

Module 2

Business Research Design

2.1. BUSINESS RESEARCH DESIGN

2.1.1. Meaning and Definition of Research Design

When a research is carried-out, it follows a definite pattern or plan of action throughout the procedure, i.e., since the problem identification to the report preparation and presentation. This definite pattern or plan of action is called "research design". It is a map that guides the researcher in collecting and analysing the data. In other words, research design acts as a blueprint that is followed throughout the research work.

For example, a building cannot be constructed without the knowledge of its structure. A builder cannot order raw materials or set dates till he knows the structure of this building, such as office building, school, home, etc.

According to William Zikmund, "Research design is defined as a master plan specifying the methods and procedures for collection and analysing the needed information".

According to Kerlinger, "Research design is the plan, structure, and strategy of investigation conceived so as to obtain answers to research questions and to control variance".

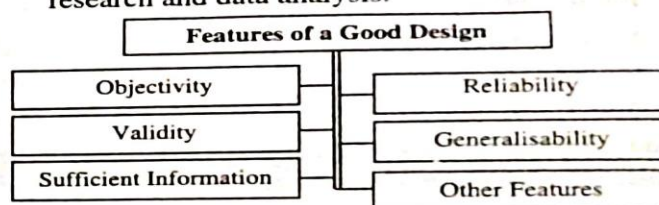
A research design is not only a work plan, it also specifies the type of data required to address the research problem. It ensures that the data analysis and the conclusions lead to answering the initial questions of researcher in a simple way. Therefore, a research design provides the structure of a research in such a way that it provides relevant outcomes economically.

2.1.2. Features of a Good Research Design

Following are the major features of a good research design:

- 1) **Objectivity:** Objectivity refers to the ability of the research instruments to give conclusions that

are free from observer's personal biases. A good research design should be able to select those instruments only that provide objective conclusions. Usually, it is believed that maintaining objectivity is pretty easy, but it proves to be difficult during execution of research and data analysis.



- 2) **Reliability:** Another essential feature of a good research design is the reliability of responses. The instruments used in research should be able to provide similar responses to a question asked from a respondent. If the response varies, the instrument is considered unreliable. In other words, reliability of research design is measured in terms of consistency in responses.
- 3) **Validity:** An important characteristic of a good research design is its ability to answer the questions in the way it was intended to. It should focus on the objective of the research and make specific arrangements or plan for achieving that objective. **For example,** when a research is conducted to measure the effects of advertisements in viewers, it should be able to answer this, and not the sale of a particular product.
- 4) **Generalisability:** A research design is said to be generalisable if the outcome of the research is applicable on a bigger population from which the sample is selected.

A research design can be made generalisable by properly defining the population properly, selecting the sample carefully, analysing the statistical data appropriately, and by preparing it methodologically. Therefore, the more the outcomes are generalisable, more efficient is the research design.

- 5) **Sufficient Information:** Any research is conducted to gain insight of the hidden facts, figures and information. The research design should be able to provide sufficient information to the researcher so that he can analyse the research problem in a broad perspective. The research design should be able to identify the research problem and research objective.
- 6) **Other Features:** Along with the above, there are some other features also that make a research design good. These are adaptability, flexibility, efficiency, etc. A good research design should be able to minimise the errors and maximise the accuracy.

2.1.3. Research Design Process

The stages in the process of research design are interactive in nature and often occur at the same time. Designing of research study follows given process:

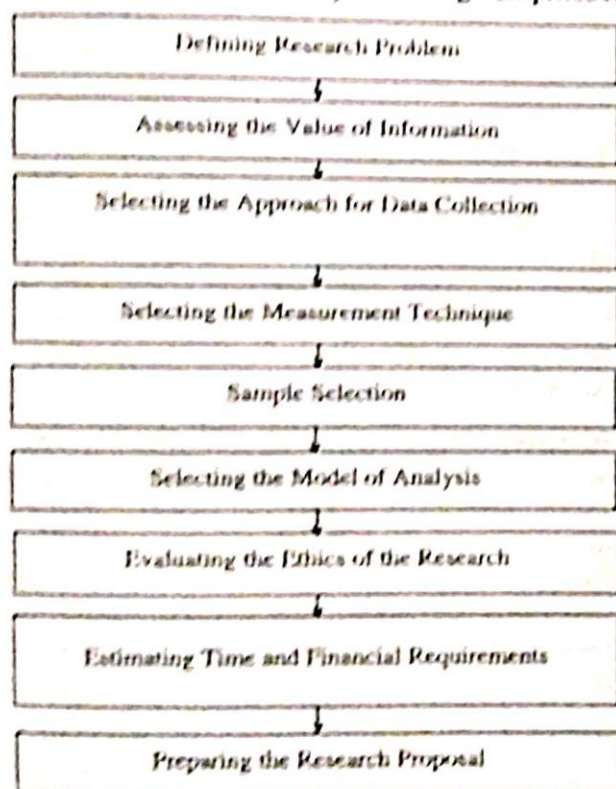


Figure 2.1: Research Design Process

Step 1: Defining Research Problem: The definition of research problem is the foremost and important part of a research design process. Defining the research problem includes supplying the information that is required by the management. Without defining the research problem appropriately, it is not possible for the researcher to conclude the accurate results. While defining research problem, the researchers first analyse the problems or opportunities in management, then they analyse the situation.

The purpose of clarifying the research problem is to make sure that the area of concern for research is properly reflected and management decision is correctly described. After situation analysis, they develop a model for research which helps in the next step which is specification of information.

Step 2: Assessing the Value of Information: When a research problem is approached, it is usually based on some information. These data are obtained from past experiences as well as other sources.

On the basis of this information, some preliminary judgements are made regarding the research problem. There is always a need for additional information which is available without additional cost and delay but waiting and paying for the valuable information is quite difficult.

For example, a car manufacturing industry may be concerned about decrease in the sale of a particular model. A researcher will look for the solutions by analysing various aspects. For this, the researcher has to continuously collect a lot of information and needs to evaluate them by understanding their value and filtering out useless information.

Step 3: Selecting the Approach for Data Collection: For any type of research, a researcher needs data. Once, it is identified that which kind of information is required for conducting the research, the researchers proceed towards collecting the data.

The data can be collected using secondary or primary sources. Secondary data is the previously collected information for some other purpose, while the primary data is collected by the researcher especially for the research problem.

Step 4: Selecting the Measurement Technique: After collecting data, the measurement technique for the collected data is selected. The major measurement techniques used in research are as follows:

- 1) **Questionnaire:** Questionnaire is a formal structure which contains questions to collect the information from the respondents regarding his attitude, beliefs, behaviour, knowledge, etc.
- 2) **Attitude Scales:** Attitude scales are used to extract the beliefs and feelings of the respondents regarding an object or issue.
- 3) **Observation:** It is the monitoring of behaviours and psychological changes of the respondents. It is widely used in research.
- 4) **Projective Techniques and Depth Interview:** Sometimes direct questions are not sufficient

to get true responses from the individuals, that is why, different approaches like depth interviews and projective techniques are used. These techniques allow the respondents to give their responses without any fear. Researcher neither disagrees nor gives advice in these techniques.

