from a part to the whole whereas deduction is the process of reasoning from some premise to a conclusion which follows from that very premise. In fact, logical reasoning makes research more meaningful in the context of decision making.
- *Good research is empirical:* It implies that research is related basically to one or more aspects of a **real situation** and **deals with concrete data** that provides a basis for external **validity to research results**.
- *Good research is replicable:* This characteristic allows research results to be verified by replicating the study and thereby building a sound basis for decisions.

METHODS OF RESEARCH:

Fundamental or Basic Research:

Fundamental or Basic Research is a search for broad principles and synthesis without any immediate utilization objectives. This kind of research is known as the theoretical research, because its objectives are to discover some new principles. It mainly concentrates on the discovery of new theory and development of existing theory.

Applied or Action Research:

Applied or Action research is known as a project that applies the interventions made out of it. Its main aim is to find a real practical and immediate solution for a problem that a society is facing. This research in the other way called as the concern for the human life.

Descriptive Research:

Descriptive research is essentially a fact finding research. It aims to portray accurately the characteristics of a particular individual situation, or group.

Historical Research:

Historical research is the introduction of principles through research to the past and social force which has shaped the present. Its aim is to apply reflective thinking to unsolved social problems by discovering past trends of events, facts and attitudes by tracing line development in human thought and action.

Formulative or exploratory research:

An exploratory study / research is one which has the purpose of formulating a problem for more precise investigation or for developing hypothesis. Besides the study may however, have other functions as follows:

- Clarifying functions
- Increasing investigators familiarity with the phenomenon
- Establishing priorities for the further research

Experimental Research:

Experimental research is the basic tool of the physical science for tracing cause and effects relationship and verifying interferences. Its application in the social science is still in its infancy. Experimental studies have their purpose to test a hypothesis of a causal relationship between variables.

The Case Study:

The case study method explains a comprehensive study of a social unit – be that unit, a person, a group, a social institution, a district or a community.

Survey Research:

A survey research defines study at large and small populations by selecting and studying samples chosen from the populations to discover the relative incidence, distribution and interrelations of sociological and psychological variables. The survey research is mostly devoted to the study of characteristics of the populations under the investigation.

Evaluation Method:

These types of research are primarily directed to evaluate the performance of the developed projects and other economic programs that have already been implemented. The objective is being to realistically assess the impact of any such programs.

Inter – Disciplinary Research:

Interdisciplinary research is a method of research in which the tools of different science are used to find an explanation to the phenomena under the study. It is thus a co-operative and co-oriented research in which the experts of different disciplines pool their knowledge together for the purpose of finding explanation to any problems.

SCIENTIFIC METHODS OF RESEARCH**Definition of scientific methods**

Scientific method is a method of investigation by which scientific or any other impartial systematic knowledge is acquired is called a scientific method.

Characteristic of the scientific methods

- Every conclusion viewed through a scientific method must be verifiable.

- The scientific conclusions are predictable
- Scientific methods are objectivity based.
- Scientific methods employ a systematic approach.

STEPS IN SCIENTIFIC METHOD

There are five major steps in scientific method.

They are

- Planning
- Research design
- Data gathering
- Data analysis and
- Interpretation of results.

1. **Planning for research:** useful and meaningful social research should be planned carefully in every respect, including what to do with the information after it has been gathered. Planning involves knowing beforehand not only exactly what you are going to do and how you are going to do it, but also what you expect to find out and possible alternative explanation of the results.

2. **Research Design:** The term research design refers to the process of planning an entire study so that specific elaborations may be tested. It requires that you know what you wish to know in advance.

3. **Data gathering:** once a social researcher has already formulated his research design, he must decide how to gather the information called for by that design. There are two. Basic types of data gathering. Data can be gathered from primary sources: such techniques include participant and direct observation and survey techniques such as interviews, questionnaires, attitude scales. No matter how collected, data must be valid, reliable and representation if sound conclusions are to be based on them.

4. **Data analysis:** once the data has been gathered, it will be subjected to data analysis. This process may involve very complicated statistical manipulation and the use of punched cards or computers. It includes counting, tabulation and cross-tabulation through which different variables are organized and compared.

5. **Interpretation:** After the data of the study has been quantified and ordered through analysis, the researcher makes an interpretation of the results.

RESEARCH PROCESS

Research process consists of a series of actions or steps necessary to effectively carry out research and the desired sequencing of these steps. These are as follows.

- Formulation the research problem
- Extensive literature survey
- Developing the hypothesis
- Preparing the research design
- Determining sample design
- Collecting the data
- Execution of the project
- Analysis of data
- Hypothesis testing
- Generalization and interpretation
- Preparation of the report

Formulation the research problem:

- Formulating the research problem is the first stage in the research process.
- There are two types of research problems, viz., those which relates to states of nature and those which relate to relationships between variables
- . At the very outset the researcher must single out the problem he wants to study
- The researcher must decide the general area of interest or aspect of a subject matter that he would like to inquire into

- Two steps are involved in formulating the research problem, viz., understanding the problem thoroughly, and rephrasing the same into meaningful terms from an analytical point of view.

Extensive literature survey:

- Once the problem is formulated, a brief summary of it should be written down.
- It is compulsory for a research worker writing a thesis for a Ph.D. degree to write a synopsis of the topic and submit it to the necessary Committee or the Research Board for approval.
- At this juncture the researcher should undertake extensive literature survey connected with the problem.
- For this purpose, the abstracting and indexing journals and published or unpublished bibliographies are the first place to go to.
- Academic journals, conference proceedings, government reports, books etc., must be tapped depending on the nature of the problem.

Development of working hypothesis:

- After extensive literature survey, researcher state in clear terms the working hypothesis or hypotheses.

