UNIT 15 RESEARCH DESIGN

Structure

15.0 OBJECTIVES

After reading this Unit, you will be able to:

- understand the concept of research design;
- comprehend its need and purpose;
- know its types; and
- apply appropriate design for research to be undertaken by you.

15.1 INTRODUCTION

Research is a systematic effort towards unraveling the mysteries surrounding us. It involves putting in persistent efforts to know the unknown. In doing so, we start from where we are, what is our present state of knowledge? We tend to interpret this present state by studying the work done by others in the field. We have used the word systematic to characterise research. There are reasons for that; there is a specific purpose while carrying out research; the effort required is monumental in view of the fact that a comprehensive study of what has already been known about it has to be understood. It has to be continued further, form conception to observation to analysis to interpretation and finally reporting, which involves considerable intellectual efforts. Robson has characterised research as systematic, skeptic, and ethic. By systematic, he means that we should be clear about what we are doing, why we are doing, and how we are doing. By skepticism he conveys that the researcher should check, cross- check, and verify his/her views before finalizing them. Researcher should not violate ethics while conducting research, whether it is conceptualisation of topic, data collection, analysis or presentation of results. Research is of two types, viz., pure and applied. The trend today is towards applied research. That is not to belittle pure research, as both are complimentary to each other. Pure research is done to improve upon our existing state

of knowledge. Applied research is done to find out new knowledge to be put into application. It is carried out with an aim of developing something better for the benefit of the society.

We have seen that research needs to be organised and systematic. Research Design is a step towards carrying out research in a planned way. In this Unit, we shall study about what is research design and what is its purpose. We shall also discuss the factors affecting research design and the types of research design.

15.2 WHAT IS RESEARCH DESIGN?

Research is an important activity affecting the society as a whole therefore, it involves a lot of decision making. Research design also involves a lot of decision - making. It provides a structure and shape to your research project. After finalising your topic, you decide about how you are going to conduct your study. It involves formulation of strategy for all the stages starting from formulation of hypotheses to the analysis of data. Kerlinger defines research design as a plan, structure, and strategy of investigation so conceived as to obtain answers to research questions or problems. The plan is the complete scheme or programme of research. It includes an outline of what the investigator will do from writing the hypotheses and their operational implications to the final analysis of data. Thyer has defined research design as a blueprint or detailed plan for a research study - starting from operationalising variables so that they can be measured, to selecting a sample of interest to study, collecting data to be used as a basis for testing hypotheses, and finally analysing the results. Thus, we can conclude that research design provides us a base on which we conduct our research.

15.3 NEED AND PURPOSE

Research is a systematic endeavour towards quest for new knowledge. The word systematic is important and needs clarification. Studying informally and casually may also yield new knowledge but that is not research. In research, organised efforts are put right from thinking of a topic to the presentation of results. The magnitude of the study and the efforts involved require systematisation. Research also involves spending public money therefore, it requires proper planning for effectiveness and efficiency. The methods and techniques involved in data collection and analysis may involve subjectivity. Adequate planning needs to be done to minimise this subjectivity. Validity is another important issue for which a proper design is required. Validity ensures that what we are measuring is what we intend to measure.

The purpose of a research design is to provide information regarding:

- What is the study?
- Why is the study being carried out?
- Where will the study be carried out?
- How will the study be carried out?
- What will be the processes and tasks involved?
- What will be the data?
- How will the data be collected?
- What methods of sampling will be used? and
- How will the analysis be done?

15.4 FUNCTIONS

The functions of a research design are to:

- Provide a plan to undertake systematic study and help to provide procedures to undertake the research work; and
- Ensure objective, valid, and economic undertaking of the study.

Research design enables the researcher to put his study on a sound scientific footing. He is able to decide in advance the what, why, and how of his study. It acts as a guide to conduct the various steps of his/her study in an objective, valid, and economic way.

Self Check Exercise

1) Define research design. Discuss its need and purpose.

Note: i) Write your answer in the space given below.
ii) Check your answer with the answers given at the end of the Unit.

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15.5 TYPES

There are different types of research design. Which one is the best for your study, depends on the purpose and scope of your study. While taking decisions on the research design, a number of factors have to be taken into consideration. These include: Nature of investigation, Data collection methods, Number of contacts made with the subjects, and the Period of reference of your study.