Step 5: Sample Selection: Once, the measurement technique has been selected, the next step is selecting the sample to conduct the research. The researchers in this stage select a sample out of the total population instead of considering the population as a whole. Sample can be selected by using two techniques, i.e., random sampling techniques, and non-random sampling techniques.

Step 6: Selecting Model of Analysis: Researchers select the model of analysis or technique of data analysis, before collecting data. After this, researchers evaluate the techniques using hypothetical values to ensure that the measurement technique would provide the desired outcome regarding the research problem.

Step 7: Evaluating the Ethics of Research: While conducting research, it becomes very much necessary for the researcher to follow ethical practices. The researches which are conducted ethically draws interests of general public, respondents, clients and other research professionals. Hence, it becomes the duty of the researcher to evaluate the practices in research, to avoid any biasness on behalf of the observer and researcher as well.

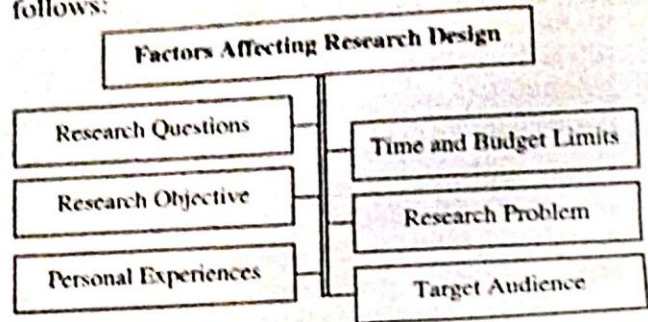
Step 8: Estimating Time and Financial Requirements: This step is one of the most important steps in designing research. Here, researchers use different methods like Critical Path Method (CPM) and Programme Evaluation Review Technique (PERT) to design the plan as well as control process and to determine the resources required.

A flowchart of these activities alongwith their approximate time is prepared for visual assessment of the research process. With the help of this chart, the researcher can find out the sequence of activities to be taken.

Step 9: Preparing the Research Proposal: The final step in the process of research design is preparing the research proposal. A research proposal or the research design is prepared for the operation and control of research. An effective research proposal is prepared before actual conduction of the research.

2.1.4. Factors Affecting Research Design

Various factors that affect research design are as follows:



- 1) **Research Questions:** Research questions perform an important role in selecting the method to carry-out research. There are various forms of research designs which include their own methods for collecting data. For example, a survey can be conducted for the respondents to ask them descriptive or interconnected questions while a case study or a field survey can be used to identify the firm's decision-making process.
- 2) **Time and Budget Limits:** Researchers are bound with restricted amount of time and budget to complete the research study. The researcher can select experimental or descriptive research when the time and budget constraints are favourable to him for the detailed study, otherwise exploratory research design can be adopted when the time is limited.
- 3) **Research Objective:** Every research is carried-out to obtain the results which help to achieve some objectives. This research objective influences the selection of research design. Researcher should adopt the research design which is suitable for research objective and also provides best solution to the problem along with the valuable result.
- 4) **Research Problem:** Selection of the research design is greatly affected by the type of research problems. For example, the researcher selects experimental research design to find out cause-and-effect relationship of the research problem.

Similarly, if the research problem includes in-depth study, then the researcher generally adopts experimental research design method.
- 5) **Personal Experiences:** Selection of research design also depends upon the personal experience of researchers. For example, the researcher who has expertise in statistical analysis would be liable to select the quantitative

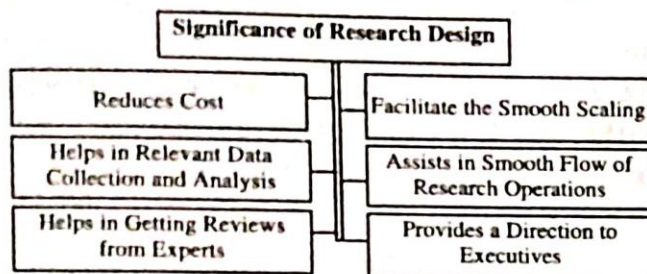
research designs. While, those researchers who are specialists in theoretical facets of research will be forced to select qualitative research design.

- 6) **Target Audience:** The type of target audience plays very important role in selection of research design. Researcher must consider the target audience for which the research is carried-out. Audiences may either be general public, business professionals or government. For example, if the research is proposed for general public, then the researcher should select qualitative research design.

Similarly, quantitative research design would be appropriate for the researcher to introduce the report in front of the business experts.

2.1.5. Significance of Research Design

Significance of research designs are as follows:



- 1) **Reduces Cost:** Research design is needed to reduce the excessive costs in terms of time, money and effort by planning the research work in advance.
- 2) **Facilitate the Smooth Scaling:** In order to perform the process of scaling smoothly, an efficient research design is of utmost importance. It makes the research process effective enough to give maximum relevant outcome in an easy way.
- 3) **Helps in Relevant Data Collection and Analysis:** Research design helps the researchers in planning the methods of data collection and analysis as per the objective of research. It is also responsible for the reliable research work as it is the foundation for entire research. Lack of proper attention in preparation of research design can harm the entire research work.
- 4) **Assists in Smooth Flow of Research Operations:** Research design is necessary to give better and effective structure to the research. Since all the decisions are made in advance, therefore, research design facilitates the smooth flow of research operations and reduces the possible problems of researchers.
- 5) **Helps in Getting Reviews from Experts:** Research design helps in developing an overview

about the whole research process and thus assists in getting responses and reviews from different experts in that field.

- 6) **Provides a Direction to Executives:** Research design directs the researcher as well as the executives involved in the research for giving their relevant assistance.

2.1.6. Errors Affecting Research Design

The research design must attempt to reduce the 8 types of potential errors that can influence research results, viz.

- 1) **Surrogate Information Error:** Surrogate information error is caused by a variation between the information required to solve the problem and the information sought by the researcher. The so-called price-quality relationship, where a consumer uses the price of a brand to represent its quality level, is a common example of a measure that is subject to surrogate information error (because price level does not always reflect quality level). It has been argued that, in part, the earlier mentioned taste test research done by Coca-Cola India resulted in surrogate information. The company based its decision on taste preferences. The resultant consumer backlash was caused by surrogate information error, as consumers purchase Coke for reasons other than taste alone.
- 2) **Measurement error:** Measurement error is caused by a difference between the information desired by the researcher and the information provided by the measurement process. In other words, not only is it possible to seek the wrong type of information (surrogate information error) but it is also possible to gather information that is different from what is being sought. This is one of the most common and serious errors. For example, respondents may exaggerate their income in order to impress an interviewer; the reported income will then reflect an unknown amount of measurement error, measurement error is particularly difficult to control because it can arise from many different sources.
- 3) **Experimental Error:** Experiments are designed to measure the impact of one or more independent variables on a dependent variable. Experimental error occurs when the effect of the experimental situation itself is measured rather than the effect of the independent variable. For example, a retail chain may increase the price of selected items in four outlets and leave the price

of the same items constant in four similar outlets, in an attempt to discover the best pricing strategy. However, unique weather patterns, traffic conditions, or competitors' activities may affect the sales at one set of stores and not the other. Thus, the experimental results will reflect the impact of variables other than price. Like measurement error, experimental error can arise from a number of sources.

