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Module 2

Research Design

Chapter Overview

The objective of this chapter is to define and explain research design in detail. In this chapter, we discussed three major types of research designs, such as exploratory, descriptive and causal research designs. We also explained the mode of data used in each of these designs and the techniques to collect these data, which would ultimately helps the researcher to decide appropriate analysis technique.

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In this chapter you will learn about:

- What research design means
- The important functions of research design
- Issues to consider when designing your own research

Once the researcher has identified and established the broad approach to the research problem, the next step is to prepare a framework or blue print of the study, which specifies the procedures necessary for achieving the stated objectives. This framework helps the researcher to lay foundation for conducting business research project. A well-prepared framework will ensure that the business research project is conducted in an efficient and effective manner.

Research design can be defined as a framework or blue print for conducting business research project in an efficient manner. It details the procedures necessary for collection, measurement and analysis of information which helps the researcher to structure/or solve business research problems.

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2.1 Meaning of research design

The formidable problem that follows the task of defining the research problem is the preparation of the design of the research project, popularly known as the "research design". Decisions regarding what, where, when, how much, by what means concerning an inquiry or a research study constitutes research design. According to Claire Sellitz "A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure."

In the words of Miller ," Research design is the planned sequence of the entire process involved in conducting a research study."

In the words of Bernard S philips, "research design constitutes the blue print for the collection, measurement and analysis of data". As such the design includes an outline of what the researcher will do from writing the hypothesis and its operational implications to the final analysis of data. More explicitly, the decisions happen to be in respect of:

(i) What is the study about?

(ii) Why is the study being made?

(iii) Where will the study be carried out?

(iv) What type of data is required?

(v) Where can the required data be found?

(vi) What periods of time will the study include?

(vii) What will be the sample design?

(viii) What techniques of data collection will be used?

(ix) How will the data be analysed?

(x) In what style will the report be prepared?

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

2.2 Components of research Design

(a) **The sampling design** which deals with the method of selecting items to be observed for the given study;

b) The **observational design** which relates to the conditions under which the observations are to be made;

(c) The **statistical design** which concerns with the question of how many items are to be observed and how the information and data gathered are to be analyzed; and

(d) The **operational design** which deals with the techniques by which the procedures specified in the sampling, statistical and observational designs can be carried out.

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

(i) It is a plan that specifies the sources and types of information relevant to the research problem.

(ii) It is a strategy specifying which approach will be used for gathering and analyzing the data.

(iii) It also includes the time and cost budgets since most studies are done under these two constraints.

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

2.3 **Features of a good design**

A good design is often characterized by adjectives like flexible, appropriate, efficient, economical and so on. Generally, the design which **minimizes bias and maximizes the reliability** of the data collected and analyzed is considered a good design. The design which gives the smallest experimental error is supposed to be the best design in many investigations. Similarly, a design which yields maximum information and provides an opportunity for considering many different aspects of a problem is considered most appropriate and efficient design in respect of many research problems. Thus, the question of good design is related to the purpose or objective of the research problem and also with the nature of the problem to be studied. A design may be quite suitable in one case, but may be found wanting in one respect or the other in the context of some other research problem. **One single design cannot serve the purpose of all types of research problems.**

A research design appropriate for a particular research problem, usually involves the consideration of the following factors:

(i) The means of obtaining information;

(ii) The availability and skills of the researcher and his staff, if any;

(iii) The objective of the problem to be studied;

(iv) The nature of the problem to be studied; and

(v) The availability of time and money for the research work.

If the research study happens to be an **exploratory or a formulative one, wherein the major emphasis is on discovery of ideas and insights,** the research design most appropriate must be flexible enough to permit the consideration of many different aspects of a phenomenon. But when the purpose of a study is accurate **description of a situation or of an association between variables** are called the descriptive studies,

accuracy becomes a major consideration and a research design which minimizes bias and maximizes the reliability of the evidence collected is considered a good design.

2.4 Important concepts relating to research design

Before describing the different research designs, it will be appropriate to explain the various concepts relating to designs so that these may be better and easily understood.

