

DSE-4T (AD)

**Research Methodology and
Design**

**“Planning of Research design and
experiment”**

Meaning of Research

Research is the search for knowledge through objective and systematic method of finding solution to a problem.

Thus, research is an original contribution to the existing stock of knowledge making for its advancement.

Objectives of Research

- To gain familiarity with a phenomenon or to achieve new insights into it.
- To portray accurately the characteristics of a particular individual, situation or a group.
- To determine the frequency with which something occurs or with which it is associated with something else.
- To test a hypothesis of a casual relationship between variables.

Types of Research

- Descriptive vs. Analytical
- Applied vs. Basic or fundamental
- Quantitative vs. Qualitative

Descriptive Research

It includes surveys and fact-finding enquiries of different kinds.

The major purpose of descriptive research is description of the state of affairs as it exists at present. In social science and business research we quite often use the term *Ex post facto research for descriptive research studies*.

The main characteristic of this method is that the researcher has no control over the variables; he can only report what has happened or what is happening. Most ex post facto research projects are used for descriptive studies in which the researcher seeks to measure such items as for example,

- frequency of shopping, preferences of people, or similar data.

Analytical Research

In this type of research, the researcher has to use facts or information already available, and analyze these to make a critical evaluation of the material.

Research can either be applied (or action) research or fundamental (to basic or pure) research. Applied research aims at finding a solution for an immediate problem facing a society or an industrial/business organisation, whereas fundamental research is mainly concerned with generalisations and with the formulation of a theory.

Fundamental Research

It is mainly concerned with generalizations and with the formulation of a theory. Gathering knowledge for knowledge's sake is termed fundamental research.

Research concerning some natural phenomenon or relating to pure mathematics are examples of *fundamental research*

- Similarly, research studies, concerning human behaviour carried on with a view to make generalisations about human behaviour, are also examples of *fundamental research*.

Applied Research

It aims at finding a solution for an immediate problem facing a society or an industrial/business organization.

- Research aimed at certain conclusions (say, a solution) facing a concrete social or business problem is an example of *Applied research*
- Thus, the central aim of applied research is to discover a solution for some pressing practical problem, whereas basic research is directed towards finding information that has a broad base of applications and thus, adds to the already existing organized body of scientific knowledge.

Quantitative Research

It is based on the quantitative measurements of some characteristics. It is applicable to phenomenon that can be expressed in terms of quantities or amount.

Qualitative Research

It is concerned with qualitative phenomenon, i.e., phenomenon relating to or involving quality or kind.

This type of research aims at discovering the underlying motives and desires, using in depth interviews for the purpose. Other techniques of such research are word association tests, sentence completion tests, story completion tests and similar other projective techniques.

- Attitude or opinion research i.e., research designed to find out how people feel or what they think about a particular subject or institution is also *qualitative research*

Qualitative research is specially important in the behavioural sciences where the aim is to discover the underlying motives of human behaviour.

- Through such research we can analyse the various factors which motivate people to behave in a particular manner or which make people like or dislike a particular thing.

CONCEPT OF RESEARCH DESIGN

- A research Design is a procedural plan that is adopted by the researcher to answer questions validly, objectively, accurately and economically.
- Research design is considered as a "blueprint" for research, dealing with at least four problems: (According to Philliber, Schwab, & Samsloss, 1980).
 1. Which questions to study,
 2. Which data are relevant,
 3. What data to collect, and
 4. How to analyse the results.

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 (According to Seltiz, Deutsch and cook, 1962).

- Through research design researcher decides to communicate to others on the decision regarding the study design that propose to use, how the information has been collected, analysed and how the findings would be addressed.

DEFINITION OF RESEARCH DESIGN

- A research design is a plan, structure and strategy of investigation, so conceived as to obtain answer to research questions or problems. The plan is the complete program of the research. It includes an outline of what the investigator will do from writing the hypothesis and their operational implications to the final analysis of data. – Kerlinger, 1986.
- A traditional research design is the blue-print or detailed plan for how a research study is to be completed – operationalizing variables so they can be measured, selecting a sample of interest to study, collecting data to be used as a basis for testing hypothesis and analysing the results – Thyer 1993.
- Green and Tull, “ It is the specification of techniques and processes for obtaining the information required. It is the over-all operational pattern or framework of the project which states what data is to be gathered from which source by what processes.”

