- Objectives of the Module:
  - ✓ Explain a sampling design appropriate for a research study
  - Explain tool, design and procedure for collection of data
- Knowledge Analysis:

Prerequisites:	Essential Questions:
A student has Knowledge of : 1. Qualitative and Quantitative methods of research 2. Types and steps of different methods research	1. What are the sources of data and how they are selected? 2. How to collect the data for different type of research?

- Instruction (Referencing):

Content	Mode of Transaction
1. Concept of sampling and other concepts related to sampling 2. Probability and non-probability samples, their characteristics and implications 3. Tools of data collections, their types, attributes and uses (questionnaire, observation, interviews, scales and tests etc	1. Lecture with Presentation 2. Reading and reflective thinking 3. Assignment & Project

- Learning hours : 12

INTRODUCTION

Research requires the accurate, reliable and valid information to solve the problem in a system way, to verify the proposed hypothesis and draw out a generalizable conclusions. The required information or pieces of information may be in the different form like facts, numbers, symbols, etc. which are referred as 'Data'. It is gathered for reference and analysis with some specific purpose or in relevance of research problem.

The types of data may be defined by several way on different basis.

Types based on nature of data:

1. **Qualitative:** The data which express trait, attribute, characteristic, merit, preference or class of an element of population is called as qualitative data. It is not perfectly quantifiable but observed subjectively. Examples: Colours, goodness etc.
2. **Quantitative:** the data which show quantification of things or their dimensions and express in numbers is called as qualitative data. Examples : Height, weight, temperature etc.

There are two subtypes of quantitative data based on nature of variables:

1. **Continuous:** the data belonging to variable which shows gradual changes and can be divided to finer level is called continuous data. For example, the age may be measured finer level from years, months, days, hours and beyond.
2. **Discrete:** the data belonging to variable which cannot be divided to and expressed in perfect numbers is discrete data. For example, the number of students will be always expressed in perfect numbers like 20, 30, 12 etc. but never like 14.5, 16.58 etc.

Types based on the Sources:

1. Primary Data: It is the data collected by researcher with specific purpose and which not used by others (It is first hand).
2. Secondary Data: It is the data that is readily available to use , may be collected by others for other purpose.

Both the types have their own advantages and disadvantages. An investigator has to fix the proportion of these resources according the need to meet the purpose of the research.

Types based on level/scale of measurement

1. **Nominal Scale**: The data which can be classified only or describes the name of category is called as nominal level data.

   For example: Gender wise list of the student.

2. **Ordinal Scale**: The data which may be arranged in a rank or order (ascending or descending) is called ordinal level data.

   For example: Results in grades: A, B,C,D and E

3. **Interval Scale**: The data which show order and equal intervals in set of values is called interval level data. The beginning point is hypothetical (not absolute) zero.

   For example: measurement of temperature

4. **Ratio Scale**: The data which have have intervals in the data with perfect ratio and begins with a true zero value is called as ratio scale.

   For example: Measurement of height, weight, age etc.

The data is gathered from various sources and it is gathered by using different tools. Thus, researchers need the knowledge of:

1. Nature of required data and sources of data
2. Sources of data and methods of selecting sources of data
3. The tools and techniques of data collection.

On this backdrop, present module introduces with two important components of research methodology i) Sampling and ii) Tools of data collection.

CONCEPT OF UNIVERSE, SAMPLE AND SAMPLING:

Generalizability is one of the most important characteristic of research. It shows the applicability of research beyond the data and limited context of the study. The

concept of sampling is based on the idea of selected representatives of things or subjects and draw conclusions applicable to the larger group of things or subjects.

Before studying the concept of sampling it is essential to understand the concept of universe and population.

Universe:

Universe is set of entire units of objects (physical things) or subjects (human being) selected for the study. For example, in a study of football players in India, the set of entire football players is the universe of study.

It is not possible to involve the universe in above mentioned example for the study. The researcher has to think on accessible portion of the universe.

