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**APPLICATION OF POPULATION, SAMPLE AND SAMPLING TECHNIQUES FOR  
EFFECTIVE LIBRARY AND INFORMATION SCIENCE RESEARCH**

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**Abstract**

In conducting a research, it is expected that data be collected from respondents which are carefully selected through the use of most appropriate technique. Therefore, this paper focuses on describing different sampling techniques and their features. The two major sampling techniques, namely: probabilistic and non-probabilistic, were considered. Also, the paper discusses sampling error and approaches in reducing such sampling errors that may affect the credibility of the research findings.

**Keywords: Library and Information Science, Research, population, sample, sampling technique**

**Introduction**

Research is conducted on daily basis across different fields and disciplines, corporate organizations and government agencies to enhance developments, advance the frontiers of knowledge, discover something new or solve an immediate or imminent problems or to disproof or affirm a theory.

While conducting a research, it is expected that data be collected from respondents. These respondents may be large or small depending on the size determined by the researcher. Similarly, as it is the goal of any research to turn up credible findings, and also that such findings may aid generalization in case of quantitative research, therefore a sample size is selected that will reflect the general interest of the entire population. To achieve credibility of research

findings is not by accident, but rather through a rigorous and careful plan by the researcher on how the actual respondents (or sample) from the universe of the potential respondents (population) are selected; and also the procedure he employs in administering his research instrument.

This paper discusses sampling techniques as it affects the conduct of research. It starts by describing what sampling technique is and tracing its place and significance in research. Also, the paper discusses different types of sampling technique and sampling error. Defining sampling technique cannot be done in isolation of other concepts such as Population and Sample from which it derives. Therefore, a good attempt will be by briefly discussing research population and sample.

### **Research Population**

Research population is a technical term used in research to describe the universe or totality of the research subject with similar characteristics from which the researcher intends to collect data. According to Issa (2012), Population refers to the totality of a *research subject* in a given research situation. Research population is the universe or totality of the research subject or group from which the researcher is expected to draw his sample, and which the researcher's findings is expected to be applicable/ generalized.

Research population varies depending on the nature of the research or the problem being investigated. For example, a research in Library and Information Science that focuses on *Library*

*Use Pattern of Students* may have the entire students (people) of a particular institution being studied as the population as each of these students (population) has a chance of being a potential respondent. Also, a *bibliometric study* may have a number of publications (mostly journals) as its population.

Furthermore, the number of entities in a research population may be unusually large than what the researcher can easily manage, hence, the need to carve out a smaller group known as sample: which can be conveniently studied. Meanwhile, to state the population of a study, the researcher may need a factual figure of the number of elements in his population to be able to draw out a bias-free sample, as this will have a direct implication on the study's findings.

### Sample

Due to the (usually) large number of study population, it becomes necessary to work with a smaller group (sample) which the researcher can easily have access to. Osuji and Ishola (2009) describe sample as the smaller group derived from the population through some procedures on which necessary data for the study will be collected. **Note: *It is the sample that will be studied and not the population.*** Hence, the actual number of sample size should be stated and should be reasonable and proportional to the population size, as the results obtained from the sample will be generalized on the entire population (this may not be the goal of qualitative research which only wants to describe some characteristics of a phenomenon). Note that, in a situation where the population is small as the case of qualitative research, the entire population can be used and studied as sample. This is called total enumeration.

## Sampling Techniques

A sample design is a definite plan for obtaining a sample from a given population (Kothari, 2004). This is the procedure adopted for deriving sample from the study's population, that is, the method or technique adopted in selecting the entities that constitute the sample size. Sampling technique adopted should aid generalization. This means that the data it will collect should reflect general interest of the entire population.

Basically, there are two major types of sampling techniques, namely:

- (i) Probabilistic or random Sampling technique
- (ii) Non-probabilistic or non-random sampling technique

### Probabilistic/Random Sampling technique

This is the least biased of all sampling techniques, as each member of the population has an equal chance of being selected as part of the respondents. It is also called *chance sampling*. The common form of Probabilistic Sampling technique is known as simple random sampling technique.

