UNIT 3 QUANTITATIVE RESEARCH METHOD*

Structure

3.0 OBJECTIVES

After reading this unit, you will be able to

- describe the meaning and characteristics of quantitative research.
- discuss the characteristics, strengths and weaknesses of quantitative research.
- describe the methods of quantitative research.

3.1 INTRODUCTION

A researcher wanted to carry out a study on organisational citizenship behaviour and work motivation of employees in public and private sector banks in Chennai. Based on the objectives of the study the method that was used by the researcher was quantitative method, as that was found to be appropriate for the conducting the study. The study was carried out using standardised psychological tests (we will discuss psychological testing in unit 6). The data thus collected was statistically analysed to make interpretations and generalisations.

In the previous block, we discussed about psychological research and also focused on sampling and sampling techniques. The first unit is especially relevant as it introduced psychological research and thus serves as a foundation to the rest of the units in this course. In this unit, we will mainly discuss about the quantitative research. Research can be categorised in to quantitative and qualitative research. Quantitative research mainly focuses on numbers and there are various methods that can be discussed under this type of research.

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3.2 INTRODUCTION TO QUANTITATIVE RESEARCH

Quantitative research deals with objective measurements and includes statistical or numerical analysis of data collected through polls, questionnaires or surveys. The variables can be manipulated as well as controlled in quantitative research. Basically, the variables are manipulated to examine the cause- effect relationship, carry out comparative analysis or interventional analysis within a specified population.

Quantitative research deals with numbers. It focuses more on convergent reasoning than on divergent reasoning which means that the researcher tries to find out solutions to a research problem with help of standardised tools and not by creative ideas. It mainly focuses on quantifying relationships between variables.

3.3.1 Characteristics of Quantitative method

The characteristics of quantitative research are as follows:

1) **Clearly defined research questions:** Based on the research problem, the researcher frames clearly defined research questions and the answers to these questions are sought objectively.

2) **Representative sample:** The researcher selects a sample from a specified population from which data is aimed to be collected. These samples are representative of the population, so that the results achieved can be generalised to the population.

3) **Manipulation/ control of variables:** As mentioned before, the quantitative research deals with variables and as per the requirement, the researcher manipulates (for example, increases or decreases) and even controls the extraneous/controlled variables that can affect the research study.

4) **Structured and standardised tools used for data collection:** Quantitative research deals with numbers and the data is collected with the help of structured or standardised research instruments. The data is analysed with help of empirical evidences. The data are collected in form of numbers, and statistics, often arranged in tables, charts, figures, or other non-textual forms.

5) **It is reliable and valid:** Since the study is done under controlled observations involving scientific investigations, they can be replicated or repeated and provide similar results. The quantitative research is high on reliability. Further, as quantitative research involves the use of standard and structured instruments (which are variable specific), they are valid as well.

6) **Generalisability:** Since the quantitative research is done in a well- planned manner and are highly reliable as well as valid, the results obtained through the method can be generalised and can also be used to effectively predict results and infer causal relationships.

3.3.2 Strengths of Quantitative Method

It needs to be mentioned that, quantitative research provides a framework to the researcher to find out relationships or conduct comparative analysis. It also enables a researcher to control the environment in order to collect the required data. Some of the strengths of the quantitative research can be mentioned as follows:

- It provides an opportunity to collect data from a larger sample and helps in conducting broader study as well as generalisation of results to a larger population.
- It helps the researcher to attain reliable, valid, accurate and objective results.
- It provides an opportunity to replicate and design similar studies.
- It provides an opportunity to conduct experiment under controled environment and thus minimises error variance.
- It uses close ended and structured questions which provide responses free from personal biases.

3.2.3 Limitations of Quantitative Method

Some of the limitations of quantitative research are as follows:

- It lacks contextual details.
- The research is limited to statistical approach and so lacks the grounds for the process of discovery.
- The closed ended or structured questions might reflect a limited and incomplete information.
- Results might provide much narrower and sometimes superficial data set.
- The research does not involve interview or in-depth perception of individuals, so it does not provide complete insight of the real world.
- The research might not yield natural and original responses of individuals.

Check Your Progress I

1) List the characteristics of quantitative method.

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2) State any one strength and limitation of quantitative research.