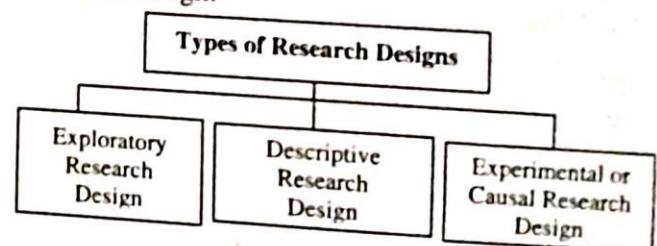
- 4) **Population Specification Error:** Population specification error is caused by selecting an inappropriate universe or population from which to collect data. This is a potentially serious problem in both industrial and consumer research. A firm wishing to learn the criteria that are considered most important in the purchase of certain machine tools might conduct a survey among purchasing agents. Yet, in many firms, the purchasing agents do not determine or necessarily even know the criteria behind brand selections. These decisions may be made by the machine operators, by committee, or by higher Level executives. A study that focuses on the purchasing agent as the person who decides which brands to order may be subject to population specification error.
- 5) **Frame Error:** The sampling frame is the list from which units are drawn for the sample. The 'list' may be an actual listing of units, as in a phone book from which phone numbers will be sampled, or some other description of the population, such as a map from which areas will be sampled. Frame error results when the sampling frame is not an accurate and complete representation of the population of interest. Frame errors arise from erroneous inclusions, erroneous exclusions, and multiple inclusions.
- 6) **Sampling Error:** It is defined as the "non-correspondence of sample selected by probability means and the representative sample selected by the researcher". It occurs when a probability sampling method is used to select a sample and this sample is not representative of the population concerned. **For example**, a random sample of 500 people composed only of people between 35-50 years of age may not be representative of adult population. Sampling error is affected by the homogeneity of the population under study. In general — more homogenous the population; the smaller the sampling error.
- 7) **Selection Error:** It is defined as the "Non correspondence of sample selected by non-probability means and the representative sample sought by the researcher." There is a natural

tendency for the investigator to select those respondents who are most accessible and agreeable. Such samples are often comprised of friends and associates who more or less represent the desired population.

- 8) **Non-response Error:** A nonresponse error occurs, when the obtained sample differs from the original selected sample. >Non response can occur in two ways:
 - i) **Non-contact errors:** Arise due to the inability to reach the respondent. This may be because the respondent is NAH (Not at Home).
 - ii) **Refusal errors:** Arises when the respondent does not respond to a particular item or to multiple items of the questionnaire. Monthly Household Income, Religion, Sex and Politics are topics that may elicit item refusal — normally categorised as refused.

2.1.7. Types of Research Design/ Different Research Designs

Based on the aim of study, there are three types of research design:



2.2. EXPLORATORY RESEARCH DESIGN

2.2.1. Meaning

Exploratory research design is the research design implied in case of exploratory research. In this type of research, researchers try to uncover the hidden and unknown facts and phenomena.

This kind of research is helpful in exploring the information for problems which have not been defined precisely.

It is also called as **formulative research**. It tries to answer the questions with appropriate reasons.

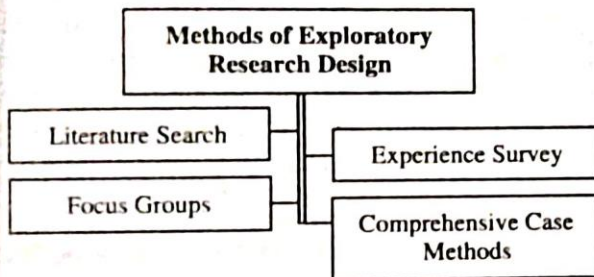
For example, in order to find out the reasons behind the continuous growth of cases of Ebola infection, exploratory research is used as the information providing the reasons is hidden in this case.

Exploratory research design is suitable for those cases, where no prior studies or background knowledge is available for reference. The major focus of these studies is to gain knowledge so that further investigations can be carried-out. Basically, this research is the initial stage of future in-depth investigations. Sometimes, exploratory research is conducted to know the suitable methodology for certain research problem.

A general exploratory research design attempts to provide maximum information in minimum time with least possible effort and money. Final decisions or results cannot be prepared with the help of exploratory research. Using this research, the researcher is able to develop the hypotheses regarding various research problems.

2.2.2. Methods of Exploratory Research Design

Exploratory research is carried out using following methods and techniques:



2.2.2.1. Literature Search

The foremost approach of a researcher for gaining knowledge regarding an issue is to go for existing literature also called secondary data. It includes collecting and evaluating facts and information already available about the selected research problem. It can be done through analysing literature. Generally, journals are useful in providing required information as results or findings of different researches can be found in these journals.

Precisely, it can be said that literature review involves the thorough analysis and examination of prior research. It acts as the summary and provides deep review of the particular or specific research area. Analysing existing literature answers many questions relating to the research problem. Secondary data reveals the gap between researcher's knowledge and available research in that field. The aim here is to be able to understand the facts and knowledge already available about a particular topic alongwith their merits and demerits. Literature review is not just simply a collection of different synopses or reading materials, it is a systematic description of prior studies which is written according to a guiding model.

Significance of Literature Search

Significance of literature search is as follows:

- 1) **Provide Deep Learning:** Literature Reviews encourage deep learning, and provide an efficient way to assess students on their knowledge and understanding of a particular topic.
- 2) **Conceptual Framework:** Literature Reviews give a conceptual framework for research or project planning because students can have a clear idea of what has already been done in the field. This helps students build up new research topics on the basis of existing literatures
- 3) **Provides Expertise:** Literature Review enables a researcher to become an expert/ specialist/ authority in the specific area; the expertise acquired is often directly proportional to the efforts put in literature review.

Limitation of Literature Search

Limitation of literature search is as follows:

- 1) **Limited Search Criteria:** Due to limited search criteria, the result of literature only include article with themes on both offshoring and culture. This approach is practical to filter irrelevant result to the maximum extent, yet it inevitably overlooks certain relevant results.
- 2) **Need Deeper Consideration:** The selection of literature outlets still needs deeper consideration. Particularly, the selection of specific journals needs reference to certain authoritative ranking, in order not to overlook any important journal in this field. Moreover the scan of the major journals is also based on keywords search, which again might result in problem of over-filtering.
- 3) **Imposed by research and publication timelines:** A limitation of literature reviews is that it is imposed by research and publication timelines, which create a lag between those studies included in the review and new published information.

2.2.2.2. Experience Survey

When experts or individuals having significant information on the concerned topic are approached for collecting relevant information, it is called 'Experience Survey'. Individuals from within or outside the research organisation who are familiar with research problem may be involved in experience surveys. This is the reason experience surveys are also called 'expert opinion surveys'. The only purpose here is to utilise the experience of these experts in gaining valuable insight of the problem.

For example, in order to deal with a consumer product problem, a marketing executive would be sufficient to provide required information as he is having experience in the field of consumer marketing. The information provided by him may be very useful for the research problem. Information can also be taken from sales executives, sales manager, product manager or any senior officer of the organisation.