**Simple Random Sampling (SRS):** According to Osuji and Ishola (2009), in this technique, the components of the samples are chosen from the larger population by a process known as randomization. The principle of randomization ensures that all the individual subjects of the larger population have equal chances of being selected and included to be members of the drawn samples. Every item of the population has equal chances of being included in the sample. Every individual unit is picked up from the population not deliberately, but through some mechanical

process. This implies that a selected sample cannot be replaced in case such is no longer available. Random sampling is considered as the best technique of selecting a representative sample because the results obtained from such sample are reliable and are truly representative of the larger populations.

### Systematic Sampling Technique

Systematic sampling technique entails selecting an  $n$ th item from a group. One picks the first item at random and every other one at that fixed interval. According to Kumar (2011), the steps involved in selecting a systematic sample are as follow:

- Step 1 Prepare a list of all the elements in the study population ( $N$ ).
- Step 2 Decide on the sample size ( $n$ ).
- Step 3 Determine the *width of the interval* ( $k$ ) =  $\frac{\text{total population}}{\text{sample size}}$
- Step 4 Using the SRS, select an element from the first interval ( $n$ th order).
- Step 5 Select the same order element from each subsequent interval.

Source: Kumar (2011)

For example, if a researcher intends to select 20% as a sample size in a class of 50 students, the 20% of 50 students is 10. The researcher will then divide the total number (50 students) by the number of proposed sample size (10 students), which is five. The next step is to group the class

into 10 groups, from which one element will be selected. The first one may be selected at random, may be through a roll of dice, and any other one will follow at a fixed interval.

### **Stratified Sampling Technique**

If a population from which a sample is to be drawn does not constitute a homogeneous group (not of the same kind or characteristics), stratified sampling technique is generally applied to obtain a representative sample. Under stratified sampling technique, the population is divided into several sub-populations (strata) that are individually more homogeneous than the total population, and then select items (sample) from each stratum to constitute a sample, using the simple random sampling technique. This kind of sampling technique results in more reliable and detailed information. For example, students of Federal University of Agriculture, Abeokuta can be divided into Pre-Degree stratum, undergraduate stratum and post graduate stratum. Therefore, some students will be selected at random from each stratum to constitute the sample for the study. Note that we can have students offering different or similar courses in each and across the stratum.

According to Kumar (2011), there are two types of stratified sampling: proportionate stratified sampling and disproportionate stratified sampling. With proportionate stratified sampling, the number of elements from each stratum in relation to its proportion in the total population is selected, whereas in disproportionate stratified sampling, consideration is not given to the size of the stratum.

There are three questions that are pertinent in stratified sampling technique:

- 1. How to form strata?** Strata should be formed based on common characteristics of the items to be put into stratum. In the example above, the common characteristic used to group the students of the Federal University of Agriculture, Abeokuta is their academic programme, such as Pre-degree, undergraduate etc. Note that it is possible to have students offering diverse courses in the same strata.
- 2. How should items be selected from each stratum?** Simple random or systematic could be used if considered appropriate in certain situations.
- 3. How many items should be selected from each stratum or how to allocate the sample size of each stratum?** One can follow the method of proportional allocation, that is, the sample size depends on the number of element in each stratum.

### Cluster Sampling technique

Cluster sampling is based on the ability of the researcher to divide the sampling population into groups (based upon visible or easily identifiable characteristics), called clusters, and then select elements within each cluster, using the simple random technique. A cluster technique is mostly used if the population is unusually large, but contains groups with similar visible characteristics. The large area or population will be divided into clusters, that is, a number of smaller non-overlapping ones) and then randomly select a number of these smaller areas (cluster) with sample consisting of all (or samples of) units in the clusters selected. For example,

dividing the university into Departments (clusters) implies that no single student can simultaneously belong to two departments, which implies that all the units (students) within each cluster (Department) share similar visible characteristics. Therefore, using the simple random technique, samples are drawn from selected clusters.

### **Multi Stage Sampling**

This involves the combination of several sampling techniques. For example, if you are studying the use of media resources in primary schools in Ogun State, the 1st stage is to categorize them into strata (e.g. Ogun West, Ogun Central etc), from each strata, we can have clusters (such as all private primary schools from Ogun West, all public primary schools from Ogun West etc). We can then select at random, a required number of samples.