Population:

The accessible portion of the universe is called as population of the study.

Sample:

Sample is single, independent unit of an object or a subject selected for study. It is the portion of population that represents the population. It is set units of objects (physical things) or subjects (human being) selected from population. Thus, it is sub-set of universe and population. Samples are reliable and valid source of information because they have all characteristics of universe and represent the universe.

Sampling:

The process of selection of samples is called as sampling.

Sampling Design:

The plan of selection of samples that defines details of population, procedure of sampling and size of sampling etc. is called as sampling design.

CHARACTERISTICS OF A GOOD SAMPLE:

A good sample should possess the following characteristics:

S: Systematic, Scientific, sizable

M : Measurable

A: Attainable, accurate

R: Representative, Relevant, Reliable

T: Testable

The selection may be affected by bias or errors. Thus, researcher must be cautious about it.

SIGNIFICANCE OF SAMPLING:

Sampling saves the time, efforts and resources. It make feasible, practical and empirical to the study. It limits the size of data and make it possible to handle, Analyze and interpret the data, testing of hypothesis. The conclusions are applicable to the population.

The process of selection is not simple. It is complex because it is difficult to select a true, accurate and perfect representative group from population. If the population is heterogeneous then specialized knowledge is required for sampling. There is chance of influence of bias in sampling which may reduce accuracy, reliability and validity of research.

TECHNIQUES OF SAMPLING:

There are two main techniques of sampling based on the principle of probability.

1. Probability Sampling
2. Non-Probability Sampling.

The probability sampling offers equal chance to each unit of the population to be selected as sample and Non Probability sampling provides chance to specific and limited units of population to be selected as sample to fulfill some specific, predetermined purpose of the research.

There are various types of probability and non-probability sampling.

TYPES OF PROBABILITY SAMPLING:

Following are the main types of probability sampling

1) Simple random sampling

2) Systematic sampling

3) Random Stratified sampling

4) Cluster sampling

5) Multi stage sampling

Simple Random Sampling:

This method is generally applicable to homogeneous population. It offers equal chance to entire elements of population to be selected. Lottery method is used for selection of sample. This is simple method because it doesn't need any specialized knowledge.

Systematic Sampling:

The samples are derived after an equal interval from previous member. It is applicable to homogeneous and finite population. All the units are equal in this sampling because they are member of homogeneous population.

Random Stratified Sampling:

When the population is heterogeneous then it is necessary that sample also should maintain same heterogeneity. This sampling method offer equal chance to each member of small homogeneous group to be selected as sample within the entire population. Small homogeneous existing within the population are called strata and sampling method is called as random stratified sampling.

Cluster Sampling (Area Sampling):

Cluster sampling is used when population is distributed in different areas. It is essential that sample should represent the characteristics of entire population. When the selection of sample is on location basis then it is applied. Thus, this type is also known as area sampling.

Multistage Sampling:

This type is applicable when the population is distributed in different stages. The samples are randomly selected from different stages.

TYPES NON-PROBABILITY SAMPLING:

There are four main types of non-probability sampling:

1. Purposive Sampling
2. Convenience Sampling
3. Quota sampling
4. Snowball Sampling

Purposive Sampling:

This method is used to serve the specific purpose with the samples having specific characteristics. It doesn't offer the equal chance to the members of population for being selected as sample but it is only limited to the some particular type of members.

Convenience Sampling:

The selection of the samples conveniently available to serve the purpose of research is called as convenient sampling. When the population is not countable or widely sprayed and not easily available for study or required for longitudinal study the convenient sampling is applied.

Quota Sampling:

The sample selection having predetermined proportion of subgroups existing in the population is called quota sampling. The quota may be defined by two ways i) equal may be allotted for each subgroup of population and ii) quota may be allotted with equal to the proportion of each subgroup in the population.