- Working hypothesis is tentative assumption made in order to draw out and test its logical or empirical consequences
- .In most types of research, the development of working hypothesis plays an important role. Hypothesis should be very specific and limited to the piece of research in hand because it has to be tested.
- The role of the hypothesis is to guide the researcher by delimiting the area of research and to keep him on the right track
- . It sharpens his thinking and focuses attention on the more important facets of the problem.

Preparing the research design:

- The research problem having been formulated in clear cut terms, the researcher will be required to prepare a research design
- The preparation of such a design facilitates research to be as efficient as possible yielding maximal information
- Research purposes may be grouped into four categories,
 1. Exploration
 2. Description
 3. Diagnosis

4. Experimentation

- The preparation of the research design, appropriate for a particular research problem, involves usually the consideration of the following:
 1. The means of obtain the information
 2. The availability and skills of the researcher and his staff
 3. Explanation of the way in which selected means of obtaining information will be organized and the reasoning leading to the selection;
 4. The time available for research; and
 5. The cost factor relating to research, i.e., the finance available for the purpose.

Determining sample design:

- All the items under consideration in any field of inquiry constitute a 'universe' or 'population'. A complete enumeration of all items in the 'population' is known as a census enquiry.
- It can be presumed that in such an enquiry when all the items are covered no element of chance is left and highest accuracy is obtained. But in practice this may not be true.
- . Even the slightest element of bias in such an enquiry will get larger and larger as the number of observations increases. Moreover, there is no way of checking the element if bias or its extent except through a resurvey or use of sample checks.
- We select only a few items from the universe for our study purposes. The items so selected continue what is technically called a sample

- The researcher must decide the way of selecting a sample or what is popularly known as the sample design.

Collecting the data:

- In dealing with any real life problem it is often found that data at hand are inadequate, and hence, it becomes necessary to collect data that are appropriate
- There are several ways of collecting the appropriate data which differ considerably in context of money costs, time and other resources at the disposal of the researcher.
- Primary data can be collected either through experiment or through survey. If the researcher conducts an experiment, he observes some quantitative measurements, or the data, with the help of which he examines the truth contained in his hypothesis. But in the case of a survey.
- Data can be collected by any one or more of the following ways:
 - By observation
 - Through personal interview
 - Through telephone interviews
 - By mailing of questionnaires
 - Through schedulers

Execution of the project:

- Execution of the project is a very important step in the research process.
- If the execution of the project proceeds on correct lines, the data to be collected would be adequate and dependable
- The researcher should see that the project is executed in a systematic manner and in time. If the survey is to be conducted by means of structured questionnaires, data can be readily machine-processed.

Analysis of data:

- After the data have been collected, the researcher turns to the task of analyzing them.
- The analysis of data requires a number of closely related operations such as establishment of categories, the application of these categories to raw data through coding, tabulation and then drawing statistical inferences.
- The un-widely data should necessarily be condensed into a few manageable groups and tables for further analysis.
- Thus researcher should classify the raw data into some purposeful and usable categories.
- A great deal of data, especially in large inquiries, is tabulated by computers. Computers not only save time but also make it possible to study large number of variables affecting a problem simultaneously.

Hypothesis-testing:

- After analyzing the data as stated above, the researcher is in a position to test the hypothesis, if any, he had formulated earlier.
- Various tests, such as *Chi-square test*, *t-test*, *F-test* have been developed by statisticians for the purpose.
- . The hypothesis may be tested through the use of one or more of such tests, depending upon the nature and object of research inquiry.
- Hypothesis-testing will result in either accepting the hypothesis or in rejecting it.
- If the researcher had no hypothesis to start with, generalizations established on the basis of data may be stated as hypothesis to be tested by subsequent researches in times to come.

Generalizations and interpretation:

- If a hypothesis is tested and upheld several times, it may be possible for the researcher to arrive at generalization, i.e., to build a theory.
- As a matter of fact, the real value of research lies in its ability to arrive at certain generalizations.
- If the researcher had no hypothesis to start with. He might seek to explain his findings on the basis of some theory. It is known as interpretation.
- The process of interpretation may quite often trigger off new questions which in turn lead to further research.

Preparation of the report or the thesis:

- Finally, the researcher has to prepare the report of what has been done by him. Writing of report must be done with great care keeping in view the following:

1. The layout of report should be as follows:

- (i) The preliminary pages;
- (ii) The main text, and
- (iii) The end matter

In its preliminary pages the report should carry title and data followed by acknowledgements and foreword. Then there should be a table of contents followed by a list of tables and list of graphs and charts, if any, given in the report.

The main text of the report should have the following parts:

- (a) *Introduction:* It should contain a clear statement of the objective of the research and explanation of the methodology adopted in accomplishing the research. The scope of the study along with various limitations should as well be stated in this part.

- (b) *Summary of findings*: after introduction there would appear a statement of findings and recommendations in non-technical language. If the findings are extensive, they should be summarized.
- (c) *Main report*: the main body of the report should be presented in logical sequence and broken-down into readily identifiable sections.
- (d) *Conclusion*: towards the end of the main text, researcher should again put down the results of his research clearly and precisely. In fact, it is the final summing up.

At the end of the report, appendices should be enlisted in respect of all technical data. Bibliography, i.e., list of books, journals, reports, etc., consulted, should also be given in the end. Index should also be given specially in a published research report.

HYPOTHESIS

MEANING OF HYPOTHESIS

- “A hypothesis is a tentative generalization, the validity of which remains to be tested. In its most elementary stage the hypothesis may be any guess, hunch, imaginative idea, which becomes the basis for action or investigation”. (G.A.Lundberg)
- “It is a proposition which can be put to test to determine validity”. (Goode and Hatt).
- “A hypothesis is a question put in such a way that an answer of some kind can be forth coming” - (Rummel and Ballaine).