Significance of Experience Survey

Following points highlight the significance of experience surveys:

- 1) **Gaining Additional Knowledge:** Generally, in order to collect expert information on a particular research topic, experience surveys are used. It helps in collecting additional information for the research.
- 2) **Collecting Vital Information:** Experience surveys are very helpful in getting vital information about any topic. It is not possible to collect such information without experience surveys.
- 3) **Information from Expert/Experienced People:** Experience surveys are also important because it includes information from expert or experienced people. This information is very reliable.

Limitations of Experience Survey

Following are the major limitations of the experience surveys:

- 1) **Difficulty in Obtaining Views and Perception:** One of the major limitations of the experience surveys is the difficulty in obtaining the views and perceptions of the experts about the crucial aspects of the research topic under study.
- 2) **Only Used When Secondary Data is Difficult to Obtain:** In practice, experience surveys are only used in cases where, it is not possible for the researcher to collect secondary data for the research.
- 3) **Inflexible Questionnaire:** Another limitation of the experience surveys is the inflexibility of the questionnaire used in the surveys. For a proper research study it is very important to have flexibility in the questionnaire used as it helps in studying several other dimensions important for the study.
- 4) **Possibility of Altering Perception:** Sometimes, experience surveys end in generating such statements/questions which affect the perception of people towards a particular concept or event.

2.2.2.3. Focus Groups

Focus group is a method in which a group of respondents is selected so as to collect desired information through a formal interactive session. It is also called 'group interviewing method'. In this, the respondents response to the questions of a moderator (sometimes researcher himself/herself) to discuss about the given topic or research problem. Moderator asks specially designed questions so as to explore in-depth information. The information explored here is not possible to collect from other techniques like surveys, observations or interviews.

Focus group method is characterised by the use of significant methods and strategies so as to collect and analyse the information generated here. This makes focus group method a reliable source of data collection. This type of method is used in areas like new product concept or new product development, improvement of production-line in an organisation, motivation program for new employees, etc.

This method results in behavioural observations of the respondents, list of ideas and few recommendations from the moderator. These observations and ideas are later quantitatively tested. Focus group is applied to different research areas and the most popular research area is consumer research.

Significance of Focus Groups

Following points highlight the significance of focus group:

- 1) **Cost-effective:** As generally six to twelve respondents are interviewed collectively in a focus group method, it is the most cost-effective method of exploratory research collecting significant information.
- 2) **Time Saving:** Another point proving the significance of the focus group method is that it is time saving. Group of respondents is interviewed in one attempt, thus, lot of time is saved.
- 3) **Recording of Session:** The whole interview session is recorded in focus group method so as to observe the behavioural or verbal responses of the respondents at later stages of the research.
- 4) **Group Interaction:** Focus group method is also significant because different respondents in the group interact with each other and it helps in generating useful information and ideas.
- 5) **Controllable:** Focus group is also useful because it is controllable. The flow of the interaction can be directed by the moderator so as to maintain the discussion in the right direction. It is the duty of the moderator that required topics are covered in the session so as to explore useful information.

- 6) **In-Depth Exploration of Topics:** Focus groups are popularly used for in-depth exploration of the research topic with the help of different respondents. It helps in describing unclear concepts and issues.

Limitations of Focus Groups

Following are the limitations of the focus group method:

- 1) **Non-representative Sample:** Generally few individuals are selected for the process and they may argue over a particular issue. Thus, they are not the true representative of the population.
- 2) **Embarrassment Factor:** In a focus group method, embarrassment factor is very much active. Respondents may hesitate to express their true thoughts over a particular issue due to fear of embarrassment or rejection from peer members. This affects the reliability of the collected information.
- 3) **Effect of Dominance:** Dominance factor is also active in few focus group sessions. Few dominant respondents rule over introvert and affect their opinion or response. It leads to poor quality of information.
- 4) **Moderator Effect:** Sometimes, moderators spoil the flow of the interaction due to poor management. It leads to loss of quality information from the respondents.
- 5) **Inconclusive Results:** The information collected from such focus group methods needs to be processed and analysed in order to be effective. The information collected cannot be used as it is.

2.2.2.4. Comprehensive Case Methods

This is among the most popular methods of exploratory research. In this method, a thorough analysis of a unit is performed. This unit can include a diverse range of entities such as an individual, a family, a cultural or regional group, an institution, a community, etc. This study emphasises on in-depth analysis of a limited issue rather than broad analysis of many issues. Case study tries to analyse the relevant incidents, processes, or situations and their interdependence. The main objective of this technique is finding the factors which may describe the behavioural outline of the given entity in an integrated form.

In case study technique, the researchers investigate the situations that are similar to the research objective. The prime objective of analysing a case study is to gain knowledge about similar situations so

that research can be conducted more objectively. The in-depth or detailed knowledge about the concerned entity or organisation with thorough attention on detailed information is the main benefit of this kind of technique. This in-depth analysis allows the researchers to trace the events as per their occurrence. **For example,** a car manufacturing company facing declining sales, may analyse the case of its competitor to understand the steps taken by them car manufacturer when their sale decreased.

Exploratory case studies are used as preambles to the detailed social researches. Descriptive case studies are studied and analysed in order to begin a research in a better way. It requires a descriptive theory to be developed prior to begin the study. Finally, the experimental case studies are studied to understand and carry-out an investigation effectively.

Significance of Case Methods

Following points highlight the significance of comprehensive case methods:

- 1) **Helps in Understanding Behavioural Changes:** Case study helps a researcher in understanding the behavioural changes of a unit under investigation and facilitates a detailed and comprehensive analysis of the problem.
- 2) **Helps in Teaching Human Behaviour:** By solving case studies, the researcher can get an in-depth insight into the motivations and perceptions that lead to certain actions by an individual in a particular situation. It also highlights the beliefs and values that compel an individual to behave in a certain way. All these information enhance the personal experience of a researcher.
- 3) **Helps in Generalisation of Knowledge:** Case studies allow the researchers to formulate various hypotheses regarding the case and also allows testing them on the basis of given data. This facilitates the researchers in generalising the outcomes for other similar cases.
- 4) **Helps in Studying Social Units:** This method of data collection allows the researchers to thoroughly study and analyse the social units which is not possible through other popular data collection methods.
- 5) **Helps in Designing Questionnaire:** Creation of a questionnaire or a schedule requires deep understanding regarding the unit under investigation. Case study method helps a researcher in preparing effective questionnaire and schedule.

- 6) **Helps in Combining Various Methods:** This method allows the researchers to apply more than one data collection method for investigation, i.e., questionnaires, depth interviews, letters, reports, etc., for an effective outcome.
- 7) **Helps in Studying Nature:** Analysing case studies allows the researchers to identify the nature and extent of problem for which the investigation is to be carried-out.
- 8) **Helps in Providing Historic Data:** Case study method helps in providing historic data about the unit to the researcher. Other than that, this method also recommends remedies for the improvement in present situation.

Limitations of Case Study

Following are the major limitations of the comprehensive case methods:

- 1) **Dissimilarity:** There is always a possibility of difference in the view points of the subject and the actual circumstance. The subject in the case study narrates the problem in his/her own words which may differ from the actual scenario. Therefore, it requires close investigation on the part of researcher in order to reach the conclusion.
- 2) **Wrong Generalisation:** Chances of wrong generalisation always exist in the case study method, as it is a study of only a limited number of units and no pre-defined guidelines are followed by the researchers.
- 3) **Time-taking Process:** Case study method requires an in-depth study of information which consumes a huge amount of time and effort of a researcher.
- 4) **Too Much Assumption Based:** While analysing a case study, the researcher make many assumptions in order to reach the conclusion, out of which many prove to be impractical in real life situations. Therefore, it can be said that the relevance of outcome also becomes uncertain.
- 5) **Limited Applicability:** Applicability of case study method is limited. It cannot be used to resolve problems of a bigger unit. Due to this, sampling of units is also not possible in case study methods.

