
UNIT 7 EXPERIMENTAL RESEARCH METHOD

Structure

- 7.0 Introduction
- 7.1 Learning Outcomes
- 7.2 Nature of Experimental Method
- 7.3 Classic Experimental Research Design
- 7.4 Process of Experimental Research
 - 7.4.1 Control of Extraneous Variables
 - 7.4.2 Randomisation
- 7.5 Experimental Design
 - 7.5.1 Factorial studies
 - 7.5.2 Quasi experimental design
- 7.6 Field Experiments
- 7.7 Merits and Demerits of Experimental Method
- 7.8 Let Us Sum Up
- 7.9 Keywords
- 7.10 Further Readings
- 7.11 Check Your Progress: Possible Answers

7.0 INTRODUCTION

Communication research has established itself firmly and is a fertile field for young researchers. The area is rich, vast, and varied. The experimental method is a well-established media research method, but its use is restricted. There is a tendency among researchers to opt for the survey method. Experimental research is highly popular in psychology and social psychology. In the case of media research, the experimental method can produce an enormous amount of data. However, media researchers find several issues in conducting experiments. For instance, the method is largely quantitative and uses extensive statistical procedures for analysis. Issues relating to infrastructure, i.e. getting the appropriate testing conditions and/or getting matching subjects for experiments, pose problems for researchers. There can be laboratory experiments or field experiments. The purpose is to find out and establish a causal relationship between an independent variable and a dependent variable. This method is also amenable to statistical analysis depending on the data generated.

We have discussed earlier that the selection of a research method depends upon the topic and the researcher's methodological approach to it. The experimental technique supports an empirical approach to research.

7.1 LEARNING OUTCOMES

After completing this Unit, you should be able to:

- Discuss the nature and method of experimental research;
- Describe the process of classic experimental research design;
- Differentiate between experimental and quasi-experimental designs;
- Explain the nature and scope of field experiments; and
- Outline the advantages and disadvantages of the experimental method of research.

7.2 NATURE OF EXPERIMENTAL METHOD

As already stated, the experimental method is widely used in natural sciences and certain social science disciplines. Being quantitative, experiments attempt to determine the cause-and-effect relationship between factors. In other words, they help establish and find out cause and effect. Of course, there are differing views. Some scholars think finding a cause-and-effect relationship between two variables, independent and dependent, is not easy. Nonetheless, the experimental method is one of the effective methods in which the researcher can control the time order when presenting two variables. This enables him/her to ensure that the cause happens first and then the effect and s/he can also control other possible causes of the variable being studied.

The experimental method is scientific in nature and character. As science makes progress, its forms of explanations also keep changing. Since social sciences adopt scientific methods of empiricism, their explanations of social phenomena also keep changing. Explanations are categorised into deductive and probabilistic. This classification is based on the types of generalisations an explanation employs. Let us take the deductive explanation for evaluation. The pre-conditions of a deductive explanation are;

- 1) A universal generalisation.
- 2) A statement of conditions which generalises appear true.
- 3) An event to be explained (explicandum), and
- 4) The rules of logic.

The law of gravitation is a good example of a deductive explanation. Its applicability encompasses past, present, and future. In natural sciences, deductive explanations are made possible with manipulation and control through experimentation. Experiments help us demonstrate the effect of one phenomenon on another phenomenon. However, only a few phenomena of interest to social scientists are susceptible to manipulation and control. Yet, certain ethical questions relate to social scientists' manipulation of social phenomena. Besides, most human factors are not amenable to natural scientists' research methods.

Social scientists mostly prefer to have probabilistic explanations. A generalisation is supposed to provide evidence for the phenomena under investigation. No explanation can be deduced from the generalisation. In universal generalisation, we may say 'All A is B', whereas a probabilistic generalisation will say that 'n per cent of A and B'. Probabilistic explanations are weak compared to deductive explanations. Probabilistic explanations have a minimal predictive capacity. The deductive explanation is strong in its predictive power.