Nature of Investigation:

- Exploratory;
- Descriptive;
- Experimental;
- Semi or Quasi- experimental;
- Non- experimental; and
- Field research.

Data Collection Methods:

- Survey;
- Case studies; and
- Content analysis;

Number of Contacts made with the Subjects:

- Cross-sectional;
- Before- and- after; and
- Longitudinal

Reference Period

- Retrospective;
- Prospective; and
- Retrospective - Prospective.

15.5.1 Based on Nature of Investigation

The nature of investigation can be exploratory, descriptive, causal/experimental, semi or quasi- experimental, non-experimental, and field research. Exploration is an important characteristic of research. Any research begins with it when the researcher dives into the unknown and unsolved terrains. He/She starts with a quest for knowing more through exploration. It is an initial foray into the densities of the unknown. Exploration starts with a vague idea of what is intended to be researched. It forms the basis of research. It is not very systematic to the order of research to be undertaken otherwise. It is a flexible approach to undertaking research where the sampling is generally non-probability and the data collection methods are unstructured. It involves a study and analysis of the literature and discussions with peers and fellow colleagues to know their views on the topic.

Descriptive research is carried out to provide information about a person, thing or process. It describes the characteristics of an individual, group, organisation, or phenomena, conditions, or a situation. The characteristics are described in terms of the dependent variables. Description may be limited to events of past or present but not of the future. In that case it becomes experimental research. Most of the research in social sciences is descriptive in nature. Some examples of descriptive research in LIS are:

- Services, collection, and infrastructure of a particular library
- Status of libraries in a geographical area
- Impact of library services on the performance of students
- Impact of IT on library services
- Attitude of users towards staff in libraries

In descriptive studies data collection is done through structured methods. Samples are selected by random sampling.

The nature of investigation moves systematically from exploratory towards experimental. The degree of investigation goes on increasing as we move ahead. Casual investigation in exploration, to description and finally causal investigation in experimental research. It aims to find cause and effect relations between the dependent and independent variables. Experimental research studies the effect of independent variables on dependent variables. The researcher identifies the two different kinds of variables and the relationship between them. For this, he/she reviews the literature on the subject and also related studies done by others. Discussions with peers and other professionals also help in finding out the relationship. Hypotheses are framed for verifying the relationships. The research is conducted under controlled conditions so that the changes in the dependent variables can be attributed solely to the changes in the independent variables.

Semi - experimental studies are different from experimental studies in that the sampling in experimental studies is random sampling compared to non - random sampling in semi - experimental or quasi-experimental studies.

Non - experimental studies also find out causal relations but they follow the reverse approach. Experimental studies explain the cause - effect relation by identifying the independent variables and later inducing changes in them to find out the resultant effect on the dependent variables. Non- experimental studies ascribe the changes that have

taken place in the dependent variables to some independent variables. They do not induce changes in the independent variables to see the effect on dependent variables. This is generally done in the social sciences and the reason for doing so is the population that are human beings compared to physical and chemical entities in sciences. Let us consider an example to clarify the difference. We want to see the effect of use of IT in the classroom on the performance of students. In experimental studies, we would take use of IT in the classroom as the independent variable and the results of students as dependent variable. We would compare the scores of students after introduction of IT to the scores obtained by them earlier and find out the relation. In non-experimental study, we would check the scores of students after IT has been introduced and find out the relation between them by studying the coefficient of correlation. Let us take another example to understand the difference, where we are studying the effect of OPAC on the use of catalogue. We would divide the users randomly into two groups. One group of users is provided the facilities of a traditional catalogue for access to the literature. The other group is provided the facility of an OPAC to access the literature. We would measure the use of catalogue in the two cases and ascribe the difference to OPAC.