2.2.3. Purpose/Significance of Exploratory Research Design

Exploratory research is useful in following ways:

- 1) **New Discoveries:** Exploratory research helps a researcher to find-out new ideas and insights

regarding a situation. It always tries to explore the unfamiliar aspects which were previously unknown. Researchers always welcome new ideas and information because it helps them to mould research in new direction which ultimately gives better results and conclusions.

- 2) **Enhances Knowledge:** Exploratory research is very helpful in adding knowledge to the ongoing research.

New knowledge to the existing pool of knowledge enhances the understanding of researchers related to certain area of research.

Since, exploratory research is not backed by statistical methods, the conclusions about a given research problem cannot be developed. However, a clear outline of the subject is effectively produced through this research.

- 3) **Wide Range of Techniques:** Exploratory research facilitates the researchers to select the techniques from a wide range of available sources. The sources used in exploratory research may be published secondary sources as well as some other sources like depth interviews, case studies, expert surveys, case studies or casual discussions.

The researchers can carry-out the research process with the help of one or more of techniques from this broad spectrum to better understand the issue.

- 4) **Directs Future Research:** Exploratory research provides valuable conclusions and new insights about the research topic. These findings and insights trigger the researchers for further researches and acts as a platform for successive investigations. Exploratory research helps the researchers to understand an issue in a better way that helps in deciding the approach to be taken to achieve the desired outcomes.

- 5) **Strategic Planning:** Exploratory research is also beneficial for strategic planning in organisations as the conclusions of this research provide general outline of the given subject, which helps in formulating strategies for future.

For example, in new product development process, an exploratory research may be conducted which can provide the expected need and demand of such products in the market. If, the conclusions are not so favourable, new product planning process may be altered or terminated.

2.2.4. Limitations of Exploratory Research Design

Besides many advantages, exploratory research has following limitations:

- 1) **Leads to Wrong Decisions:** Since, exploratory research does not include statistical analysis to find the conclusions; hence the conclusions of these researches can be completely reliable. Due to this drawback, relying on these findings may lead to wrong decisions. Exploratory research is qualitative in nature, and therefore the outcomes are quite judgemental.
- 2) **Incorrect Information:** Since, the outcomes of exploratory research are qualitative, therefore the analysis may subject to some personal biases. In addition to this, the results are not distinctive, but are generally vague. Because of this limitation, it requires further research to confirm the findings.
- 3) **Cannot be Generalised:** The results of the exploratory research cannot be generalised for the whole population as these only explore the understanding of a given situation or problem. It cannot be used for representing the responses or thinking of the entire population.
- 4) **Costly:** Conducting exploratory research requires significant amount of time and money to arrive at conclusions. Even after spending resources, researchers cannot be certain about the conclusions.

2.3. CONCLUSIVE RESEARCH DESIGN

2.3.1. Introduction

Conclusive research is the type of research which offers information with the help of which a logical decision can be made by the researcher. An appropriate decision from a variety of other decisions has to be made by the researcher.

An experimental research design or a descriptive research design can be helpful in arriving at the most appropriate conclusion.

An accurate alternative is chosen in experimental research design whereas only a part of the situation is explained under descriptive research design. Thus, a very significant conclusive research design can be seen in the form of experimentation.

The exploratory research design is usually less structured and formal when compared to conclusive research design. The samples are large in number

under conclusive research design and the data acquired from those samples undergo quantitative analysis. Therefore the determination, evaluation and selection of the most appropriate action course to be pursued in a particular situation is carried out with the help of conclusive research.

Descriptive research designs can be longitudinal or cross-sectional whereas conclusive research designs can be causal or descriptive.

2.3.2. Types of Conclusive Research Design

There are basically two types of conclusive research design which are as follows:

- 1) **Descriptive Research Design:** Unlike exploratory research, the aim of descriptive research is to describe the characteristics of a phenomenon. It is more rigid than exploratory research. It describes various aspects related to a population.

It is the study that is designed to depict the population in much more accurate way. It attempts to describe, explain and interpret the conditions in much detailed approach. It examines a phenomenon that is occurring at a specific place and at specific time.

- 2) **Experimental or Causal Research Design:** Experimental or Causal or Conclusive research design is a type of research design which is predetermined and structured in nature. It is used for causal or conclusive research, which is conducted quantitatively. It is called causal research, because it is helpful in exploring the cause and effect relationship of a research problem. The main objective of casual research is to test the hypotheses which were defined in the exploratory Research Design. Causal research is simply opposite to the descriptive research, as with the help of experimentation, it can interpret whether the relationship is causal or not.

2.4. DESCRIPTIVE RESEARCH DESIGN

2.4.1. Meaning of Descriptive Research Design

When the objective of the research is to describe the characteristics of a phenomenon or population, the researchers select descriptive research. It can provide and describe the critical features and information about the target population or environment. It describes the answers for questions like what, who,

how, when, where, etc. The objective of descriptive research is to reveal the already present data or feature in the given population. In other words, it can be said that descriptive research seeks to explain a phenomenon and the reasons and assumptions behind the specific behaviour. **For example**, archaeologists explained the Harappan civilisation and described many significant findings such as urban planning, baked brick houses, drainage system, water supply system, etc., which has influenced modern society to a great extent.

Descriptive research emphasises on explaining the phenomenon by providing factual and accurate information, but does not discuss the variables responsible for a situation. Also the effect of a particular variable cannot be measured, it can only be described. Therefore, it cannot be used for describing the cause and effect relationship among the variables.

Descriptive research focuses on the status of a given environment. It is very suitable for research in education, management, epidemiology, and social sciences, behavioural sciences, etc. Both qualitative and quantitative data are produced through descriptive research that helps in describing the state of nature at a given time.

2.4.2. Types/Methods of Descriptive Research Design

Major methods or techniques for conducting descriptive research are as follows:

- 1) **Evaluating Secondary Data:** Sometimes, to collect the primary data, it is essential to collect and analyse the secondary data first. These secondary data are already available in form of magazines, journals, previous researches, which saves the time from conducting a survey. Even if the primary data is already collected, most of the projects analyse quantitative secondary data for various purposes.

The factors which make secondary data less trustworthy are validity and reliability of those data. If the data are collected and analysed keeping in mind the reliability and validity, analysis of quantitative data becomes more effective. An example of quantitative secondary data is census data, crime rates, unemployment rates, etc.

- 2) **Survey:** Survey is a systematic descriptive technique that is conducted to collect the information from a sample of individuals drawn from a large population. Generally, surveys are carried-out with the help of well-constructed questionnaire. In this method, the researchers ask

questions to the respondents to which they answer, and their answers are subsequently recorded. After the completion of questionnaire, these data are analysed and interpreted to get the conclusion. For effective and reliable survey, a questionnaire should be simple and well-constructed. The questions used in the questionnaire should be properly sequenced and easy to understand. The technique of survey is widely applicable to many areas that include primary data collection. Survey can be conducted in many forms such as feedback forms, mail surveys, face to face in-depth interviews, etc.