7.3 CLASSIC EXPERIMENTAL RESEARCH DESIGN

A classic experimental research design contains two groups for comparison. One is an experimental group, and the other is a control group. These two groups are equal in every respect. However, there is one difference. The experimental group is administered or exposed to an independent variable called the experimental stimulus, and the control group is not exposed to the experimental stimulus. Measurements on the dependent variable are called scores and are taken twice from each group. The first measurement is known as the **pre-test**. It is taken before administering experimental stimulus to the experimental group. The control group also undergoes measurement. The second set of measurements takes place after the experimental group is exposed to the experimental stimulus. This is known as the **post-test**. The control group, of course, is not exposed to the experimental stimulus. But both groups are measured. The difference in measurement between the post-test and pre-test will be compared in the experimental and control groups. In the case of the difference in the experimental group, we can safely assume that the independent variable causes changes in the dependent variable or that the independent variable affects the dependent variable and is causally related to the dependent variable.

| Group | Pre-test | Post-test | Difference |
|--------------|----------|-----------|-----------------|
| Experimental | M1 | M2 | $M2 - M1 = R_a$ |
| Control | M3 | M4 | $M4 - M3 = R_b$ |

Selden Menefee and Audrey Menefee, who visited the Tiptur area of Karnataka, conducted an experimental study using a mimeographed newspaper to measure the information level of the sample subjects chosen. When the measurements were compared between the experimental group and the control group, it was found that the information level of the experimental group had gone up due to the exposure to the mimeographed newspaper more than the control group that was not exposed to the newspaper, the experimental stimulus. This meant that exposure to the newspaper caused an increase in the information level of those exposed to it.

Check Your Progress: 1

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this Unit.

1. What is the primary purpose of the experimental method?

.....
.....
.....
.....

2. Identify the pre-conditions of a deductive explanation.

.....
.....
.....
.....

3. Briefly explain the classical experimental method.

.....
.....
.....
.....

7.4 PROCESS OF EXPERIMENTAL RESEARCH

The experimental method involves two operations: manipulation and observation. Researchers manipulate an independent variable in scientific jargon and observe the subjects' consequences or responses to the dependent variable. Each experiment may be different, but every researcher must consider the common steps to follow.

Below is a direct quotation from Wimmer and Dominick (2003), who have identified the steps as follows:

- 1) "Every researcher has to select the setting. Most experiments are conducted in a laboratory or any other environment that is under the investigator's control. Experiments are also conducted in natural settings, but the researcher has limited control over them.
- 2) Any research will have to select the experimental design. The hypotheses or research question will determine the appropriateness of the design. The types of variables available for manipulation or evaluation, the availability of respondents, and the availability of resources will impact the design selection.
- 3) Operationalise the variables: In experimental research, the independent variables are operationalised after their creation through manipulation. Scales or rules are constructed to categorise behaviour observations to operationalise the dependent variables.

- 4) Decide how to manipulate the independent variable. A set of clear and specific instructions, events or stimuli is developed to manipulate the independent variables and present them to the experiment subjects. The two types of manipulations are straightforward and staged. "In straightforward manipulation, written materials, verbal instructions, or other stimuli are presented to the subjects". The investigators create events and circumstances that help them manipulate the independent variable if it is staged manipulation. It can be simple or elaborate. The use of a confederate is also in vogue. A confederate is a person who acts like a subject, but in reality, he is also part of the manipulation.
- 5) Select and assign subjects to experimental conditions. The best way to guarantee external validity is to select the subjects randomly from the population and assign them to the experimental and control groups.
- 6) Conduct a pilot study: A pilot study involving a small number of subjects will reveal problems and enable the investigator to make suitable corrections and revisions. It is done to determine whether manipulating the independent variable has had the desired effect.
- 7) Administer the experiment: The main phase of research is data collection. Experimental manipulations are done on the subjects, either individuals or groups. Then, the effect of the independent variable is measured, and the subjects are debriefed. While debriefing, the investigator explains the objectives and consequences or implications of the study undertaken.
- 8) Analysis and interpretation of results: The subjects' scores on the dependent variables measured are tabulated and statistically analysed. Then the investigator interprets the results.

7.4.1 Control of Extraneous Variables

In media research, an investigator encounters unwanted extraneous variables. He or she must remove or control them to ensure the internal validity of the instrument/ method employed for research. These extraneous variables are also called **confounding variables**, which normally contaminate and complicate the findings. The environment, experimental manipulations, experimental design, and the assignment of subjects to both experimental and control groups control the confounding variables.