Field research is done in the natural surroundings in real life situations. Here the main criterion is doing research in social settings rather than on the techniques of research. Let us discuss some observations on field research:

"Field research is the design, planning and management of scientific investigations in real-life settings" (Fielder)

Kaplan comments that Field research involves direct or indirect observation of behaviour in the circumstances in which it occurs without any significant intervention on the part of the observer. We can conclude that field research is conducted in real life settings without any modifications done to the settings. There is little stress that the techniques applied are scientific. Importance is given to the fact that the observer collects data while being on the site along with those observed. He is trained to be part of the observed group and objective in recording the observations. Such research is carried out particularly in subjects like sociology or social work. Field studies have been divided into field research and field experiments. Field experiments are different from field research in that the former involve studying the effect of varying independent variables on dependent variables in real life natural settings. The difference between experimental research and field experiment is that the former are conducted in laboratory settings whereas the latter are conducted in natural settings. Thus, the control in the observations is not possible in field experiments, which is possible in laboratory experiments.

Self Check Exercise

2) Enumerate the different kinds of designs based on the nature of investigation. Describe the descriptive design.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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15.5.2 Based on Data Collection Methods

Research design based on data collection methods is of the following types: survey, case studies, and content analysis. Survey approach is used on a large population. But instead of studying the whole of population, a sample is studied. The sample is generally large in size. It is generally used in descriptive studies, however it can also be used in experimental studies. The techniques of data collection used are questionnaire and interviews. Questionnaire can be self- administered or mailed. It can be structured or otherwise. In social science research, survey method is generally used.

Case study involves studying few cases in contrast to the large sample in survey. But the level of study in case study is intensive which is not true of survey. Example of a case study can be " Automation in University Libraries of North India: A Case Study of University Libraries of Kurukshetra, Punjab, and Jammu". The study involves taking a sample and studying that in detail. This would enable the researcher to study automation in detail in these libraries than if the study would have taken all University libraries of North India. But the question is whether we can generalise the results of the study and conclude for the whole of North India.

Content analysis is another type of data collection method where the data is collected from documentary sources. In this method the contents of documents are analysed to arrive at a conclusion. This is a method used and particularly useful in historical research. It enables to study the events in present that have taken place in the past. It is only documents like diaries, autobiographies, archival documents that can act as the source of data. Content analysis can be done quantitatively as well as qualitatively. Quantitative analysis involves counting of words or phrases. Qualitative analysis involves analysing documents to find out the ideas behind words.

Self Check Exercise

3) Define survey approach to data collection. Differentiate between survey and case study method.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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15.5.3 Based on Number of Contacts made with the Subjects

Based on the number of contacts made with the subjects, research studies are: cross-sectional, before- and- after, and, longitudinal. Cross- sectional studies are case studies that involve studying a phenomenon at one point in time. These are also called one - shot studies. Examples of these could be:

- Attitudes of users towards use of IT in libraries
- Status of LIS education in India
- Continuing education for librarians in India

These are simple to undertake as they involve contact only once with the population. They have a drawback that they are not suitable for measuring change.

Before-and- after study design tries to overcome the disadvantage of cross-sectional studies by taking the observation twice. The observation is done before introducing a change in the independent variable and after introducing a change in the independent variable. Thus, we are able to measure change in the variables over a period of time. Examples of the before and after design are:

- Impact on users of the use of IT in libraries.
- Attitudes of users towards use of IT in libraries before and after automation.

In the above two examples, observations are made twice, before and after introduction of IT in libraries. It enables to measure change, which is not possible in cross- sectional studies.

Longitudinal design tries to overcome the disadvantage of the before-and- after study design. It is able to measure the pattern of change in the dependent variables over a period of time. A number of observations are taken over a population after regular intervals of time, which may vary from a week to even more than a year. In the above two examples, if observations are made over a period of time to know the pattern of impact on users at different stages of automation, the design is called longitudinal design.

15.5.4 Based on Reference Period

Based on the period of reference of study, research design has been divided into: retrospective, prospective, and, retrospective- prospective. Retrospective studies study a phenomenon, event, or situation that has happened in the past. Data is collected on the basis of documentary evidence or the respondents' recall of the situation. Some examples of retrospective studies are:

- Libraries in Ancient India.
- Devastation caused by floods to libraries in the 20th century.
- Employment scenario among LIS Professionals in 1990s.