DESIGN VERSUS METHOD

Failing to distinguish between design and method leads to poor evaluation of designs. Equating cross-sectional designs with questionnaires, or case studies with participant observation, means that the designs are often evaluated against the strengths and weaknesses of the method rather than their ability to draw relatively unambiguous conclusions or to select between rival plausible hypotheses.

RESEARCH DESIGN

Within group/ Repeated measure design

Incomplete

Complete

Between group Design

Randomized-Groups Design

Two randomized group design

More than two randomized group design

Matched-Groups Design

Factorial design

Research Methods versus Methodology

- *Research methods may be understood as all those methods/techniques that are used for conduction of research.*
- *Research methods or techniques, thus, refer to the methods the researchers use in performing research operations. In other words, all those methods which are used by the researcher during the course of studying his research problem are termed as research methods.*

Keeping this in view, research methods can be put into the following Three Groups

1. In the first group we include those methods which are concerned with the collection of data. These methods will be used where the data already available are not sufficient to arrive at the required solution;

2. The second group consists of those statistical techniques which are used for establishing relationships between the data and the unknowns;

3. The third group consists of those methods which are used to evaluate the accuracy of the results obtained.

Research Methodology

- Is a way to systematically solve the research problem.
- It may be understood as a science of studying how research is done scientifically.
- In it we study the various steps that are generally adopted by a researcher in studying his research problem along with the logic behind them.
- It is necessary for the researcher to know not only the research methods/techniques but also the methodology.

All this means that it is necessary for the researcher to design his methodology for his problem as the same may differ from problem to problem.

- Thus research methodology has many dimensions and research methods constitute a part of the research methodology.
- The scope of research methodology is wider than that of research methods.

Thus, when we talk of research methodology we not only talk of the research methods but also consider the logic behind the methods we use in the context of our research study and explain :

- Why we are using a particular method or technique
- Why we are not using others so that research results are capable of being evaluated either by the researcher himself or by others.

Importance of Knowing How Research is Done

- The study of research methodology gives the students necessary training in :
 - gathering material and arranging or card-indexing them.
 - Participation in the field work when required.
 - Training in techniques for the collection of data appropriate to particular problem
 - In the use of statistics, questionnaires and controlled, experimentation.
 - Recording evidence, sorting it out and interpreting.

The following order provide procedural guideline regarding the research process:

- (1) Formulating the research problem.
- (2) Extensive literature survey.
- (3) Developing the hypothesis
- (4) Preparing the research design.
- (5) Determining sample design.
- (6) Collecting the data.
- (7) Execution of the project
- (8) Analysis of data.
- (9) Hypothesis testing.
- (10) Generalisations and interpretation and
- (11) Preparation of the report or presentation of the results, i.e.; formal write-up of conclusions reached.

1. Formulating the research problem

- At the very outset the researcher must single out the problem he wants to study, i.e., he must decide the general area of interest or aspect of a subject-matter that he would like to inquire into.
- Essentially two steps are involved in formulating the research problem, viz., understanding the problem thoroughly, and rephrasing the same into meaningful terms from an analytical point of view.

2. Extensive literature survey

- Once the problem is formulated, a brief summary of it should be written down.
- At this juncture the researcher should undertake extensive literature survey connected with the problem.
- For this purpose, the abstracting and indexing journals and published or unpublished bibliographies are the first place to go to.
- Academic journals, conference proceedings, government reports, books etc., must be tapped depending on the nature of the problem.

- In this process, it should be remembered that one source will lead to another.
- The earlier studies, if any, which are similar to the study in hand should be carefully studied.
- A good library will be a great help to the researcher at this stage.
- print and Non – Print sources are all included in this category.

3. Development of working hypotheses:

- After extensive literature survey, researcher should state in clear terms the working hypothesis or hypotheses.
- Working hypothesis is tentative assumption made in order to draw out and test its logical or empirical consequences.
- As such the manner in which research hypotheses are developed is particularly important since they provide the focal point for research.
- They also affect the manner in which tests must be conducted in the analysis of data and indirectly the quality of data which is required for the analysis.

Approach to Develop a working Hypothesis

- (a) Discussions with colleagues and experts about the problem, its origin and the objectives in seeking a solution
- (b) Examination of data and records, if available, concerning the problem for possible trends, peculiarities and other clues.
- (c) Review of similar studies in the area or of the studies on similar problems and
- (d) Exploratory personal investigation which involves original field interviews on a limited scale with interested parties and individuals with a view to secure greater insight into the practical aspects of the problem.