Generally, three types of techniques are used in assigning subjects to groups. They are:

- Randomising
- Matching
- Generalisation

Matching and randomisation are the two methods of control. Matching control variables are known to the researcher before the research process starts. Randomisation will enable him/her to remove the effect of unexpected or not- seen-before factors.

Matching is a method to equate the experimental group with the control group on external variables presumably related to research hypotheses. The two methods of matching the groups are precision matching and frequency distribution. Precision matching is also known as pairwise matching. Each subject in the experimental group is matched by another one in the control group with the same characteristics. For example, if one person is 30 years of age in the experimental group, another subject in the control group will also be of the same age. The problem with this method is the difficulty of matching many variables. Pairwise matching is a tough task. Precision matching has a very high number of losses of cases in the absence of compatible twins.

This is usually substituted by frequency distribution. Here, experimental and control groups are matched separately rather than in combination for each variable. It is not one-to-one matching, but these two groups are matched on identified central characteristics. For instance, the average age of one group should match the average age of another. This may be less precise, but it is easy to manage. As we know, matching can control a limited number of pre-identified extrinsic variables. A good number of confounding variables may affect the relationship between independent and dependent variables.

7.4.2 Randomisation

One cannot be sure of eliminating the confounding variables. Hence, there is scope for wrong interpretation of results. This can be avoided by opting for randomisation - a process by which subjects are assigned to the experimental and control groups. The assignment can be done by flipping the coin, using a table of random digits, using the lottery method, or any other suitable method. This will ensure an equal probability of being selected for the experimental or the control group. Randomisation will remove any systematic mistake because extrinsic variables may relate to independent or dependent variables.

Internal validity is important in communication research. Another equally significant aspect of research is the generalisability of the findings. The effect of one variable on another in a natural setting and on a bigger population is known as the external validity of research designs. It also refers to the ability to generalise the research findings. Two factors related to external validity that can affect the generalisation of research results are the representativeness of the sample and the reactive arrangements.

Random assignment of subjects to the experimental and control groups will ensure equality between the groups and the investigation's internal validity. However, it may not represent the larger population, only the sample selected. A high rate of refusal and enormous cost may affect opting for a highly representative sample. Next will be the reactive arrangements. The results of a study should be generalised not only to a large population but also to a real-life situation. This is difficult to accomplish. It may result in a reactive effect of testing on the subjects. For instance, a pre-test may affect subjects' responses to the experimental stimulus. Such an effect can be avoided by opting for a post-test only.

Check Your Progress: 2

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this Unit.

1. Explain the two operations involved in the experimental method.

.....

2. List the common steps to follow in experimental research.

.....

3. Briefly explain the three factors that can be used to control the confounding variables.

.....

7.5 EXPERIMENTAL DESIGN

The experimental design refers to the 'total experimental plan or structure of the research'. It is selecting and planning the experiment related to a research problem. The simple procedures are pre-test, experiment, and post-test. Other factors like variables, sampling, control, and the construction of a measuring instrument should also be included in the process. Normally, research designs are classified as experimental and quasi-experimental. We have already discussed the basic procedure of a classical research design. Some of the popular experimental designs are recounted here:

a) Pre-test-post-test control group

The pretest-posttest control group design is one of the basic procedures commonly adopted by media researchers. This procedure helps control rival hypotheses because of the effects of maturation, testing, history, and other sources. Each group faces the same situations during the experiment. This is the other name for classical experimental design.

b) Post-test, the only control group

There is a possibility of subjects becoming sensitive to the experiment during the pre-test. In the post-test-only control group method, neither the experimental nor control group is exposed to the pre-test. Only the experimental group is exposed to the independent variable, which will be a post-test of the group. Then, the two groups are compared to the presence of statistical significance. This helps control the rival explanation as both groups are equally affected by factors like maturation, history, and others.

c) Solomon four-group design

We have already observed that a pre-test has its own merits and demerits. It enables us to assess the time sequence and is the basis of comparison. Yet, we may have reactive effects in the process. More than that, these are occasions where we may not be able to have the luxury of a pre-measurement period. The Solomon four-group design will have the same features as a classic experimental research design. The difference is that an additional set of control and experimental groups will not be made subject to pre-testing. When we have two experimental and control groups each, the comparisons will show whether the experimental stimulus (x) has independently affected the groups that were not made sensitive by a pre-test. If we find that the experimental stimulus had its effect without a pre-test, the findings can be generalised to the target population. The element of causality will increase in its strength.

