Research Methodology

Lesson – 5

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Sample Design

- Sample design is a definite plan for obtaining a sample from a given population (Kothari, 1988). Sample constitutes a certain portion of the population or universe. Sampling design refers to the technique or the procedure the researcher adopts for selecting items for the sample from the population or universe. A sample design helps to decide the number of items to be included in the sample, i.e., the size of the sample. The sample design should be determined prior to data collection.

Sampling Design – Steps

- **Type of Universe:** The first step involved in developing sample design is to clearly define the number of cases, technically known as the universe. universe may be finite or infinite.

- **Sampling Unit:** Prior to selecting a sample, decision has to be made about the sampling unit. A sampling unit may be a geographical area like a state, district, village, etc., or a social unit like a family, religious community, school, etc., or it may also be an individual.

- **Source List:** Source list is also known as the 'sampling frame', from which the sample is to be selected. The source list must be reliable, comprehensive, correct, and appropriate. It is important that the source list should be as representative of the population as possible.

- **Size of Sample:** Size of the sample refers to the number of items to be chosen from the universe to form a sample . The size of sample must be optimum. An optimum sample may be defined as the one that satisfies the requirements of representativeness, flexibility, efficiency, and reliability. While deciding the size of sample, a researcher should determine the desired precision and the acceptable confidence level for the estimate. The size of the population should be considered, as it also limits the sample size. The budgetary constraints and sampling procedure plays an important role in deciding the size of sample.

Criteria for Selecting a Sampling Procedure

The cost of data collection, and

The cost of drawing incorrect inference from the selected data.

- **Systematic bias:** Systematic bias arises out of errors in the sampling procedure. They cannot be reduced or eliminated by increasing the sample size.
  - a. Inappropriate sampling frame,
  - b. Defective measuring device,
  - c. Non-respondents and
  - d. Natural bias in the reporting of data.

- **Sampling error.:** refers to the random variations in the sample estimates around the true population parameters.
  - √ Tends to decrease with the increase in the size of the sample
  - √ When the population is homogenous.

In summary, while selecting the sample, a researcher should ensure that the procedure adopted involves a relatively smaller sampling error and helps to control systematic bias

Characteristics of a Good Sample Design

- The sample design should yield a truly representative sample;
- The sample design should be such that it results in small sampling error;
- The sample design should be viable in the context of budgetary constraints of the research study;
- The sample design should be such that the systematic bias can be controlled; and
- The sample must be such that the results of the sample study would be applicable, in general, to the universe at a reasonable level of confidence.

Different Types of Sample Designs

Sample designs may be classified into different categories based on two factors, namely, the representation basis and the element selection technique.

Under the representation basis, the sample may be classified as:

- Non-probability sampling
- Probability sampling

Non Probability Sampling

- Non-probability sampling is the sampling procedure that does not afford any basis for estimating the probability that each item in the population would have an equal chance of being included in the sample. Non-probability sampling is also known as deliberate sampling, judgment sampling and purposive sampling. Under this type of sampling, the items for the sample are deliberately chosen by the researcher; and his/her choice concerning the choice of items remains supreme. In such a case, the judgment of the researcher of the study assumes prime importance in this sampling design.

Non Probability Sampling Types

- **Convenience sampling** is a non-probability sampling technique where samples are selected from the population only because they are conveniently available to the researcher. Researchers choose these samples just because they are easy to recruit, and the researcher did not consider selecting a sample that represents the entire population.

- **Quota sampling:** Under this sampling, the researchers simply assume quotas to be filled from different strata, with certain restrictions imposed on how they should be selected. This type of sampling is very convenient and is relatively less expensive.

- **Judgmental or Purposive sampling:** In the judgmental sampling method, researchers select the samples based purely on the researcher's knowledge and credibility. In other words, researchers choose only those people who they deem fit to participate in the research study. Judgmental or purposive sampling is not a scientific method of sampling, and the downside to this sampling technique is that the preconceived notions of a researcher can influence the results.

- **Snowball sampling:** Snowball sampling helps researchers find a sample when they are difficult to locate. Researchers use this technique when the sample size is small and not easily available. This sampling system works like the referral program. Once the researchers find suitable subjects, he asks them for assistance to seek similar subjects to form a considerably good size sample.

Probability Sampling

- Probability sampling is also known as ‘choice sampling’ or ‘random sampling’. Under this sampling design, every item of the universe has an equal chance of being included in the sample. Therefore, only chance would determine whether an item or the other would be included in the sample or not. Random sampling satisfies the law of statistical regularity, according to which if on an average the sample chosen is random, then it would have the same composition and characteristics of the universe.

Probability Sampling Types – Simple Method of Selecting a Random Sample

- The process of selecting a random sample involves writing the name of each element of a finite population on a slip of paper and putting them into a box or a bag. Then they have to be thoroughly mixed and then the required number of slips for the sample can be picked one after the other without replacement. While doing this, it has to be ensured that in successive drawings each of the remaining elements of the population has an equal chance of being chosen. This method results in the same probability for each possible sample.

Probability Sampling Types – Complex Random Sampling Designs

- The probability sampling may result in complex random sampling designs. Such designs are known as mixed sampling designs. Many of such designs may represent a combination of non-probability and probability sampling procedures in choosing a sample.

Complex Random Sampling Designs

- **Systematic Sampling:** In some cases, the best way of sampling is to select every first item on a list. Sampling of this kind is called as systematic sampling. An element of randomness is introduced in this type of sampling by using random numbers to select the unit with which to start. For example, if a 10 per cent sample is required out of 100 items, the first item would be selected randomly from the first low of item and thereafter every 10th item. In this kind of sampling, only the first unit is selected randomly, while rest of the units of the sample is chosen at fixed intervals.

- **Stratified Sampling:** When a population from which a sample is to be selected does not comprise a homogeneous group, stratified sampling technique is generally employed for obtaining a representative sample. Under stratified sampling, the population is divided into many sub-populations in such a manner that they are individually more homogeneous than the rest of the total population. Then, items are selected from each stratum to form a sample. As each stratum is more homogeneous than the remaining total population, the researcher is able to obtain a more precise estimate for each stratum.

- **Cluster Sampling:** When the total area of research interest is large, a convenient way in which a sample can be selected is to divide the area into a number of smaller non-overlapping areas and then randomly selecting a number of such smaller areas. Thus in cluster sampling, the total population is sub-divided into numerous relatively smaller subdivisions, which in themselves constitute clusters of still smaller units. And then, some of such clusters are randomly chosen for inclusion in the overall sample.

- **Area Sampling:** When clusters are in the form of some geographic subdivisions, then cluster sampling is termed as area sampling. That is, when the primary sampling unit represents a cluster of units based on geographic area, the cluster designs are distinguished as area sampling.

- **Multi-Stage Sampling:** A further development of the principle of cluster sampling is multi-stage sampling. When the researcher desires to investigate the working efficiency of nationalized banks in India and a sample of few banks is required for this purpose, the first stage would be to select large primary sampling unit like the states in the country. Next, certain districts may be selected and all banks interviewed in the chosen districts. This represents a two-stage sampling design, with the ultimate sampling units being clusters of districts.

- **Sampling With Probability Proportional To Size:** When the case of cluster sampling units does not have exactly or approximately the same number of elements, it is better for the researcher to adopt a random selection process, where the probability of inclusion of each cluster in the sample tends to be proportional to the size of the cluster.

End of Lesson 5