1. Dependent and independent variables: A concept which can take on different quantitative values is called a variable. As such the concepts like weight, height, income are all examples of variables. Qualitative phenomena (or the attributes) are also quantified on the basis of the presence or absence of the concerning attribute(s). Phenomena which can take on quantitatively different values even in decimal points are called 'continuous variables'. But all variables are not continuous. If they can only be expressed in integer values, they are non-continuous variables or in statistical language 'discrete variables'. Age is an example of continuous variable, but the number of children is an example of non-continuous variable. If one variable depends upon or is a consequence of the other variable, it is termed as a dependent variable, and the variable that is antecedent to the dependent variable is termed as an independent variable.

2. Extraneous variable: **Independent variables that are not related to the purpose of the study, but may affect the dependent variable are termed as extraneous variables.** Suppose the researcher wants to test the hypothesis that there is a relationship between children's gains in social studies achievement and their self-concepts. In this case self-concept is an independent variable and social studies achievement is a dependent variable. Intelligence may as well affect the social studies achievement, but since it is not related to the purpose of the study undertaken by the researcher, it will be termed as an extraneous variable. Whatever effect is noticed on

dependent variable as a result of extraneous variable(s) is technically described as an 'experimental error'.

3. Control: One important characteristic of a good research design is to minimize the influence or effect of extraneous variable(s). The technical term 'control' is used when we design the study minimizing the effects of extraneous independent variables. In experimental researches, the term 'control' is used to refer to restrain experimental conditions.

4. Confounded relationship: **When the dependent variable is not free from the influence of extraneous variable(s), the relationship between the dependent and independent variables is said to be confounded by an extraneous variable(s).**

5. Research hypothesis: When a prediction or a hypothesized relationship is to be tested by scientific methods, it is termed as research hypothesis. **The research hypothesis is a predictive statement that relates an independent variable to a dependent variable.** Usually a research hypothesis must contain, at least, one independent and one dependent variable. Predictive statements which are not to be objectively verified or the relationships that are assumed but not to be tested are not termed research hypotheses.

6. Experimental and non-experimental hypothesis-testing research: When the purpose of research is to test a research hypothesis, it is termed as hypothesis-testing research. It can be of the experimental design or of the non-experimental design. Research in which the independent variable is manipulated is termed 'experimental hypothesis-testing research' and a research in which an independent variable is not manipulated is called 'non-experimental hypothesis-testing research'.

7. Experimental and control groups: In an experimental hypothesis-testing research when **a group is exposed to usual conditions, it is termed a 'control group',** but **when the group is exposed to some novel or special condition, it is termed an**

'experimental group'. In the above illustration, the Group A can be called a control group and the Group B an experimental group. If both groups A and B are exposed to special studies programmes, then both groups would be termed 'experimental groups.' It is possible to design studies which include only experimental groups or studies which include both experimental and control groups.

8. **Treatments:** The different conditions under which experimental and control groups are put are usually referred to as 'treatments'. In the illustration taken above, the two treatments are the usual studies programme and the special studies programme. Similarly, if we want to determine through an experiment the comparative impact of three varieties of fertilizers on the yield of wheat, in that case the three varieties of fertilizers will be treated as three treatments.

9. **Experiment**: The process of examining the truth of a statistical hypothesis, relating to some research problem, is known as an experiment.

10. **Experimental unit**(s): The pre-determined plots or the blocks, where different treatments are used, are known as experimental units. Such experimental units must be selected (defined) very carefully.

2.5 Function of a Research Design

Research design gives an idea about the steps to be followed in a research study. The main functions of research design are:

1. Research designs help to know what are the things to be observed and how many observations should be made.
2. The research design states how should the sample items be selected and what should be the size of the sample.
3. It helps to locate the variable and to manipulate them.

4. Research designs are useful to test the relationship between variables and it tells us which statistical method is more useful for conducting such tests.
5. They help to analyse the qualitative and quantitative representations of data.
6. Research design given an idea about the conclusion to be drawn from the analysis.

2.6 Purpose of Research Design

Any research design has two basic purposes (1) to provide answers to research-questions as validly, objectively, accurately, and economically as possible, and (2) controlling variance.