7.5.1 Factorial studies

When a researcher analyses two or more independent variables simultaneously, it is called factorial design. In this, each independent variable is called a factor. The factorial study has advantages like saving time, money, and resources. It allows the investigator to know the interaction between two or more - dependent variables and the effects they cause on the dependent variable. If we say that it is a two-factor design, it means that two independent variables are manipulated. The same applies to a three-factor design where three independent variables are manipulated. Factors can have two or more levels. An example here will make understanding it easy. Imagine that there is an advertising campaign on radio and television. The subjects of these media are assigned two groups, one that is exposed to the radio and the other to television. These are known as two levels of investigation.

7.5.2 Quasi experimental design

The quasi-experimental design is not suitable for application in certain research situations. This is especially true when manipulation and random assignment of respondents are impossible. In social sciences, two types of relationships are identified. The first is the stimulus-response, and the second is the property- disposition relationship. For the first one, reward and satisfaction or advertisement and consumption levels can be given as examples. For property-disposition relations, attitudes, values, and orientations can be examples. Stimulus- response situations are best suited for experimental methods, while quasi-experimental designs can tackle property- disposition.

The four areas of difference between these two types of designs are identified.

1. The time gap between the effect of an independent variable and the response to it. In stimulus — response relations, the time interval is short. In contrast, property disposition relations are longer.

2. A stimulus is easy to isolate, and its effect can be well-described. On the other hand, properties like social class are unclear, and dispositions like prestige and education have their own effect on other elements.
3. The 'before and after' comparison is easy in experimental studies and difficult in quasi-experimental studies. For example, two groups with different properties and dispositions cannot be compared. An upper-class group differs from a lower-class group on many counts, like values and social practices.
4. The time sequence of events varies in experimental research, and the direction of causality is clear for pre- and post-comparisons. However, the time sequence is difficult to establish in a property-disposition relationship. As such, manipulation, comparison, and control cannot be easily applied to property-disposition relationships.

Experimental methods are strong on control but weak on representation. Quasi-experimental studies, particularly surveys, are strong on representation but weak in control. Experiments can control both extrinsic and intrinsic variables through randomisation. They also have control over the introduction of experimental stimuli. This helps them in determining the direction of causation. These advantages cannot be seen in quasi-experimental designs. On the other, laboratory experiments cannot replicate social life. Quasi-experiments will not have the random assignment of subjects to experimental groups. The major quasi-experimental designs are pretest-posttest, non-equivalent control group design, and interrupted time-series design. The one-shot case study, correlational designs, panel, and trend studies are also considered types of quasi-experimental studies by some scholars, though they can be longitudinal studies.

Check Your Progress: 3

- Note:** 1) Use the space below for your answers.
2) Compare your answers with those given at the end of this Unit.

1. Explain the Solomon four-group methods.

.....
.....
.....
.....

2. Distinguish between stimulus-response and property-disposition relationships.

.....
.....
.....
.....

3. List the four areas of difference between experimental and quasi-experimental designs.

.....

.....

.....

.....

7.6 FIELD EXPERIMENTS

As you are aware, laboratory experiments are artificial, so they do not have external validity. In contrast, field experiments have external validity. Subjects react in their natural setting with normal behaviour. For example, watching a TV commercial in a laboratory setting differs from viewing it in a natural setting. One of the characteristics or advantages of field experiments is that they are closer to reality and often non-reactive. Complex social processes and events can be studied. Field experiments can be less expensive as they do not need special equipment. Yet, if the size of the study increases, then the expenditure may also increase. Sometimes, field experiments are the only option left in certain social situations.

There are a few practical difficulties with the field experiments. For instance, certain research studies cannot be done in the field for ethical reasons. The impact of television violence on children cannot be measured through field experiments. Field experiments now and then face external obstacles that may be unexpected. It is time-consuming when the researcher wants to establish contacts, seek cooperation, and obtain necessary permission. Often, this procedure takes weeks and months. The field experiment's most difficult part is controlling intervening variables. The extraneous variables will affect the accuracy of experiments and, in turn, the entire research work.