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3.3 METHODS OF QUANTITATIVE RESEARCH

Let us now discuss various mathods of qualitative research

Experimental research

In an experimental research, the researcher can manipulate the predictor or independent variable(s) as per the requirement of the research, to examine the cause- effect relationship. The researcher conducts the experiment under controlled environment, where the sample is divided in to two groups out of which one group is treated as experimental group (the group on which experimentation or manipulation is done) and the other is placed as a control group (the group on which no manipulations or treatments are given).The research is carried out under a high level of control that ensures that most of the extraneous variables are dealt with. You should know here that the independent or predictor variables are those variables which can be manipulated to see its effect on the dependent variable(s). For example, if you vary the intensity of light and temperature to examine its effect on performance of individuals, light and temperature here are the predictor variables and the performance becomes the dependent variable. A predictor variables therefore, predicts its effect on dependent variable. Aronson et al (2016, page 34) defined experimental method as "the method in which the researcher randomly assigns participants to different conditions and ensures that these conditions are identical except for the independent variable(s) (the one thought to have a causal effect on people's responses)".

The main characteristics of experimental method are:

1) It involves a systematic procedure including definition of the problem, research design, data collection and interpretation.
2) There is manipulation of one or more independent variable (s) to study its effect on dependent variable (s).
3) The study is carried out under controlled conditions. Thus, there is not much interference of extraneous variable (s).
4) It has high internal validity [(it can be said that the changes in dependent variable (s) are as a result of independent variable(s) and not extraneous variable(s)].
5) It has lower external validity (as the study is carried out under controlled conditions, the results as such cannot be generalised to other situations). External validity is of two types, ecological validity and population validity. Ecological validity denotes whether generalisation of the results can be carried out to other situations and population validity denotes whether generalisation of the results (of the study carried out on a certain group of participants) can be carried out to the population.
6) Sample can be selected using randomisation.

Experiments are often carried out in laboratory set up that provides adequate control, these are referred to as laboratory experiments. The laboratory experiment uses a standardised procedure, in which the participants are randomly allotted to each independent variable group. An example of laboratory experiment conducted in psychological research is the Milgram's experiment on obedience. The

laboratory experiment is advantageous because it involves standardised procedure; it can be replicated; control of extraneous variables is possible and cause- effect relationship can be established. Though it is not aloof from disadvantages because it is conducted in artificial setting which may lessen the ecological validity as the participant might not behave as they would have behaved in real life setting. Further, there might be an influence of experimenter's bias. Demand characteristics may also act as confounding variable and affect the results.

Non-experimental research

As the name reflects, this research lacks the required conditions of experimental research. In non- experimental research, the researcher cannot manipulate the independent variable(s), also because independent variable(s) may have already occurred. For example, if we want to study the effect of abuse on mental health of children, in this case, the independent variable that is abuse has already occurred. The non- experimental research is high on external validity and can be generalised on a larger population. This method can also be used when the participants cannot be randomly assigned (for example, in a study to analyse whether a damage in mid brain affects the sleep of participants, participants cannot be randonly assigned due to the nature of the sample), though it can study causal relationships without manipulating the independent variables. It can also be used in exploratory researches (for example, a study to explore how efficiently child can be nurtured by single mothers).

Some of the characteristics of non-experimental research are:

1) The independent variable cannot be manipulated.
2) There is low control.
3) Randomisation cannot be used.
4) External validity is high.
5) Internal validity is low.

Field Experiments

The field experiments are conducted in natural settings within the environment of the participants (for example, classroom). The experimenter can manipulate independent variable(s), though control may not be high. An example of field experiment done in the field of psychology is Holfing's hospital study on obedience. The advantages of field experiment are that the behavior reflected by participants in real life setting is natural and spontaneous; the chances of demand characteristics affecting the results are low and it has higher ecological validity than the laboratory experiment. The disadvantage of this research is that, it has no control over extraneous variable(s) which might affect the results. Also as it is done in natural settings, it is difficult to replicate field experiments.

Characteristics of field experiments are as follows:

1) The researcher can manipulate the independent variable(s).
2) Control is not high as the experiment is carried out in a natural settings.
3) External validity is higher compared to experimental research.
4) Randomisation is not possible.