TESTING OF HYPOTHESES

- Hypothesis is usually considered as the principal instrument in research. Its main function is to suggest new experiments and observations. In fact, many experiments are carried out with the deliberate object of testing hypotheses.
- Decision-makers often face situations where in they are interested in testing hypotheses on the basis of available information and then take decisions on the basis of such testing.
- In social science, where direct knowledge of population parameter(s) is rare, hypothesis testing is the often used strategy for deciding whether a sample data offer such support for a hypothesis that generalization can be made.
- Thus hypothesis testing enables us to make probability statements about population parameter(s). The hypothesis may not be proved absolutely, but in practice it is accepted if it has withstood a critical testing.
- we explain how hypotheses are tested through different tests meant for the purpose, it will be appropriate to explain clearly the meaning of a hypothesis and the related concepts for better understanding of the hypothesis testing techniques

MEANING OF RESEARCH DESIGN

A researcher attempting to solve his problem, should, necessarily prepare a plan which will help him to attain his ultimate motto. This plan is nothing but a research design. It is a plan for the collection and analysis of data. It is tentative plan which undergoes many modifications as the study progresses. It presents a series of guide posts to enable the researcher to progress in the right direction.

A research design or model indicates a plan of action to be carried out in connection with a proposed research work. It provides only a guideline for the researcher to enable him to keep track of his actions and to achieve his goal. The design may be a specific presentation of the various steps in the process of research.

Definition of research design

Several definition of 'research design' have been advanced by several writers on the subject of research methodology. A few of them are presented below. According to Pauline V. Young a research design is 'the logical and systematic planning and directing a piece of research'. The design, according to her 'results from translating a general scientific model into varied research procedures'. It gives an outline of the structure and process of the research programme. Without such a plan of study no scientific study is possible.

Features of Research Design:

The important features of research design may be outlined as follows:

- it constitutes a plan that identifies the types and sources of information required for the research problem;

- it constitutes a strategy that specifies the methods of data collection and analysis which would be adopted; and
- it also specifies the time period of research and monetary budget involved in conducting the study, which comprise the two major constraints of undertaking any research.

Needs of a research design:

The above definitions give the essential of a good research design. They are

- It is a plan that specifies the objectives of the study and the hypotheses to be tested.
- It is an outline that specifies the sources and type of
- Information relevant to the research questions.
- It is a blueprint specifying the method to be adopted for gathering and analyzing the data.
- It is a scheme defining the domain of generalisability, i.e., whether the obtained information can be generalized to a larger population or to different situations.

DIFFERENT RESEARCH DESIGNS

Different research designs can be conveniently described if we categorize them as: (1) research design in case of exploratory research studies; (2) research design in case of descriptive and diagnostic research studies, and (3) research design in case of hypothesis-testing research studies. We take up each category separately.

- **Research design in case of exploratory research studies**

- Exploratory research studies are also termed as formulative research studies. The main purpose of such studies is that of formulating a problem for more precise investigation or of developing the working hypotheses from an operational point of view
- The major emphasis in such studies is on the discovery of ideas and insights. As such the research design appropriate for such studies must be flexible enough to provide opportunity for considering different aspects of a problem under study.
- Inbuilt flexibility in research design is needed because the research problem, broadly defined initially, is transformed into one with more precise meaning in exploratory studies, which fact may necessitate changes in the research procedure for gathering relevant data. Generally, the following three methods in the context of research design for such studies are talked about: (a) the survey of concerning literature; (b) the experience survey and (c) the analysis of 'insight-stimulating'
- *The survey of concerning literature* happens to be the most simple and fruitful method of formulating precisely the research problem or developing hypothesis.

Hypotheses stated by earlier workers may be reviewed and their usefulness be evaluated as a basis for further research

- It may also be considered whether the already stated hypotheses suggest new hypothesis. In this way the researcher should review and build upon the work already done by others, but in cases where hypotheses have not yet been formulated, his task is to review the available material for deriving the relevant hypotheses from it. Besides, the bibliographical survey of studies, already made in one's area of interest may as well as made by the researcher for precisely formulating the problem.
- He should also make an attempt to apply concepts and theories developed in different research contexts to the area in which he is himself working. Sometimes the works of creative writers also provide a fertile ground for hypothesis formulation and as such may be looked into by the researcher.
- *Experience survey* means the survey of people who have had practical experience with the problem to be studied
- The object of such a survey is to obtain insight into the relationships between variables and new ideas relating to the research problem.
- Analysis of 'insight-stimulating' examples is also a fruitful method for suggesting hypotheses for research it is particularly suitable in areas where there is little experience to serve as a guide.

- This method consists of the intensive study of selected instances of the phenomenon in which one is interested. For this purpose the existing records, if any, may be examined, the unstructured interviewing may take place, or some other approach may be adopted
- **Research design in case of descriptive and diagnostic research studies:**
 - Descriptive research studies are that study which are concerned with describing the characteristics of a particular individual, or of a group, whereas diagnostic research studies determine the frequency with which something occurs or its association with something else
 - The studies concerning whether certain variables are associated are examples of diagnostic research studies. As against this, studies concerned with specific predictions, with narration of facts and characteristics concerning individual, group or situation are all examples of descriptive research studies.
 - Most of the social research comes under this category. From the point of view of the research design, the descriptive as well as diagnostic studies share common requirements and as such we may group together these two types of research studies
 - The research design must make enough provision for protection against bias and must maximise reliability, with due concern for the economical completion of the research study.

- In a descriptive/diagnostic study the first step is to specify the objectives with sufficient precision to ensure that the data collected are relevant. If this is not done carefully, the study may not provide the desired information.

- the research design in case of descriptive/diagnostic studies is a comparative design throwing light on all points narrated above and must be prepared keeping in view the objective(s) of the study and the resources available. However, it must ensure the minimisation of bias and maximisation of reliability of the evidence collected. The said design can be appropriately referred to as a *survey design* since it takes into account all the steps involved in a survey concerning a phenomenon to be studied.