4. Preparing the research design:

- The research problem having been formulated in clear cut terms, the researcher will be required to prepare a research design. i.e., he will have to state the conceptual structure within which research would be conducted.
- In other words, the function of research design is to provide for the collection of relevant evidence with minimal expenditure of effort, time and money.
- But how all these can be achieved depends mainly on the research purpose

5. Determining sample design:

- All the items under consideration in any field of inquiry constitute a 'universe' or 'population'.
- A complete enumeration of all the items in the 'population' is known as a census inquiry.
- As Census inquiry is not possible in practice under many circumstances.
- Hence, quite often we select only a few items from the universe for our study purposes.
- The items so selected constitute what is technically called a sample.

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

- In other words, a sample design is a definite plan determined before any data are actually collected for obtaining a sample from a given population.
- Samples can be either probability samples or nonprobability samples.
- With probability samples each element has a known probability of being included in the sample but the non-probability samples do not allow the researcher to determine this probability.
- Probability samples are those based on simple random sampling, systematic sampling, stratified sampling, cluster/area sampling.
- whereas non-probability samples are those based on convenience sampling, judgement sampling and quota sampling techniques.

6. Collecting the data

- There are several ways of collecting the appropriate data which differ considerably in context of money costs, time and other resources at the disposal of the researcher.
- Primary data can be collected either through experiment or through survey.
- If the researcher conducts an experiment, he observes some quantitative measurements, or the data, with the help of which he examines the truth contained in his hypothesis.
- But in the case of a survey, data can be collected by any one or more of the following ways:
 - *By observation*
 - *Through personal interview*
 - *Through personal interview*
 - *Through telephone interviews*
 - *By mailing of questionnaires*
 - *Through schedules:*

7. Execution of the project:

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

8. Analysis of data

- After the data have been collected, the researcher turns to the task of analysing them.
- The analysis of data requires a number of closely related operations such as establishment of categories, the application of these categories to raw data through coding, tabulation and then drawing statistical inferences.
- Thus, researcher should classify the raw data into some purposeful and usable categories such as:
 - *Coding operation is usually done at this stage through which the categories of data are transformed into symbols that may be tabulated and counted.*

Editing is the procedure that improves the quality of the data for coding. With coding the stage is ready for tabulation.

Tabulation is a part of the technical procedure wherein the classified data are put in the form of tables. The mechanical devices can be made use of at this juncture. A great deal of data, specially in large inquiries is tabulated by computers.

Computers not only save time but also make it possible to study large number of variables affecting a problem simultaneously.

9.Hypothesis-testing:

- After analysing the data as stated above, the researcher is in a position to test the hypotheses, if any, he had formulated earlier.
- Do the facts support the hypotheses or they happen to be contrary.
- The hypotheses may be tested through the use of one or more of such tests, depending upon the nature and object of research inquiry.
- Hypothesis-testing will result in either accepting the hypothesis or in rejecting it.
- If the researcher had no hypotheses to start with, generalisations established on the basis of data may be stated as hypotheses to be tested by subsequent researches in times to come.

10. Generalisations and interpretation:

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

Criteria of Good Research

- Whatever may be the types of research works and studies, one thing that is important is that they all meet on the common ground of scientific method employed by them.
- One expects scientific research to satisfy the following criteria:
 1. The purpose of the research should be clearly defined and common concepts be used.
 2. The research procedure used should be described in sufficient detail to permit another researcher to repeat the research for further advancement, keeping the continuity of what has already been attained.
 - 3. The procedural design of the research should be carefully planned to yield results that are as objective as possible.

4. The researcher should report with complete frankness, flaws in procedural design and estimate their effects upon the findings.

- 5. The analysis of data should be sufficiently adequate to reveal its significance and the methods of analysis used should be appropriate. The validity and reliability of the data should be checked carefully.

- 6. Conclusions should be confined to those justified by the data of the research and limited to those for which the data provide an adequate basis.

- 7. Greater confidence in research is warranted if the researcher is experienced, has a good reputation in research and is a person of integrity.

- In other words, we can state the qualities of a good research.

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

- *Good research is logical: This implies that research is guided by the rules of logical reasoning and the logical process of induction and deduction are of great value in carrying out research.*

- *3. Good research is empirical: It implies that research is related basically to one or more aspects of a real situation and deals with concrete data that provides a basis for external validity to research results.*