Field Studies: These researches are non - experimental in nature, as the researcher

does not manipulate any variable(s), and research is carried out in natural settings. The data can be collected through face-to-face interviews, surveys, or direct observation. The data collected is specific to a particular issue/problem. The researcher carefully plans the procedure of research and ensures that the data is accurate, valid, and collected efficiently. The data is analysed and interpreted accordingly. The advantages of field studies are that, they can be used in studies where manipulation of independent variable(s) is not possible. It is also useful in areas where manipulation of independent variables are not ethical. The disadvantages of this method are that, there are possibilities of ethical challenges (like, deception) involved in the study; there are more chances of sampling bias and there may be influence of extraneous variables in the study. Some of the characteristics of field studies are:

1) The researcher cannot manipulate the independent variable(s).
2) The study is carried out in naturalistic setting.
3) Internal validity is low.
4) External validity is high.
5) Randomisation is not possible.

Table 3.1 Differences between laboratory experiment, field experiment and field study.

Laboratory Experiment	Field Experiment	Field Studies
Experiments are conducted under controlled setting.	Experiments are not conducted under controlled setting.	Researches are conducted in natural settings.
Experimenter can manipulate independent variable(s) as well as control extraneous variable(s).	Experimenter can control independent variable(s) but has no control over extraneous variable(s).	Researcher can neither manipulate independent variable(s) nor control extraneous variable(s).
Ecological validity is lowest.	Ecological validity is comparatively higher.	Has very high ecological validity.
We can infer causal conditions, as their internal validity is high.	Depending on the level of control of extraneous variables they may have high internal validity and accordingly causal conditions can be inferred.	We cannot infer causal conditions as their internal validity is low.
The generalisiblity of the findings is limited.	The results can be generalized to the	The results can be generalized.

population under study.

Check Your Progress II

Fill in the blanks

1) The independent or predictor variables are those variables which can be manipulated to see its effect on the..... .

2) The non- experimental research is high on..... and can be generalised on a larger population.

3) The field experiments are conducted in.....within the environment of the participants.

4) Field studies have high ..... .

3. 4 LET US SUM UP

To summarise, in the present unit we mainly discussed about the quantitative research.

Research can be categorised in to quantitative and qualitative methods. The characteristics of quantitative research include clearly defined research questions, representative sample, manipulation/ control of variables, structured and standardised tools used for data collection. Also they are reliable and valid and generalisation is possible. The strengths and limitations of quantitative research were also discussed. Further, the unit also covered the methods of quantitative research including experimental research, non experimental research, laboratory experiments, field experiments and field studies. In an experimental research, the researcher can manipulate the predictor or independent variable(s) as per the requirement of the research to examine the cause- effect relationship. The researcher conducts the experiment within a controlled environment. In non-experimental research, the researcher cannot manipulate the independent variable(s).The non- experimental research is high on external validity and can be generalised on a larger population. The field experiments are conducted in natural setting within the environment of the participants. The experimenter can manipulate independent variable(s), but control is low. Field studies are non - experimental in nature, as the researcher cannot manipulate any variable(s), and study is carried out in a natural setting.

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3.6 KEY WORDS

Experimental research: In an experimental research, the researcher can manipulate the predictor or independent variable(s) as per the requirement of the research to examine the cause- effect relationship.

Field Experiments: The field experiments are conducted in natural settings within the environment of the participants. The experimenter can manipulate independent variable(s), but has no control on extraneous variable(s).

Field Studies: These researches are non - experimental in nature, as the researcher cannot manipulate any variable(s), and the study is carried out in natural settings.

Laboratory Experiments: Laboratory experiments are those experiments which are conducted within a laboratory setting.

Non-experimental research: In non- experimental research, the researcher cannot manipulate the independent variable(s).

3.7 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress I

1) List the characteristics of quantitative method

   Clearly defined research questions

   Representative sample

   Manipulation/ control of variables

   Structured and Standardised tools used for data collection

   It is reliable and valid

   Generalisation is possible

2) State any one strength and limitation of quantitative research

   Strength: It provides an opportunity to conduct experiments under controlled

environment and so minimises error variance.

Limitation: The research does not involve interview or in-depth perception of individuals, so it does not provide complete insight of the real world.

Check Your Progress II

Fill in the blanks

1) The independent or predictor variables are those variables which can be manipulated to see its effect on the dependent variable.
2) The non- experimental research is high on external validity and can be generalised on a larger population.
3) The field experiments are conducted in natural setting within the environment of the participants.
4) Field studies have high ecological validity.

3.8 UNIT END QUESTIONS

1) Discuss the characteristics of quantitative method.
2) Point out the advantages and disadvantages of quantitative method.
3) Explain experimental and non-experimental research.
4) Differentiate between laboratory experiment, field experiment and field studies.