Table 3.1

<i>Research Design</i>	<i>Type of study</i>	
	<i>Exploratory of Formulative</i>	<i>Descriptive/Diagnostic</i>
Overall design	Flexible design (design must provide opportunity for considering different aspects of the problem)	Rigid design (design must make enough provision for protection against bias and must maximise reliability)
(i) Sampling design	Non-probability sampling design (purposive or judgement sampling)	Probability sampling design (random sampling)
(ii) Statistical design	No pre-planned design for analysis	Pre-planned design for analysis
(iii) Observational design	Unstructured instruments for collection of data	Structured or well thought out instruments for collection of data
(iv) Operational design	No fixed decisions about the operational procedures	Advanced decisions about operational procedures.

The difference between research design in respect of

the above two types of research studies can be conveniently summarized in tabular form as under:

Research design in case of hypothesis-testing research studies

- Hypothesis-testing research studies (generally known as experimental studies) are those where the researcher tests the hypotheses of causal relationships between variables. Such studies require procedures that will not only reduce bias and increase reliability, but will permit drawing inferences about causality
- Usually experiments meet this requirement. Hence, when we talk of research design in such studies, we often mean the design of experiments. Professor R.A. Fisher's name is associated with experimental designs
- Beginning of such designs was made by him when he was working at Rothamsted Experimental Station (Centre for Agricultural Research in England). As such the study of experimental designs has its origin in agricultural research. Professor Fisher found that by dividing agricultural fields or plots into different blocks and then by conducting experiments in each of these blocks, whatever information is collected and inferences drawn from them, happens to be more reliable
- This fact inspired him to develop certain experimental designs for testing hypotheses concerning scientific investigations. Today, the experimental designs are being used in researches relating to phenomena of several disciplines. Since experimental designs originated in the context of agricultural operations, we still use, though in a technical sense, several terms of agriculture (such as treatment, yield, plot, block etc.) in experimental designs

SAMPLE DESIGN AND SAMPLING PROCEDURES

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 for the sample. Sample design may as well lay down the number of times to be included in the sample

i.e., the size of the sample. Sample design is determined before data are collected. There are many sample designs from which a researcher can choose. Some designs are relatively more precise and easier to apply than others. Researcher must select/prepare a sample design which should be reliable and appropriate for his research study.

STEPS IN SAMPLE DESIGN:

While developing a sample design, the researcher must pay attention to the following points:

1. **Type of universe:** The first step in developing sample design is to clearly define the set of objects, technically called the Universe, to be studied. The universe can be finite or infinite. In finite universe the number of items is certain, but in case of an infinite universe the number of items is infinite i.e., we cannot have any idea about the total number of items. The population of a city, the number of workers in a factory and the like are examples of finite universes, whereas the number of stars in the sky, listeners of a specific radio programme, throwing of a dice etc., are examples of infinite universes.
2. **Sampling Unit:** A decision has to be taken concerning a sampling unit before selecting sample. Sampling unit may be a geographical one such as state, district, village, etc., or a construction unit such as house, flat, etc., or it may be a social

unit such as family, club, school, etc., or it may be an individual. The researcher will have to decide one or more of such units that he has to select for his study.

3. **Source List:** It is also known as 'Sampling frame' from which sample is to be drawn. It contains the names of all items of a universe (in case of finite universe only). If source list is not available, researcher has to prepare it. Such a list should be comprehensive, correct, reliable and appropriate. It is extremely important for the source list to be as representative of the population as possible.
4. **Size of sample:** This refers to the number of items to be selected from the universe to constitute a sample. This major problem before a researcher. 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, representative-ness, reliability and flexibility. While deciding the size of sample, researcher must determine the desired precision as also an acceptable confidence level for the estimate.
5. **Parameters of interest:** In determining the sample design, one must consider the question of the specific population parameters which are of interest. For instance, we may be interested in estimating the proportion of persons with some characteristic in the population, or we may be interested in knowing some average or the other measure concerning the population. There may also be important sub-groups in the population about whom we would like to make estimates. All this has a strong impact upon the sample design we would accept.
6. **Budgetary Constraint:** Cost considerations, from practical point of view, have a major impact upon decisions relating to not only the size of the sample but also to the type of sample. This fact can even lead to the use of a non-probability sample.

7. *Sampling Procedure:* Finally, 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. In fact, this technique or procedure stands for the sample design itself. There are several sample designs out of which the researcher must choose one for his study. Obviously, he must select that design which, for a given sample size and for a cost, has a small sampling error.

CHARACTERISTICS OF GOOD SAMPLE DESIGN:

From what has been stated above, we can list down the characteristics of a good sample design as under:

1. Sample design must result in a truly representative sample.
2. Sample design must be such which results in a small sampling error.
3. Sample design must be viable in the context of funds available for the research study.
4. Sample design must be such so that systematic bias can be controlled in a better way.
5. Sample should be such that the results of the sample study can be applied, in general, for the universe with a reasonable level of confidence.

CRITERIA OF SELECTING A SAMPLING PROCEDURE:

In this context one must remember that two costs are involved in a sampling analysis viz., the cost of collecting the data and the cost of an incorrect inference resulting from the data. Researcher must keep in view the two causes of incorrect inferences viz., systematic bias and sampling error. Systematic bias results from errors in the sampling procedures, and it cannot be reduced or eliminated by increasing the sample size. At best the causes responsible for these

errors can be detected and corrected. Usually a systematic bias is the result of one or more of the following factors.

1) Inappropriate frame: If the sampling frame is inappropriate i.e., a biased representation of the universe, it will result in a systematic bias.

2) Defective measuring device: If the measuring device is constantly in error, it will return in systematic bias. In survey work, systematic bias can result if the questionnaire or the interviewer is biased. Similarly, if the physical measuring device is defective there will be systematic bias in the data collected through such a measuring device.