Snowball Sampling:

The snowball sampling is process of selecting samples with the help of other samples who are acquainted to them. The selection begins with few samples or small group of samples and they help the researcher to identify and select available respondents who meet the purpose of research.

TOOLS OF DATA COLLECTION

The first part of the module is on sampling and this second part belongs to tools of data collection. The sampling frame is significant for knowledge of nature of sample which is source of data. It is necessary to employ the appropriate tool and technique to draw out the information relevant to research and its objectives. The tool and technique of data collection varies according to purpose of research, nature of data, nature of sample etc.

The tools may be enlisted as follows :

1. Observation
2. Interviews
3. Questionnaires
4. Rating Scales
5. Inventories & Tests

OBSERVATION :

Observation is one of the basic method of data collection. It may be defined as the purposeful, careful of watching of something to draw out factual statements with adequate evidences. Now a day various devices are available for observation. Thus, the recording or noting of the observation became smooth and easy. There are several types of observation according to nature of observation. they are like :

1. Structured and Unstructured

2. Participant and Non-participant

Structured and Unstructured Observation:

When it is required to specific aspect of the process, occurrence etc the structured observation is preferred and when the researcher is unknown to process, occurrence etc. unstructured observation may be preferred. The structured observation doesn't provide flexibility to observer. However, the degree of flexibility is optimal in the unstructured observation.

Participant and Non-Participant Observation:

In some situation it may be required that the observer must be the part of situation to collect factual data the participant observation is more suitable. The non-participant is employed when the participation of observer may influence the situation and data could not be gathered in natural setting.

INTERVIEW:

Interview is also one of the direct method of data collection. It is different than conversation in various aspects. It is method to collect the responses to oral enquiry. Thus, it is expected that an interview must be planned, systematic and purposeful.

There are various type of interviews according to purpose, nature and process of interview.

Structured Interview:

Structured interview is comprised of predetermined selected questions and sometimes the responses also may be restricted to limited options. The structured interviews are useful to collect the information on specific points and avoid unnecessary information which may be given by the respondent.

Semi-Structured Interview:

The interview having flexibility in both questions and responses is semi structured interview. It provides some flexibility to interviewer as well as respondents.

Unstructured Interview:

The unstructured interview provides high degree of flexibility to both interviewer and interviewee in questioning and responses.

QUESTIONNAIRE:

Questionnaire is tool collect the responses in written form to the set of predetermined questions. It is a device employed on respondents competent to give responses in written form. It is tool which may be employed to the respondents sprayed over wide jurisdiction.

There are two important type of the questionnaire based on the types of questions:

i. Closed Questionnaire :

The closed questionnaire is comprised of the questions having restricted responses. Respondents has to choose one of the option from the list of predetermined responses.

This type is useful to avoid the unnecessary information which may be provided by respondents

ii. Open Questionnaire:

The responses to the questions in this type are not restricted to predetermined responses. The respondents can note their responses with explanations or information in detail. It is useful when the subjective and in-depth information is required for research.

RATING SCALE:

Rating scale is also an enquiry form employed to collect the judgements, opinions regarding some situation, statements etc. Rating allows the quantification of responses. For example, Goodness of the something may be asked and respondent has to choose one of the option from set of responses like : A, B, C, D, E which shows gradual increase or decrease of goodness.

SUMMARY:

The data is gathered from various sources and it is of different types. Thus, researchers need the knowledge of Nature of required data, Sources of data, methods of selecting sources of data and the tools and techniques of data collection.

The concept of sampling is based on the idea of selected representatives of things or subjects and draw conclusions applicable to the larger group of things or subjects.

The probability method gives equal chance of selection to each member of population to be selected as sample. The different probability methods are applicable according to constitution of population.

The non- probability methods of sampling allows only those members to be sample who are competent to serve the predetermined criterions and objectives of the research.

The tools are important for collection of reliable and valid data. The researcher has to device the tools according to nature of problem, population and nature of required data.