Prospective studies try to predict situations that have yet to take place. They attempt to foresee the future. The studies are concerned with studying the future of a concept, object, organisation, or even attitudes of people. These are experimental in nature. Examples of some such studies are:

- Libraries of the future: How will they exist.
- Prospects of digital libraries in India.
- Effect of RFID technology on pilferage of books in college libraries.
- Image of IT savvy librarians.

Retrospective- Prospective studies are concerned with the events or phenomena that has happened in the past and predict it for the future. These are like before-after studies with the difference that there is no control group here. The dependent variable is observed before and after variation in independent variable on the same population. Some examples of such studies are:

- Impact of automation on the use of libraries.
- Change in attitude of users towards staff after library orientation.
- Rate of use of helmets by people after heavy fines were imposed by traffic police.
- Effect of advertisement on billboards on the sale of cars in metropolitan cities of India.

The plan of research from the point of operationalisation of hypotheses to the analysis of data is presented as research design. The research design is the blueprint of your nature of investigation, data collection methods to be used, number of contacts to be made with the subjects, and the reference period of study. Broadly your nature of investigation can be either exploratory, or descriptive, or experimental. It depends upon your topic which one you choose. A study can adopt more than one also. For example, any research starts with an exploratory investigation where you tend to explore your topic. It is a stage where you tend to formulate your topic based on the review of literature and discussion with others in the field. The research here does not rigidly follow research methodology. The data collection methods also do not follow strictly probability sampling. As in social sciences, in library science also descriptive methods of research is followed. It describes the situation of an object, phenomenon, or a process or an event in the past or present. If it does in the future it becomes experimental research. If our topic of research is: "Impact of automation on the services of academic libraries in India" it has to be descriptive research. Similarly you have to describe the data collection design. Whether it will be survey, or case study, or content analysis. It will be survey in case of the topic, Impact of automation on the services of academic libraries in India". A mention of the number of contacts to be made with the subjects and period of reference also needs to be made here.

In the research design you should also mention the population under study clearly. Describe the data that you intend to collect in terms of the dependent and independent variables. Then you also need to clarify whether you will collect data from the whole of the population or from only a sample. If it has to be a sample study, you need to specify what methods of sampling would be used. Whether it would be probability sampling or non- probability sampling. Within probability and non- probability sampling also state which type of sampling method would be used. The size of the sample should be mentioned here. Next in the research design, the researcher should mention the techniques and tools of data collection. In the techniques, he/she should mention, whether it would be observation, questioning, or interview. What tools of data collection would be used, questionnaire (mailed or self- administered), interview schedule, etc. The research design should also state when and where will the data collection be done.

Data collection tools are the base on which the results of the study depend upon. If the data is not truly representative of the variables, it has a direct effect on the results. Validity and reliability of the tools are therefore measured before they are used. Let us define these concepts. Validity of a tool refers to the fact that we are measuring what we intend to measure. Smith has defined it "…as the degree to which the researcher has measured what he has set out to measure." The next question is how to measure the validity of an instrument. One is by observation and analysis and the other is statistically. Experts and peers can do observation.

Validity is of different kinds, viz., Face, Content, Construct, Predictive, and Concurrent Validity. Face validity, as the name implies measures the validity as seen on its face. It is observed and assessed by the observer on the basis of his experience of the subject. Content validity is also measured in the same way when the expert ensures that all the aspects of the subject have been covered in the instrument. Construct validity is an extension of content validity. It analyses the different constructs that contribute to the formation of a concept that the researcher intends to measure. While measuring the construct validity, it is checked whether all the constructs have due representation in the instrument. Let us discuss by taking an example. We are measuring the professional competencies of librarians and construct a scale for that. While ensuring the construct validity, we should check whether all the constructs of competencies, viz., knowledge, skills, and attitudes have been covered in the scale or not. Predictive validity refers to

the extent to which we can predict a measure of the dependent variables. In the above example of Professional competencies of the librarians, we can measure the predictive validity by verifying how far the competencies measured through the instrument match their actual competencies demonstrated through their work. Concurrent validity refers to how far the observations regarding the dependent variables tally at different times.