3) Non-respondents: If we are unable to sample all the individuals initially include in the sample, there may arise a systematic bias. The reason is that in such a situation the likelihood of establishing contact or receiving a response from an individual is often correlated with the measure of what is to be estimated.

4) Indeterminacy principle: Sometimes we find that individuals act different when kept under observation that what they do when kept in non-observed situations. For instance, if workers are aware that somebody is observing then in course of a work study on the basis of which the average length of time to complete a task will be determined and accordingly the quota will be set for piece work, they generally tend to work slowly in comparison to the speed with which they work if kept unobserved. Thus, the indeterminacy principle may also be a cause of a systematic bias.

5) Natural bias in the reporting of data: Natural bias of respondents in the reporting of data is often the cause of a systematic bias in many inquiries. There

is usually a downward bias in the income data collected by government taxation department, whereas we find an upward bias in the income data collected by some social organization. People in general understate their incomes if asked about it for tax purposes, but they overstate the same if asked for social status or their affluence. Generally in psychological surveys, people tend to give what they think is the 'correct' answer rather than revealing their true feelings.

DIFFERENT TYPES OF SAMPLE DESIGNS:

There are different types of sample designs based on two factors viz., the representation basis and the element selection technique. On the representation basis and the element selection technique. On the representation basis, the sample may be probability sampling or it may be non-probability sampling. Probability sampling is based on the concept of random selection, whereas non-probability sampling is 'non-random sampling. On element selection bias, the sample may be either unrestricted or restricted. When each sample element is drawn individually from the population at large, then the sample so drawn is known as 'unrestricted sample', whereas all other forms of sampling are covered under the term 'restricted sampling'. The following chart exhibits the sample designs as explained above.

CHART SHOWING BASIC SAMPLING DESIGNS

Element selection technique ↓ Unrestricted sampling	Representation basis	
	Probability sampling	Non-probability sampling
Unrestricted sampling	Simple random sampling	Haphazard sampling or convenience sampling
Restricted sampling	Complex random sampling (such as cluster sampling, systematic sampling, stratified sampling etc.)	Purposive sampling (such as quota sampling, judgement sampling)

Non-probability sampling: Non-probability sampling is that sampling procedure which does not afford any basis for estimating the probability that each item in the population has of being included in the sample. Non-probability sampling is also known by different names such as deliberate sampling, purposive sampling and judgment sampling. In this type of sampling, items for the sample are selected deliberately by the researcher; his choice concerning the items remains supreme. In other words, under non-probability sampling the organizers of the inquiry purposively choose the particular units of the universe for consulting a sample on the basis that the small mass that they so select out of a huge one will be typical or representative of the whole. For instance, if economic conditions of people living in a state are to be studied, a few towns and villages may be purposively selected for intensive study on the principle that they can be representative of the entire state. Thus, the judgment of the organizers of the study plays an important part in this sampling design.

Quota sampling: It is also an example of non-probability sampling. Under quota sampling the interviewers are simply given quotas to be filled from the different strata, with some restrictions on how they are to be filled. In other words, the actual selection of the items for the sample is left to the interviewer's discretion. This type of sampling is very convenient and is relatively inexpensive. But the samples so selected certainly do not possess the characteristic of random samples. Quota samples are essentially judgment samples and inferences drawn on their basis are not amenable to statistical treatment in a formal way.

Probability sampling: Probability sampling is also known as 'random sampling' or 'chance sampling'. Under this sampling design, every time of the universe has an equal chance of inclusion in the sample. It is, so to say, a lottery method in which individual units are picked up from the whole group not deliberately but by some mechanical process. Here it is blind chance alone that determines whether one item or the other is selected. The results obtained from probability or random sampling can be assured in terms of probability i.e., we can measure the errors of estimation or the significance of results obtained from a random sample, and this fact brings out the superiority of random sampling design over the deliberate sampling design. Random sampling ensures the Law of Statistical Regularity which states that if on an average the sample chosen is a random one, the sample will have the same composition and characteristics as the universe. This is the reason why random sampling is considered as the best technique of selecting a representative sample.

Random sampling from a finite population to that method of sample selection which gives each possible sample combination an equal probability of being picked up and each item in the entire population to have an equal chance

of being included in the sample. This applies to sampling without replacement i.e., once an selected for the sample, it cannot appear in the sample again (sampling with replacement is used less frequently in which procedure the element for the sample is returned to the population before the next element is selected. In such a situation the same element could appear twice in the same sample before the second element is chosen).in brief, the implications of random sampling (or simple random sampling) are:

- (a) It gives each element in the population an equal probability of getting into the sample; and all choices are independent of one another.
- (b) It gives each possible sample combination an equal probability of being chosen.

COMPLEX RANDOM SAMPLING DESIGNS:

Probability sampling under restricted sampling techniques, as stated above, may result in complex random sampling designs. Such designs may as well be called 'mixed sampling designs' for many of such designs may represent a combination of probability and non-probability sampling procedures in selecting a sample. Some of the popular complex random sampling designs are as follows:

(i) Systematic Sampling: In some instances, the most practical way of sampling is to select every i^{th} item on a list. Sampling of this type is known as systematic sampling. An element of randomness is introduced into this kind of sampling by using random numbers to pick up the unit with which to start. For instance, if a 4 percent sample is desired, the first item would be selected randomly from the first twenty-five and thereafter every 25th item would automatically be included in the sample. Thus, in systematic sampling only the first unit is selected

randomly and the remaining units of the sample are selected at fixed intervals. Although a systematic sample is not a random sample in the strict sense of the term, but it is often considered reasonable to treat systematic sample as if it were a random sample.