- 3) **Panels:** Panels are mostly used progressively for syndicated research projects. In this method a panel of study units such as organisations, households, retail stores, etc., from which data is collected periodically. This kind of measurement provides data that show the changes in behaviour, attitudes, perceptions, etc., over time. Various commercial institutions sponsor the panel studies and are maintained by different research agencies.

Panels can be studied for numerous purposes such as to analyse the trends in market, assess the changes in market due to changes in marketing mix variables. Although panel studies are suitable for these researchers, considerable efforts should be made to control the dynamic variables. **For example**, in a consumer panel, buying behaviour of individuals is observed with respect to time.

- 4) **Observation:** One of the most common methods used by researchers to collect data is to observe the situation or phenomenon. Here, it is important to note that observation does not only mean to see things, but to intensively monitor and understand them deeply to interpret about them.

Researchers select observation for data collection because with the help of observation various unspoken expressions can be recorded along with their timings. It also reduces the possibility of personal biasness that occurs during other methods. It allows the researchers to record detailed descriptions and formulate relevant questions to bring out the nature, intention, attitude, etc. An example of observation study can be used to estimate the percentage of population who obey the traffic rules.

- 5) **Case Study Method:** Another technique used for descriptive research is case study. The prime

purpose of analysing a case is to enhance the pool of knowledge in various fields. In this technique, usually the researchers study the case histories of organisations, institutions, programmes, etc., rather than an individual. Several fields like psychology, medicine, sociology, management and counselling etc., use case study for information gathering.

- 6) **Longitudinal Research:** Longitudinal research attempts to examine the features of people or units at more than different points in time. It is used to examine the changes in society. Longitudinal research is used in descriptive and explanatory researches. It is comparatively costly and complex than cross-sectional research.
- 7) **Cross-Sectional Research:** Cross sectional research is a snapshot of a phenomenon that represents the data at one point in time. It shows how those variables would be pointed out in a section of a population. This kind of research uses survey method for data collection. Although it is most suitable with the exploratory research but it can also be used along descriptive and explanatory researches as well. It is very cost-efficient and simple in nature.
- 8) **Other Methods:** Besides above methods, some other methods are as follows:
 - i) **One-Shot Survey Design:** One-shot survey design is the basic type non-experimental research. In this technique, researcher carries out a single observation to describe the phenomenon or situation. It is preliminary research type, but holds a good position in descriptive research.
 - ii) **Trend Survey:** Trend survey seeks to estimate perceptions regarding a group's shared experience. The distinctive characteristic of trend surveys is that it measures the perceptions of a group rather than individual's perception. Trend surveys consider many groups and measure the changes in their perceptions to trace any trend. Trend surveys are conducted on general public to represent common interest. These studies can be carried-out for short as well as long duration projects.
 - iii) **Follow-Up Survey:** Follow-up surveys require an additional step past panel surveys. In a follow-up survey, researchers survey a group of individuals then again survey the same group several years later, then surveys the same group a third time several years after the panel group study has completed.

- iv) **Developmental Survey:** In this type of descriptive research, the development in learning and performance of people are measured with time. This research is carried out with the help of longitudinal research, in which group of people are measured over time.

Since, it becomes difficult to trace same group over a long period of time, hence to overcome this problem cross sectional method can be adopted, where people from different age groups are selected to assess the effects of maturity. A good example of developmental survey is to measure the attitude of viewers of cinema, where the perceptions can be measured by selecting people from different age group.

2.4.2.1. Case Study Design

A common technique used for descriptive research is case study. In this, a similar incident or situation (sometimes a small number) is comprehensively analysed so as to gain the information about the real problem. While in survey method, few amount of information is gathered about a large population, in contrast, in case study method, a large amount of information is collected about one or few respondents. By examining one significant case, the researcher is able to draw thorough conclusions about several other related cases.

Although, case study cannot be used for making inferences or generalisations about a particular population, the conclusions drawn from the case studies play a significant role in developing concepts and theories by providing sufficient reasoning. Case study is generally used to deal with the critical issues faced by organisations in their operations.

The prime purpose of analysing a case is to enhance the pool of knowledge in various fields. In this technique, usually the researchers study the case histories of organisations, institutions, programmes, etc., rather than an individual. Several fields like psychology, medicine, sociology, management and counselling etc., use case study for information gathering.

Case studies are widely employed in various fields of research in management, like planning strategy, introducing innovation, organisational change and information systems, showing how case study designs are versatile in nature. Case study is considered to be an effective method of descriptive research, as it undertakes deep down analysis of the subject and uses numerous sources for acquiring the data. This is because case studies prove to be useful

are controlled and structured in nature. To understand the causal relationship, it is necessary to manipulate one or more independent variables to measure the effects on dependent variables.

Therefore, experimental or causal researches help in collecting experimental knowledge or information, which is based on experimental data rather than theories. This research may be helpful in understanding an event or enhance the performance in a particular field.

Experimental research is important to society as well for business, as it helps in predicting the future activities. It provides an outline of activities to be performed to test the relationship between various variables by proving hypotheses. In other words, it is a structured design that allows the researchers to carry-out experiments.

2.5.2. Classification/Methods of Experimental Research Design

According to the Campbell and Stanley, experimental research design can be described with the help of following symbols:

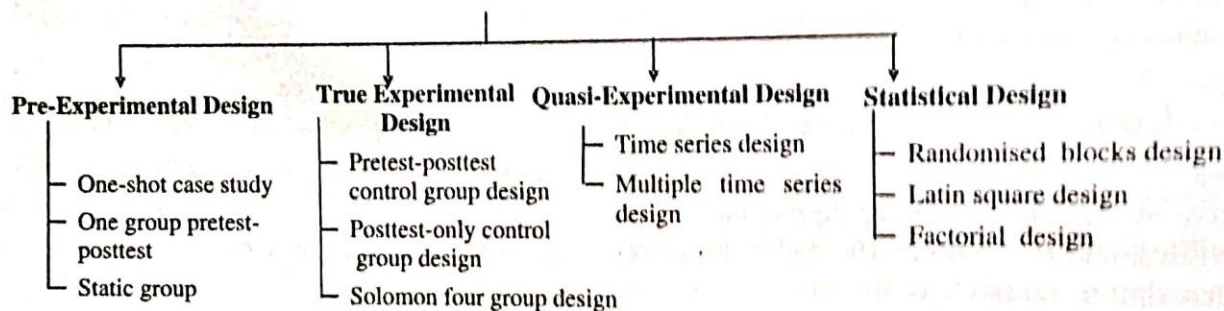
X = A set of treatments introduced on experimental group.

O = Observations or measurements taken on independent variable. In case of more than one observation, these can be denoted with the help of subscripts, i.e., O_1, O_2, \dots, O_n .

R = Random assignment of the test units.

Experimental research designs can be carried out using following methods:

Methods of Experimental Research Design



2.5.2.1. Pre-Experimental Designs

In pre-experimental designs, treatments are not allocated to the subjects randomly. Therefore, these designs cannot be called true-experimental designs, as these techniques do not deal with the challenges which have occurred due to loss of internal validity.