1. Providing answers to research questions.

All the research activities have the purposes of answering research questions. However, the manner of seeking answers to the research questions differ from situation to situation according to the nature of the problems. In any project the research problems are stated in forms of specific hypothesis so that they can be tested against empirical evidences achieved. There are various ways of testing the hypothesis depending upon their structure. This has resulted in to the development of different Research designs. The different research designs differ among themselves in the manner of seeking answers and also in the manner of testing the hypothesis.

2. Control of variance

Second basic purpose of research design is the control of variance. The research aims at establishing relation between dependent and independent variables. Independent variable is the experimental variable or assumed cause. The dependent variable is the effect. The relation between the experimental variable and dependent variable is the cause-effect relation. To establish such a relationship it is essential that the effect of extraneous variable should be controlled. By stating that the purpose of any research design is to control variance, we mean, that it specifically aims at (a) maximizing systematic variance(b) controlling or eliminating extraneous variance (c) minimizing error variance.

(a) ***Maximizing systematic Variance***: The systematic variance is the variation or the difference caused on the dependent variable by the experimental variable along and not by any other variable. By maximizing the systematic variance, we mean magnifying the effect of the experimental variable on the dependent variable. Suppose a professor makes the hypothesis that student's class performance is improved by the "Participation Method', than by 'Simple Lecture Method'. In this example the experimental variable will be 'Participation Method of Teaching', the effect of which the professor desires to measure, as compared to the effect of Lecture Method of Teaching. Student's performance is the dependent variable. Therefore the purpose of research is to study the effect of experimental variable on the dependent variable.

(b) ***Control of Extraneous Variance***: It means, the control or elimination of the impact of other independent variables, which are likely to influence the dependent variable but are considered as unwanted or extraneous. For example: Method of teaching is independent variable and class performance of the student is the dependent variable. Then age, intelligence, previous school environment, family background etc.., are the additional factors which might influence the class performance of the students. They are extraneous factors. The purpose of research is to isolate, minimize, nullify or eliminate the effect of such extraneous variables in order to study the effect of experimental variable, on the dependent variable.

(c) ***Minimizing Error Variance***: A third group of factors, influencing the dependent variable are known as random variables because they are temporary factors which vary from situation to situation. Their influence is considered as error variance. There are a number of such factors causing error variance. For instance, variation of response from one trial to another, variation due to guessing etc. Minimization of error variance can be achieved through (i) measuring under controlled

conditions, and (ii) by increasing the reliability of measure or measuring instruments.

2.7 Factors Affecting Research Design (Problems of research design)

An effective research design is necessary in any research work. But it is not easy to prepare a research design which is quite suitable to a research study. The reason for this are the following factors which affect any research design.

1. ***Non-availability of sufficient Data***: Non-availability of sufficient data effects the research work and therefore the researcher has to alter his design from time to time. The problem would be more intensive to those working with primary sources. The non-availability of respondents and their poor response affects the reliability of data.
2. ***Non availability of Time***: Time plays a vital role in the formulation of suitable research design. Adequate time must be devoted for identification of the problem, its analysis and finally interpretation of the results. Normally, very much time is spent for identifying the problem and data collection and very little time is spent for its analysis. As such, many students do not vary rigour which they should have in their analysis.
3. ***Non availability of Resources***: A research design is also determined by the availability of resources, because the attainment of goals largely depends on the money and manpower used in the research. Normally, the larger the amount of money spent on research the greater is the accuracy of result. For this reason, there will be a vast difference in the nature of studies undertaken by the individuals and research organizations.
4. ***Inability of the Researcher*** : Knowledge, skill and ability of the researcher are important factors in designing the study, It is the knowledge and interest of the researcher that decide the specific design of the study. For example, in a study

which requires experimentation, the researcher should know clearly about experimentation method. Similarly, a study based on statistical method requires adequate knowledge in the statistical methods. This is found to be one of the major deficiencies of many research scholars in commerce and management.

5. ***External Factors***: There may be various external and uncontrollable factors which affect the research design one formulated. So the researcher may have to revise the form of the research design on the basis of the new developments.
6. ***Result Desired***: The solution or result desired from the study may indicate the types of design to be formulated. For instance, research in management aims at the specific tasks of problem solving result maximization. Therefore here the researcher has to prepare utility oriented research design.

Summary

In fact, the research design is the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. As such the design includes an outline of what the researcher will do from writing the hypothesis and its operational implications to the final analysis of data.

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