(ii) Stratified Sampling: If a population from which a sample is to be drawn does not constitute a homogeneous group, stratified sampling technique is generally applied in order to obtain a representative sample. Under stratified sampling the population is divided into several sub-populations that are individually more homogeneous than the total population (the different sub-populations are called 'strata') and then we select items from each stratum to constitute a sample. Since each stratum is more homogeneous than the total population, we are able to get precise estimates for each stratum and by estimating more accurately each of the component parts; we get a better estimate of the whole. In brief, stratified sampling results in more reliable and detailed information.

(iii) Cluster Sampling: If the total area of interest happens to be a big one, a convenient way in which a sample can be taken is to divide the area into a number of smaller non-overlapping areas and then to randomly select a number of these smaller areas (usually called clusters), with the ultimate sample consisting of all (or samples of) units in these small areas of clusters.

Thus in cluster sampling the total population is divided into a number of relatively small subdivisions which are themselves clusters of still smaller units and then some of these clusters are randomly selected for inclusion in the overall sample. Suppose we want to estimate the proportion of machine parts in an inventory which are defective. Also assume that there are 20000 machine parts in

the inventory at a given point of time, stored in 400 cases of 50 each. Now using a cluster sampling, we would consider the 400 cases as clusters and randomly select 'n' cases and examine all the machine parts in each randomly selected case.

Cluster sampling, no doubt, reduces cost by concentrating surveys in selected surveys. But certainly it is less precise than random sampling. There is also not as much information in 'n' observations within a cluster as there happens to be in 'n' randomly drawn observations. Cluster sampling is used only because of the economic advantage it possesses; estimates based on cluster samples are usually more reliable per unit cost.

(iv) Area Sampling: If clusters happen to be some geographic subdivisions, in that case cluster sampling is better known as area sampling. In other words, cluster designs, where the primary sampling unit represents a cluster of units based on geographic area, are distinguished as area sampling. The plus and minus points of cluster sampling are also applicable to area sampling.

(v) Multi-stage Sampling: Multi-stage sampling is a further development of the principle of cluster sampling. Suppose we want to investigate the working efficiency of nationalized banks in India and we want to take a sample of few banks for this purpose. The first stage is to select large primary sampling unit such as states in a country. Then we may select certain districts and interview all banks in the chosen districts. This would represent a two-stage sampling design with the ultimate sampling units being clusters of districts.

If instead of taking a census of all banks within the selected districts, we select certain towns and interview all banks in the chosen towns. This would represent a three-stage sampling design. If instead of taking a census of all banks

within the selected towns, we randomly sample banks from each selected town, then it is a case of using a four-stage sampling plan. If we select randomly at all stages, we will have what is known as 'multi-stage random sampling design'.

Ordinarily multi-stage sampling is applied in inquires extending to a considerable large geographical area, say, the entire country. There are two advantages of this sampling design viz., (a) It is easier to administer than most single stage designs mainly because of the fact that sampling frame under multi-stage sampling is developed impartial units. (b) A large number of units can be sampled for a given cost under multistage because of sequential clustering, whereas this is not possible in most of the sample designs.

(vi) Sampling with probability proportional to size: In case the cluster sampling units do not have the same number or approximately the same number of elements, it is considered appropriate to use a random selection process where the probability of each cluster being included in the sample is proportional to the size of the cluster. For this purpose, we have to list the number of the elements in each cluster irrespective of the method of ordering the cluster. Then we must sample systematically the appropriate number of elements from the cumulative totals.

(vii) Sequential Sampling: This sampling design is some what complex sample design. The ultimate size of the sample under this technique is not fixed in advance, but we determined according to mathematical decision 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 the 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 but the number of samples is certain and decided in advance, the sampling is known as the multiple sampling. But when the number of samples is more than two but it is neither certain nor decided in advance, this type of system is often referred to as sequential sampling.

STEPS IN PREPARING A RESEARCH DESIGN:

The Title:

The title of the research proposal should do not more than name of the topic. It should be so worded that it suggests the theme of the study. In selecting the title the researcher should consider two things i). it should not be burdened by pompous words and should not include of unscientific, rhetorical, argumentative, emotional etc.. The language in the title should be professional in nature.

Statement of the problem:

Statement of the problem is not exactly the same as the title of the research. It has a definite place in the introductory chapter and is an attempt to focus on a clear goal. The statement of the problem should primarily be an expansion of the title.

Review of the Literature:

Review of the literature in research is a preliminary step before attempting to plan the study. It is essential to review all the relevant materials connected with the problem chosen. It is necessary to show how the problem under study relates to previous research studies. It is also equally important to show how the work is differing from the existing literature.

Source of information to be tapped:

The sources of information to be tapped vary with the interest of the researcher and the types of the study. The sources are divided into documentary and field sources. Documentary sources of information are those which are connected in the published and unpublished documents, reports, statistics, manuscript, letters, and diaries and so on.

Development of Bibliography:

As soon as the consultations of the available sources are begun, the development of bibliography preferably with annotations should be undertaken. Each reference should be written down in the research report. It should be in this format. The last name of the author should be first and second name, initial, or the following names, name of the book, publisher name and date and the year of publication.

Nature of the study:

The nature of the study is based on the research design the researcher is planning. Eg:- statistical study, comparative study etc..

Objectives of the study:

The objective of the study should be compiled in a clear-cut terms. The objectives differ with the nature of the studies and goals to be attained. Some research studies aims to gather descriptive data or explanatory data from which theoretical construction could be deduced.

Geographical areas to be covered:

It is essential to determine the geographical area to be covered in connection with the research study. Therefore physical boundaries of the areas are to be specified in the research design.

Period of the time to be covered:

It is essential to determine the period of time that the researcher takes to complete the study. Detailed pre fixed timing will give a motivation to the researcher to complete the study with in the stipulated time frame.