These designs are suitable for the cases, when it is the only possible solution for an experiment. Various pre-experimental designs are as follows:

- 1) **One-Shot Case Study:** This technique is also known as 'after-only design'. In this technique, only one test unit is assigned a treatment X , and then a single measurement O_1 is taken on dependent variable.

The test units are not randomly assigned to the treatments, and the test units are selected by the researcher.

For example, if a primary school teacher wants to see if praising children cause them to become more confident. He tests it with two students of second standard, and praises them. He finds that they are more confident.

Hence he concludes that:

Group	Treatment	Post-test
Experimental Group	X	O_1
Students	Praise	Confidence

While one-shot case study is the most basic form of experiment, it has its own limitations. It does not allow the researcher to compare the measurement O_1 with the dependent variable before the treatment. Alongwith this, the measurement of one-shot case study can be affected by many extraneous variables, which cannot be controlled.

This in turn affects the validity of the measurement. Therefore, this type of research is suitable for exploratory research rather than experimental research. This technique is opted only when it is the only solution to the problem.

- 2) **One Group Pretest-Posttest:** In one group pretest-posttest design, only one group is involved which is exposed to the treatment. Here, the researcher measures the subjects before and after the implementation of treatment. It is the improvement over one-shot case study, as it allows researchers to compare the changes in objects from before and after stages.

For example, a sales manager may wish to conduct a training programme to enhance the knowledge of sales team members. The sales manager may measure the knowledge of team members as 'O₁'. As the training programme is completed, the sales manager may again measure the knowledge level of team members as 'O₂'.

Group	Pre-test	Treatment	Post-test
Experimental Group	O ₁	X	O ₂
Sales Team Members	Selling Skills	Training Programme	Selling Skills

This technique is widely used in marketing research. It also suffers from disadvantages. There is a possibility that other extraneous variables cause the change rather than the treatment.

- 3) **Static Group:** In this technique, there are two groups upon which measurements are to be taken. The first group is experimental group which is subjected to the treatment, and the other one is control group, which is not subjected to the treatment. Here, the measurement of experimental group is taken after being exposed to treatment, while the control group is measured

without treatment. The outcome of the experiment is measured by comparing both the measurements.

For example, a researcher may wish to compare the effect of a medicine by giving it to a patient, and comparing his condition with another similar patient without the medicine.

Group	Treatment	Post-test
Experimental Group	X	O ₁
Patient	Medicine	Patient after treatment
Control Group		O ₂
Patient		

$$\text{Experimental Variable Effect} = (O_1 - O_2)$$

Although, this technique is more reliable than previous techniques, but it also has some disadvantages. This technique does not assure that both the control group and the experimental group are equal in every aspect. If the groups are selected randomly, and the group elements are not similar in nature, then the outcome may differ which may affect the validity of findings. When the group elements are selected by the researcher, then it is called as an after-only design with control group.

2.5.2.2. True Experimental Designs

True experimental research design is considered to be the most accurate type of experimental research design. In this type of experimental designs, researchers try to conduct research to prove some hypotheses using statistical techniques. True experimental designs are as follows:

- 1) **Pretest-Posttest Control Group Design:** In this technique, a measurement is taken both from the experimental and control group before the treatment is administered on control group. After the treatment is subjected, a posttest is conducted on both the groups to measure the changes in the groups. The difference between the measurements can be calculated statistically. The criterion for conducting this technique is that both the groups should be similar in every possible aspect. The basic philosophy behind this design is that both the groups would be equally affected by the presence of any extraneous variable.

For example, this technique can be used to measure the effectiveness of an advertisement. For this, two groups will be randomly selected, named 'experimental group' and 'control group' respectively. A questionnaire will be given to them to measure their perspective regarding the product. After that members of the experimental group will be shown the advertisement. After showing the advertisement, the measurement will be taken from both groups to see the changes in perspective regarding the product.

Randomisation	Group	Pre-test	Treatment	Post-test
R	Experimental Group	O ₁	X	O ₂
	A group of People	Response to Questionnaire	Product Advertisement	Response to Questionnaire
R	Control Group	O ₃		O ₄
	A group of People	Response to Questionnaire		Response to Questionnaire

$$\text{Experimental Variable Effect} = (O_2 - O_1) - (O_4 - O_3)$$

- 2) **Posttest-Only Control Group Design:** In posttest-only control group design, experimental and control group are selected from the target population, which are identical in nature. Before the introduction of the treatment, no measurement is taken from any group. Only after the introduction of the treatment, the level of phenomenon is measured in both the control and experimental groups. The resulting effect of the variable may be calculated by subtracting the control group level from the experimental group level. The above example can be implemented through this technique also. The difference would be that researchers would not test the perspective of group of people before showing the advertisement related to them. The perspective of the people would be measured right after showing the advertisement.

Randomisation	Group	Treatment	Post-test
R	Experimental Group	X	O ₁
	A Group of People	Product Advertisement	Response to Questionnaire
R	Control Group		O ₂
	A Group of People		Response to Questionnaire

Experimental Variable Effect = (O₁ - O₂)

- 3) **Solomon Four-Group Design:** Solomon four-group is an improvement over pretest-posttest design. This design introduces two additional control groups, which helps the researchers to assess the influence of confounding variables on the measurement. It also allows estimating the changes caused due to pretest on the subjects. In this experimental design, different combinations of tests are conducted to identify the extraneous and confounding variables and reduce their effects on the outcome. Although this design is beneficial from the perspective of accuracy, but executing this design incurs huge cost and takes a lot of researcher's time.

For example, 100 teachers are selected and randomly divided into four groups of 25 teachers and named 'experimental group-1', 'experimental group-2', 'control group-1', and 'control group-2' respectively. Now, first experimental group would be given a faculty morale questionnaire and would receive the treatment in form of sensitivity training. The control would be given the questionnaire and would not receive any treatment.

On the other hand, second experimental group would receive sensitivity training and the second control group will directly be posttested in form of questionnaire.

As soon as the groups are pretested and receive treatments, they would be again given the questionnaire. Now, the effects on various groups of teachers can be measured by comparing the groups.

Randomisation	Group	Pre-test	Treatment	Post-test
R	Experimental Group 1	O ₁	X	O ₂
	25 teachers	Faculty Morale Questionnaire		
R	Control Group 1	O ₃	Sensitivity Training	Faculty Morale Questionnaire
	25 teachers	Faculty Morale Questionnaire		
R	Experimental Group 2		X	O ₅
	25 teachers			
R	Control Group 2		Sensitivity Training	Faculty Morale Questionnaire
	25 teachers			
				O ₆
				Faculty Morale Questionnaire

2.5.2.3. Quasi-Experimental Designs

Quasi-experimental research designs are applied when true experimental designs cannot be applied. These techniques are easy and economical in nature.

These research designs are suitable for following conditions:

- 1) Researchers have complete control over the measurements.
- 2) Researchers cannot control the projection of treatments and randomisation of test units is not possible.