Reliability is another important characteristic of the instruments that need to be verified before it is used to measure the variables. Reliability is the degree to which we can repeat the results of the observations at different times in the same conditions. The more the degree of correlation between the two results, the more the reliability. The reliability can be increased by making sure that: language used is simple, clear, unambiguous, and precise. There are different methods to increase the reliability, e.g., test- retest. Here we administer the instrument to the subjects again and check the correlation as a ratio of the results. If the ratio of the results of the two observations is unity, it is the ideal situation, i.e., 100% reliability. The less this ratio, the less the reliability. Another method to ensure reliability is to do parallel test where we design two similar instruments and divide the population in two groups and administer one instrument each to the groups. Later we correlate the results of the two to measure the reliability. Split – half technique is another method to increase the reliability of the instrument. Here we divide the questions into two parts. The parts contain questions to cross-check the responses of the subjects on the same issues. Their correlation enables the researcher to measure the reliability of the instrument.

After the data collection methods are discussed, the methods of its presentation and analysis should be described. Here a mention should be made of the types of tables and graphs that you intend to use to present your data. Also explain how you would analyse your data. What statistics do you intend to use? If you plan to do the analysis using some software package like SPSS, MS-Access, or MS-Excel, etc. mention in the design.

Self Check Exercise

4) Define content analysis as a method of research design for data collection.

5) Enumerate the different kinds of validity. How would you measure content validity of an instrument?

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of the Unit.

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15.6 SUMMARY

In this Unit, we discussed the concept of research design. Research design is the blue-print of your research work. After a discussion of the need and purpose, its functions are discussed. There are different kinds of research designs based on a number of factors. You have to choose one depending upon the purpose of your research work. All these have been explained in the Unit with examples.

15.7 ANSWERS TO SELF CHECK EXERCISES

1) Research design is a plan, structure, and strategy of investigation so conceived as to obtain answers to research questions or problems. It is a blueprint or detailed plan for a research study - starting from operationalising variables so that they can be measured, to selecting a sample of interest to study, collecting data to be used as a basis for testing hypotheses, and finally analyzing the results. Research is a systematic and organised effort towards quest for new knowledge. It involves spending public money and thus accountability towards them. Thus, it needs to have a well thought of research design.

2) The different kinds of designs based on the nature of investigation are:
   - Exploratory;
   - Descriptive;
   - Experimental;
   - Semi or Quasi- experimental;
   - Non- experimental; and
   - Field Research

   Descriptive research is carried out to provide information about a person, thing or process. It describes the characteristics of an individual, group, organisation, or phenomena, conditions, or a situation. The characteristics are described in terms of the dependent variables. Description may be limited to events of past or present but not of the future. In that case it becomes experimental research. Most of the research in social sciences is descriptive in nature.

3) Survey approach is one of the approaches of research based on the method of data collection. It is generally done on a large population. But instead of studying the whole of population, a sample is studied. It is used in descriptive studies, however it can also be used in experimental studies. The techniques of data collection used are questionnaire and interviews. It is one of the most used methods in social sciences. It is different from case study in that the size of the population is small in case study method. In case study the level of study done is intensive compared to survey method.

4) In content analysis, documents are analysed to collect data. This is a method used and particularly useful in historical research. It enables to study the events in present that have taken place in the past. It is only documents like diaries, autobiographies, archival documents that can act as the source of data. Content analysis can be done quantitatively as well as quantitatively. Quantitative analysis involves counting of words or phrases. Qualitative analysis involves analysing documents to find out the ideas behind words.

5) Face, Content, Construct, Predictive, and Concurrent Validity. Content validity is measured on the basis of views of experienced people in the subject/area by observation and assessment of the tool.

15.8 KEYWORDS

Descriptive Studies : Research studies that are carried out to describe an object, phenomena, process, or organisation in the present.

Experimental Studies : Research studies that are undertaken to study cause and effect relations between variables are called experimental studies.

Reliability : The measure of being able to measure the variables with the same accuracy at different times under similar conditions refer to reliability.

Research Design : The strategy that a researcher adopts to undertake his/her research. It concerns the operationalisation of hypothesis, data collection, and data analysis.

Content Analysis : It is a method of data collection for studying events that have taken place in the past on the basis of literature.

Validity : Validity is a measure of the extent of what you are measuring is what you intend to measure.

15.9 REFERENCES AND FURTHER READING

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