Dimensions of the Study:

It is essential to make certain assumptions in the research like limitations of the study can be imposed while making a study. The new concept we are incorporating in the research must be clearly defined and explained. The method of defining must be in a common usage of words no metaphorical usage of words should be used.

The basis for selecting Data:

Usually two dimensions of the data will be collected for the study namely primary data and secondary data. Primary data – collected from the samples and the secondary data – collected from the documents. The basis of selecting data also tells us to determine the study samples for the study.

Techniques of the study:

The next steps in preparing the research design are the preparation of the techniques for the study. This determines the suitable techniques for collecting data. Below find the common usage of techniques. If the study requires close attention of the researcher then use the **observation method**; if the study is created over a wider area then use **questionnaires method** and if the subject matter to be collected from a limited area then use **interview method** for collecting the data.

The control of error:

The control of error mostly applies in the experimental studies. But in the other studies it explains the common errors in selecting the samples, false statements, fake information, plagiarism, improper analytical techniques etc..

Chapter Schemes:

The preparation of the chapter outline in research is the last step in planning the research. This requires the researcher to explain about each chapter in a nutshell what the specified chapter is compiled of.

DATA SOURCE:

The source of information in the research is generally classified as Primary and Secondary. According to V. Young the source of information can be classified in to documentary and field source.

Primary Source:

Primary source of data are called as the first hand information that the researcher collect from the defined samples by adapting various techniques as Observation, Interview, Questionnaire, group discussion based on the research etc..

Secondary Source:

The Secondary sources of data are divided in to four forms. Namely Internal Source, External Source, Private Documents and Public Documents.

The Internal Source:

Internal Source explains the information that the researcher has in hand or if it is a company who undertake the research then they may have the previous research reports from their stakeholders.

The External Source:

External Source explains information collected from external sources such as Government sources, Business references, Commercial agencies etc..

Private Documents:

Private data or documents are categorized under the following system: i. Life History, ii. Dairies, iii. Letters and iv. Memories.

Life History:

Life history generally contains all kinds of biographical materials from the point of personal documents. Since it contains the author about social phenomena it is of interest to the students in sociology and social research.

Diaries:

Many people keep diaries in which they keep all kinds of records about their life and the events. Diaries are the most important source of knowing about a person's real history.

Letters:

Letters is another useful source of information about a person. They through more light upon an intimate aspect of a person or events.

Memories:

Memories are another form of source of information which people leave for others to use it or to have it as remembrance. Eg:-Some people write their memories of travelling to other countries etc..

Public Documents:

Public documents are different from the private documents. It deals with the matters of different interests. Public documents are divided in to the following categories: i. Published Records ii. Unpublished Records.

Published Records:

Published records are the available to people for investigation and perusal. These report can be considered as journals, Newspapers, Radio and T.V, Film and Public Speech of different persons.

Unpublished Records:

Unpublished records are known as the records which are not published so far. These kind of records are not kept in form of documents but is timely collected from people through conversations, expressive arts, etc..

THECNQUES OF WRITING RESEARCH PROPOSAL

1. Title: -

The Title of the project must be attractive and self- explanatory in itself, that means, it must mention What is going to be done, for Whom and Where. For example, Renewable Energy based Community Oriented Eco-village Development Project will be implemented in 20 selected villages in two blocks.

2. Executive Summary: -

An executive summary of the entire proposal should be presented along with the detailed proposal. The summary would give an overview of the proposal in brief and is a one page summary.

3. Project Holder (PH) and Project Implementing Organizations (PIOS):-

Give brief information about the main organization acting as the project holder or the lead organization and also the various project partners. The detail information about the Lead Organization is to be attached as Annexure. Also attach Annual Report of past three years, Statement of Income and Expenditure for the past three years, list of Governing Board or Executive Body or Management Committee Members, list/ profile of the core members, Chief Functionary (CF) or Chief Executive Officer (CEO), Project/Programme Director/Manager for this particular project, copy of the brochures and other supporting documents, List of other project and funding agencies and other source s of funding etc.

4. Existing Infrastructure and staff:-

What are the physical infrastructure available with the NGO and the professional and field staff with experience as well as volunteers and advisors and consultants to implement developmental project for poverty reduction and empowerment of marginalized group of people incorporating RET activities.

5. Conceptual Framework: -

After the title, would come the rationale of the project, stating the purpose of the project, the need for beginning the programme. The rationale could be broad based talking about the general status to a specific area of the problem OR start with an incident to more general focus about the issue (could be supplemented with facts and figures). Information based on objective research, not subjective impressions, should be provided to justify the need or problem. The rationale should be written in a way that would lead to objectives.

6. Objectives: -

Objectives of the project should be minimum of 3 (three) in number or a maximum of 5 (five) in number. Preferably, not to separate them into long and short term objectives and the objectives must be clear and there should be a central focus/ common link in all the objectives. The objectives should be such that it would lead to the action/ activities.

7. Activities:-

To clearly state tasks or action the NGO would take to achieve the objectives. The activities must be specific, clear and in point form and must flow naturally from problems and objectives.

8. Target Group/ Beneficiaries:-

The project proposal must mention the criteria for selecting a particular target group and the number, eligibility of the beneficiaries.

9. Location of the Project:-

Give relevant information about the precise geographical location of the project

10. Project Duration:-

The proposed project could be a part of the bigger programme to achieve the overall goal set. The entire programme could be divided in to several phase. For example, phase I, II, III and IV. Phases could be divided into preparatory-cum-pilot, followed by two main phases. The last phase

which will be consolidation and preparation of the target community and handing the programme to them, and then withdrawal of NGO from main activities. Beyond this period, the NGO taking up role of advisor-cum-mentor and providing on[going support and trouble-shooting as well as capacity building and facilitation and linkages to governmental programmes to ensure that the project reaches the logical end and achieve the overall goal. Each phase could be treated as separate project of three years duration.