Types of Field Experiments

Field experiments have been categorised into two: experiments in which the investigator manipulates the independent variable and the other in which manipulation of the independent variable happens naturally. Wimmer and Dominick provide an example for the first type. Imagine an investigator who wants to know the effects of being unable to read a newspaper. The option is to choose two comparable samples and not allow one sample to read a newspaper for some time. The second sample will continue to read the newspaper. Later, a comparison will be made to determine the effect on other areas of life, such as interpersonal communication. The other types of field experiments deal with passive manipulation of the experimental stimulus.

In some cases of field experiments, the investigators may not be able to assign subjects randomly to experimental and control groups. Such field experiments are known as quasi-experiments. One major challenge for a researcher is to guard against alternative explanations.

7.7 MERITS AND DEMERITS OF EXPERIMENTAL METHODS

Like every research method in social sciences, the experimental method has advantages and disadvantages. The practical advantages of experiments are:

- a) **Evidence of causality:** Experiments enable us to determine the cause-and-effect relationship between an independent and dependent variable. They also support controlling the time order and other possible causes of research efforts.
- b) **Control:** As already stated, control is an advantage of the experiments. An investigator will control the environment and isolate the testing from other influences and effects. This means that they can structure the experimental setting according to their choice. However, the artificial nature of the laboratory setting is a disadvantage. The selection and control of subjects are other advantages of experimental research.
- c) **Cost:** Experiments can be less expensive compared to other research methods.
- d) **Replication:** The experiments can be replicated. Since the conditions under which they are conducted are clearly described, it becomes easy for others to repeat them. Modifications can also be made.

Disadvantages:

The experimental method has its disadvantages:

- a) **Artificiality:** As already stated, the artificiality of the research environment is a major problem in experiments, as behavioural alterations take place when media researchers employ the laboratory setting. Because of the artificial environment in the laboratory, results that emanate from these do not resemble behaviour in a natural atmosphere or real-life situation. In real life, subjects are exposed to competing stimuli from other sources. The artificiality may affect the external validity of the research.
- b) **Researcher bias:** The experimenter can influence the experiment so that he or she can get the result according to the pre-decided hypotheses. To avoid this type of bias on the researcher's part, a technique called double-blind is used. In this, neither the researchers nor the subjects will know whether a particular subject is given to the experimental or control group.
- c) **Limited scope:** Only select research questions can be experimented upon. When issues and topics in mass communication concern a large number of people, experiments on a massive scale are not possible.

Check Your Progress: 3

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this Unit.

1. What are the characteristics of field experiments?

.....
.....
.....
.....

2. Identify the categories of field experiments.

.....
.....
.....
.....

3. Enumerate the advantages and disadvantages of the experimental technique.

.....
.....
.....
.....

7.8 LET US SUM UP

The experimental method is a technique used in communication research. However, its adoption is restricted in media research, unlike in psychology and social psychology. Natural sciences make the best use of experimental research. Experiments attempt to find out the relationship between factors of cause and effect. These enable us to ensure that the cause is scientific. Explanations in social sciences are classified as deductive and probabilistic.

Deductive explanations are strong as their applicability encompasses the past, present, and future. In natural sciences, deductive explanations are made possible with manipulation and control. But in social sciences, only a few phenomena are amenable to manipulation and control.

A classic research design contains two equal groups: experimental and control. The experimental group is exposed to experimental stimulus, and the control group is not. The measurements taken during the pre-test and post-test are compared to know whether the experiment involves manipulation and control, which are difficult to achieve in social sciences. The experimental technique normally has eight steps. Control of confounding or extraneous variables can be done by matching, randomisation, and generalisation. Internal and external validity will have to be achieved in experimental research. There are two designs when we deal with experimental methods: Experimental design and quasi- experimental designs, pretest-posttest control group, post-test only group, and Solomon four-group designs belong to experimental design.

When a researcher analyses two or more independent variables simultaneously, it is called a factorial study or design. Here, each

independent variable is called a factor. Pretest-posttest non-equivalent control group designs and interrupted time series designs belong to the category of quasi experiments.