### **Non-probabilistic/ Non-random sampling technique**

This is a sampling procedure which does not guarantee equal chances of representation for any item in the population. Hence, it is seen as a biased procedure of selecting sample. Due to this form of biasness, findings from such samples, though may be credible, cannot be generalized on the entire study population. Non-probability sampling designs are used when the number of elements in a population is either unknown or cannot be individually identified. Non-probabilistic sampling technique is commonly used in qualitative studies, because generalization of findings is usually not the main target. Non-random sampling technique is known by different nomenclatures such as: Deliberate Sampling, Purposive Sampling, Judgmental Sampling, Convenience Sampling, and Accidental Sampling.



In this type of sampling, items for the sample are selected *deliberately* by the researcher. In other words, the researcher purposely chooses the particular units or entities with an assumption that the small mass will represent the general population. For instance, in studying the use of research collections in *Nimbe Adetipe Library*, FUNAAB, the researcher can pick sample from the final year students knowing that they will be using such collections for their final year project work. Also, in studying acquisition of library materials in Federal Polytechnic Ilaro Library, the Acquisition Librarian (being the one in charge of the Library's acquisitions routines) will be selected, and not the Circulation Librarian, because the former has a direct link or purpose to the study.

In non-probabilistic technique, personal interest prevails; which brings about the danger of bias that may affect the validity of the results or findings. Also, there is no assurance that every elements of the population has some specifiable chance of being included in the sample. Sampling error in this type of sampling cannot be estimated, and element of bias is always there. As such, this kind of sampling technique is rarely adopted in studies that deal with large number of research subjects.

According to Kumar (2011), the advantages of using this design are: it is the least expensive way of selecting a sample; you do not need any information, such as a sampling frame, the total number of elements, their location, or other information about the sampling population; and it guarantees the inclusion of the type of people you need. The disadvantages are: as the resulting sample is not a probability one, the findings cannot be generalized to the

total sampling population; and the most accessible individuals might have characteristics that are unique to them and hence might not be truly representative of the total sampling population.

### **Sampling Error**

As it is expected that research findings should be credible, however, the reverse may be the case due to certain error that may be associated with the procedure adopted by the researcher to select sample (that is, the sampling technique adopted). This is tagged sampling error. Sampling error is the nonconformity of the selected sample to the true characteristics or qualities of the entire population. According to Qualtrics (2010), sampling errors are the random variations in the sample estimates around the true population parameters. This implies that sampling errors are sharp deviations of the sample from the population, resulting in finding variations. Sampling error occurs when what the researcher finds out from the sample is in sharp contrast with the interest of the entire population, resulting from the procedure he adopted in drawing his sample.

As observed by Explorable (2017), sampling error can occur due to researcher's biasness while drawing sample from the population. For instance, a randomized sample, by chance may concentrate towards a particular group, thereby reducing the chances of other group in the same universe. Otherwise tagged a sampling frame error, it is when the researcher chooses a wrong group to represent the population. Therefore, such sample may not be a true representation of the whole population.

### **Strategies for Eliminating Sampling Error**

In the view of Explorable (2017), one way to eliminate sampling error in a study is to eliminate the concept of sample, and to test the entire population. However, since this may be impracticable in most cases, the next option left is to adopt an unbiased sampling technique and by using a large sample size. Kothari (2004) shares the same view by stating that sampling error decreases with the increase in the size of the sample, and it happens to be of a smaller magnitude in case of homogeneous population. Also, multiple contacts to the selected sample will enable the researcher to be assured of the representative response.

### **Conclusion and recommendation**

Research is a process which cannot be executed haphazardly as it requires rigorous and careful planning. Therefore, there is need for adequate planning in selecting sample from whom data would be collected. As the type of research will determine the type of methodology and by extension, sampling technique to adopt, it is incumbent on researchers to take cautious steps in selecting the appropriate sampling technique as this is the most crucial stage in arriving at credible and dependable findings and conclusion for the research work.

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