11. Organizational Manpower:-

Manpower required from within or outside the NGO to carry out the project, hierarchy, committee or any other way of functioning and qualifications of the personnel.

12. Project Management & Implementation: -

A detailed process, step-by-step or stage wise execution plan to be incorporated in the project proposal.

13. Infrastructure Requirements:-

What are the infrastructure needed for the project, for example, space, vehicle or equipment.

14. Monitoring Mechanism:-

Mechanism by which an NGO would check or periodically review the project. This portion must contain information as to who would monitor– internal or external monitoring, which area would be monitored or focus/ thrust area of monitoring. Monitoring of the programme and of financial aspect in the project proposal in order to undertake mid-course correction to rectify the project at a specific stage and improvise on the same at a given moment, so that the desired results are achieved and project goals are realized.

15. Evaluation:-

Mention the objectives of evaluation and how it will be carried out. This will help to understand whether data of records is kept or there is documentation on the project. Evaluation aids in improvising the future projects so that the errors are not repeated and more precaution and foresight is integrated in the project proposal.

16. Sustainability & Follow-up/ Direction for the Future:-

This aspect is very important to ensure the running of the project or to decide viability of the project in the long run once funding stops. For example, in an income generation project for the senior citizens, the latter would take over the project by forming an association.

17. Budget/Project Cost:-

Budget is a tentative estimate or statement of income and expenditure. Thus, it shows where the money is coming from and where is it going through. It should relate with aims and objectives as well as the activities and expected output proposed to be achieved by the project.

18. Share of Project Budget/Project Cost:-

The budget is the total amount required to implement the project. However, the funds to implement the project, has to come from different sources.

19. Networking, dissemination and Advocacy:-

Please describe plans to network with other groups for sharing of learning from the project. Also mention how the project propose to disseminate the information with other NGOs and other agency as well as advocacy with the policy and decision makers for support of such project.

20. Innovation:-

How is your idea truly innovative or unique? Describe the extent to which it uses a novel approach and is different from others in this sector.

21. Follow-up:-

What are the propose plans for future activities after the project is over so that the programme continues to achieve the overall goal of the project.

TYPES OF SCALE

(a) Nominal scale

- (b) Ordinal scale
- (c) Interval scale
- (d) Ratio scale

Nominal Scale

In this scale, numbers are used to identify the objects. E.g. University Registration numbers assigned to students, numbers on jerseys, of sports personal.

Examples:

Have you ever visited Bangalore?

Yes-1

No-2

“Yes” is coded as “One” and “No” is coded as “Two”. Numeric attached to the answers has no meaning, it is a mere identification. If numbers are interchanged as one for “No” and two for “Yes”, it won’t affect the answers given by the respondents. Numbers used in nominal scales serves only counting. Telephone number is an example of nominal scale, where one number is assigned to one subscriber. The idea of using nominal scale is to make sure that no two persons or objects receive the same number. Bus route numbers are example of nominal scale. “How old are you”? This is an example of nominal scale.

“What is your PAN Card No?”

Arranging the books in the library, subjectwise, authorwise – we use nominal scale.

Example: Physics- 48, Chemistry – 92 etc.

Limitations:

- (a) There is no rank ordering
- (b) No mathematical operation is possible
- (c) Statistical implication – Calculation of standard deviation and mean is not possible.

It is possible to express mode.

8.2.2 Ordinal Scale (Ranking scale)

Ordinal scale is used for ranking in most market research studies. Ordinal scales are used to find consumer perception, preferences etc. E.g. Consumer may be given a list of brands which will suit and expect them to rank on the basis of ordinal scale.

1 Lux

1 Liril

1 Cinthol

1 Lifebuoy

1 Hamam

Rank	Item	Number of respondents
I	Cinthol	150
II	Liril	300
III	Hamam	250
IV	Lux	200
V	Lifebuoy	100
Total		1,000

In the above example, II is mode and III is median. Scaling Techniques

Statistical implications: It is possible to calculate mode and median.

In market research, we often ask the respondents to rank say, "A soft drink, based upon flavour or colour". In such a case, ordinal scale is used. Ordinal scale is a ranking scale.

Rank the following attributes of 1 - 5 scale according to the importance in the microwave oven.

TABLE

Attributes	Rank
A) Company image	5
B) Functions	3
C) Price	2
D) Comfort	1
E) Design	4

Interval Scale

Interval scale is more powerful than nominal and ordinal scale. The distance given on the scale represents equal distance on the property being measured. Interval scale may tell us "How far apart the objects are with respect to an attribute?" This means that, the difference can be compared. The difference between "1" and "2" is equal to the difference between "2" and "3".

Example 1: Suppose we want to measure the rating of a refrigerator using interval scale. It will appear as follows:

1. Brand name Poor ----- Good
2. Price High ----- Low
3. Service after sales Poor ----- Good
4. Utility Poor ----- Good

The researcher cannot conclude that the respondent who gives a rating of 6 is 3 times more favorable towards a product under study than another respondent who awards

the rating of 2.

Example 2: How many Hours do you spend to do class assignment every day.

< 30 min.

30 min. to 1 hr.

1hr. to 1½ hrs.

> 1½ hrs.

Statistical implications: We can compute the range, mean, median etc.

Difference between interval and ordinal scales:

Ordinal scale gives only the ranking of the alternatives viz., one is greater than the other,

but it won't give the difference/distance between one and the other. Interval scales provide information about the difference between one and two.

Ratio Scale

Ratio scale is a special kind of internal scale that has a meaningful zero point. With this scale, length, weight, distance, can be measured. In this scale, it is possible to say, how many times greater or smaller one object compared to the other.

Example: sales of this year for product A is twice the sale of the same product last year.

Statistical implications: All statistical operation can be performed on this scale.

The following scales are measuring the attitude:

l Paired comparison

l Likert scale

l Semantic differential scale

l Thurstone scale