Experimental designs are unsuitable for application in certain research situations, especially when manipulation and random assignment of respondents are impossible. Experimental designs are best suited to stimulus-response relationships but not to property-disposition relationships. Quasi-experimental designs, including one-shot case studies, correlational designs, and panel and trend studies, can tackle the property-disposition relationships. Field experiments are conducted in natural settings. They are closer to reality and often non-reactive. They do not need any special equipment. The costs can be lower compared to other methods. The advantages of experimental methods are evidence of causality, control, cost-benefit, and replication. The disadvantages are artificiality, researcher's bias, and limited scope.

7.9 KEYWORDS

Confounding variables : Variables which are extraneous to the experiment. They contaminate the findings.

Deductive explanation : An explanation that has the element of generalisation regarding past, present and future.

Empiricism : Verification with strong evidence.

Explicandum : An event or phenomenon to be explained.

Manipulation : Deliberately produce a change in the phenomenon selected.

Pilot study : Involves a small number of subjects on whom the study is conducted.

Subjects : People who are selected to participate in the experiment.

Verstehen : A tradition of understanding human behaviour.

7.10 FURTHER READINGS

1. Broota, K.D (1992), Experimental Design in Behavioural Research, New Delhi, Wiley Eastern Limited.
2. Nachmias, David and Chava Nachmais (1976), Research Methods in the Social Sciences, New York, St. Martin's Press.
3. Priest, Susanna Hornig (2010), Doing Media Research: An Introduction, New Delhi: SAGE Publications India Pvt. Ltd.
4. Wimmer D. Roger and Joseph R. Dominick (2003), Mass Media Research, Belmont (USA) Wadsworth/Thomson Learning.

7.11 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress: 1

1. The main purpose of the experimental method is to determine the relationship between factors of cause and effect. Experiments are more suitable for natural sciences than social sciences. In other words, experimental research attempts to determine the cause-and-effect relationship between an independent variable and a dependent variable.
2. The four pre-conditions of a deductive explanation are:
 - A universal generalisation
 - A statement of conditions which generalises appear true
 - An event to be explained (explicandum)

The rules of logic.

3. A classical experimental research design has two equal groups for comparison: experimental and control. The experimental group is exposed to the experimental stimulus, but the control group is not, for post-test. The difference between the post-test and pre-test on the measurements taken will prove that the independent variable affects the dependent variable.

Check Your Progress: 2

1. The two operations involved in experimental research are manipulation and observation. In scientific jargon, researchers manipulate an independent variable and then observe the subjects' response to the dependent variable.
2. The eight steps involved in experimental research are selecting the setting, selecting the experimental design, operationalising variables, manipulating the independent variable, selecting, and assigning subjects to experimental conditions, conducting a pilot study, administering the experiment, and analysing and interpreting extraneous variables.
3. The confounding variables can be controlled by matching, randomisation, and generalisation; matching can be either precision matching or frequency distribution. Randomisation can be done by assigning the subjects to experimental and control groups using different methods. It is called generalisation if the findings can be applied to a large population.

Check Your Progress: 3

1. The Solomon four-group design will have the same features as the classic experimental research design, except that it will have an additional control and experimental set of control and experimental groups not subjected to pre-testing. The findings can be generalised if we

find that the experimental stimulus had its effect without a pre-test.

2. The stimulus-response relationship is based on a reward-satisfaction proposition. The property-disposition relationship is based on attitudes, values, and orientations. The first one is amenable to experiments, while the property-disposition relations are taken in the case of quasi-experimental designs.
3. The four areas of difference between experimental and quasi-experimental designs are the time gap between the effect of the independent variable and the response to it; a stimulus can be easily isolated, but properties are not; before and after comparison; and the variation in time sequence.

Check Your Progress: 4

1. Field experiments are carried out in natural settings, which gives them external validity. Subjects will react with their normal behaviour. Field experiments are non-reactive, less expensive, and do not need special equipment or facilities.
2. There are two types of field experiments: Experiments in which the researcher manipulates the independent variable and the other in which manipulation of the independent variable happens naturally.
3. The advantages of the experimental method are evidence of causality, control, less cost, and replication. The demerits are artificiality, the researcher's bias, and limited scope.