Some of the major quasi-experimental designs are as follows:

- 1) **Time-Series Design:** In this design, the researcher takes a series of periodic measurements on the dependent variable. The treatment is introduced either manually by the researcher or occurs naturally. As soon as the treatment occurs, the periodic effects in measurements are estimated. By measuring the dependent variable before and after the treatment, researcher becomes able to identify and control the extraneous variables. Periodic assessment not only affects the immediate measurement to the treatment, but also affects all the measurements. By applying randomisation in selection of test units biasness in research outcomes can be reduced.

For example, the death rate of people due to Ebola disease, can be measured periodically, i. e., before and after the medication of people in successive years to measure the effects. While the people suffering from this disease can be measured before the treatment, the people can also be observed after introducing the treatment in form of medication. This will enable the researchers to see the effect of medication on people.

Randomisation	Group	Pretest			Treatment	Posttest		
		O ₁	O ₂	O ₃		O ₄	O ₅	O ₆
R	Experimental Group	Death Rate (Before 3 years)	Death Rate (Before 2 years)	Death Rate (Before 1 years)	Medication	Death Rate (After 1 year)	Death Rate (After 2 year)	Death Rate (After 3 years)
	A group of people suffering from Ebola							

- 2) **Multiple Time-Series Design:** This design is slightly different from the time series design in a way that it includes a control group for measurement. The efficiency of this design depends on the fact that the effect of treatment needs to be measured twice, i.e., against the measurements of experimental group before the treatment, and against the control group as well. Another consideration while performing this research is to select the test units of control group carefully.

Taking the above example, the same observation can be made with the help of a control group. The members of control group would not receive the medication. This technique helps in drawing the conclusions in a better way.

Randomisation	Group	Pretest			Treatment	Posttest		
		O ₁	O ₂	O ₃		O ₄	O ₅	O ₆
R	Experimental Group	Death Rate (Before 3 years)	Death Rate (Before 2 years)	Death Rate (Before 1 years)	Medication	Death Rate (After 1 year)	Death Rate (After 2 years)	Death Rate (After 3 years)
	A group of people suffering from Ebola							
R	Control Group	Death Rate (Before 3 years)	Death Rate (Before 2 years)	Death Rate (Before 1 years)	—	Death Rate (After 1 year)	Death Rate (After 2 years)	Death Rate (After 3 years)
	A group of people suffering from Ebola							

2.5.2.4. Statistical Designs

The most common statistical designs are as follows:

- 1) **Randomised Block Design:** Randomised block design has evolved from agricultural research, where the researcher introduces various treatments to different blocks of land, so that their effects on the yield of crop can be assessed. Though there may be difference in the characteristics of land due to which the yield of crop can be affected. To identify the differential

factors, the researchers introduce the treatments to the plots in each block randomly.

The number of plots in a block is equal to the number of treatments, so that plots from each block can be selected for different treatment. As soon as the treatment is introduced, the production of crop is measured by using statistical techniques to analyse the effect of treatment.

- 2) **Latin Squares Design:** In this research technique, the researcher aims to control the variation in two factors. The design forms a square as there is equal number of rows and columns. This technique is adopted to identify the extraneous variable causing the change.

In this research, all the possible combinations of these two variables can be estimated multiple times. This design is used to reduce the effect of nuisance factors. An important criterion for conducting this research is that the number of many test units should be equal to the number of treatments.

- 3) **Factorial Design:** In factorial experimental design the researcher tests two or more variables at the same time. It tries to find out whether the two variables combine to form the observed response or they combine independently.

This technique is suitable when there are three or more experimental variables, and the test units are selected randomly. The major disadvantage of this method is that it involves complex calculations.

2.5.3. Significance of Experimental Research Design

The significance of experimental research can be understood by following points:

- 1) **Cause and Effect:** The major advantage of experimental research design is that the cause of a particular event can be identified here. Other research designs either explain the event or describe the population, but do not determine the cause behind an effect. By conducting an experiment using random assignments, and participants unknown to the causing factors, would enable the researcher to observe any deviation due to the experiment.
- 2) **Reliable Outcomes:** Another benefit of experimental research is that the outcomes of experimental researches are highly reliable, as the procedure is conducted in a controlled environment using quantitative measures, and random assignments. This distinctive feature allows the researchers to generalise the findings as well as replicate the experiment with similar sample drawn from the same larger population. The samples drawn are true representative of the population.
- 3) **Provides Helpful Insight:** These designs are very useful in providing important insight for

solving immediate problem. For example, by researching on different techniques of motivation, a suitable and effective motivation technique may be developed for the employees of an organization.

- 4) **Control over Variables:** In experimental research design, the researcher can control different variables in the environment. Thus the researcher is able to determine the individual impact of all possible variables. Moreover, the interrelationship among variables can also be measured more effectively.

2.5.4. Limitations of Experimental Research Design

Experimental research design has following limitations:

- 1) **Artificiality:** The experiments are performed in artificial settings which lack real-life conditions. Such unnatural environment disturbs the genuine behaviour of respondents, hence producing a false picture. As these experiments are entirely different from the real-life environment, the outcomes of such experiments may not be used for other live situations.

- 2) **Biases by Researchers:** Since in experiments researchers input the causing variables manually, therefore it is susceptible to "selection bias" on the part of the researcher. Many times because of convenience in execution, the researcher can manipulate the inputs. As a result, the outcomes are not completely reliable and valid.

Moreover, the easiest and cost-effective sample is selected by the researcher for the study and findings of this study are generalised for further use.

- 3) **Modified Responses:** The responses of the participants may be influenced by many factors in the surrounding. Instead of giving genuine responses, the respondents may respond what the researcher wants to hear or may modify the response as per the subject of research.

- 4) **Impossible to Control All the Variables:** The much known feature of experimental design is the control over different variables present in the environment. However, all the factors cannot be entirely controlled as it is not possible to identify all the potential variables affecting the experiment. Thus, it is very difficult for the researcher to have complete control over the thinking and behaviour of the respondents.

- 5) **Uncertainty of Actual Responses:** The responses given by the respondents in such designs are uncertain as it is difficult to differentiate between the true and manipulated responses.

2.5.5. Formal and Informal Experimental Designs

Experimental design seeks to find-out the cause-and-effect relationship of the phenomenon under study. Under this design, two similar groups, one called 'experimental group' and the other 'control group' are chosen. The experimental group is exposed to pre-designed procedures while the control group is kept constant. At the end of experiment, the two groups are compared to find-out the resultant effect of the experiment. The difference between the two groups is considered to have been produced by the causative factors. The types of experimental research design are as follows:

- 1) **Formal Designs:** In formal designs the researcher randomly assigns treatments to randomly selected test units, whereas in informal design careful assignment of treatments was not adopted. Thus statistical tests such as analysis of variance can be applied to the observations of formal designs. Analysis of variance enables the researcher using an experiment on a sample to determine whether one treatment significantly influences another factor or whether the observed association could have been due to chance of some other factor. The four types of formal experimental designs are listed below:
 - i) Completely Randomised Design.
 - ii) Randomised Block Design.
 - iii) Latin Squares Design.
 - iv) Factorial Design.
- 2) **Informal Designs:** When these designs are used, many of the effects related to the experiment can be quantified. But because of the fairly loose way in which they are structured, the changes specifically caused by the treatment cannot be isolated by statistical tests. The treatments are not allocated to experimental units randomly but these designs are less expensive and easy to