**Sampling Methods**  
 LEARNING OUTCOMES   
By the end of this topic, you should be able to:   
1.Define what is sampling and its concept;   
2.Identify the advantages and disadvantages of sampling;   
3.Describe sampling terminologies;   
4.Identify sample size and selection method; and   
5.Differentiate between probability sampling and non-probability sampling   
techniques.   
1.1 **CONCEPT OF SAMPLING**   
 Sampling is a process of selecting samples from a group or population to become the   
foundation for estimating and predicting the outcome of the population as well as to   
detect the unknown piece of information. When only some elements are selected from a   
population, we refer to that as a   
**sample**  
; when all elements are included, we call it a   
**census**. There are a few advantages and disadvantages associated with the sampling   
process.  
 (a)  
**Advantages of Sampling**  
 Among the advantages are that sampling can save cost and human resources   
during the process of research work.   
 (b)**Disadvantages of Sampling**  
 A researcher may not find the information about the population being studied   
especially on its characteristics. The research can only estimate or predict   
them. This means that there is a high possibility of error occurrence  
 in the   
estimation made. Sampling process only enables a researcher to make   
estimation about the actual situation instead of finding the real truth. If you   
take a piece of information from your sampling population, and if your   
reasoning is correct, your findings should also be accurate to a certain degree.   
When selecting a sample, it is very important for a researcher to consider the   
possibility of error during the selection process.  
 1.2 **SAMPLING TERMINOLOGIES**   
In sampling, there are a few terminologies that a researcher should be familiar with. For   
example, lets say you are working in a research project on computing implementation for   
elderly and disabled citizens for a smart home system. You are supposed to find out the   
average age of senior and disabled citizens involved in your study.   
(a)  
The community, families living in the town with smart homes form the   
**population**or **study population**   
and are usually denoted by the letter  
 N.  
 (b)The sample group of elderly people or senior citizens and disable people in the   
vicinity of the smart home community is called   
**sample**. (c)  
The number of elderly people or senior citizens and disabled people you obtain   
information to find their average age is called the   
**sample size** and is usually   
denoted by letter   
**n**. (d)The way you select senior citizens and disabled people is called the   
**sampling   
design/method**   
or **strategy**   
. (e)  
Each citizen or disabled people that becomes the basis for selecting your sample is   
called the   
sampling unit  
 or sampling element  
. (f)A list identifying each respondent in the study population is called   
**sampling   
frame**  
. In case when all elements in a sampling population cannot  
 be individually   
identified, you cannot have a sampling frame for the study population.   
(g)Finally, the obtained findings based on the information of the respondents are   
called   
**sample statistics**. 1.3 **SAMPLE SIZE AND SELECTION**   
Most of the new researchers always wonder about the sample size that needs to be   
selected. You must remember that the larger the sample for your research, the better   
outcome you can evaluate at the end of the research process. The larger the sample, the   
more likely the estimates will become a representation of true values  
. For instance, in IT   
survey, the sample size required depends on the statistical outcome needed for the   
findings. The following are some guidelines to decide on how large a sample should be:   
 When the selected sample needs to be segregated into smaller clusters involving   
comparisons of clusters, a large sample would be appropriate.   
The longer the duration of a study, the higher the number of subjects that will drop   
out. To reduce attrition, a researcher should keep demands on subjects to the   
minimum, to fully inform the subject about the study and research, and make   
frequent communication with subjects to maintain the interest.   
A larger sample is needed when the population is highly heterogeneous on the   
variables being studied so that different characteristics can be identified. If   
members of the population is less, then a small sample size would do to obtain the   
necessary characteristics.   
1.3.1 **Selecting a Sample**The objective of selecting a sample is to achieve maximum accuracy in your estimation   
within a given sample size and to avoid bias in the selection of the sample. This is   
important as bias can attack the integrity of facts and jeopardise your research outcome.  
 Table 1.1 explains how bias can occur in sample selection.   
**Table 10.1**:   
Reasons Bias Occurs in Sample Selection   
 **No.**  
 **Reason(s)**   
 1.Sampling done using non-random method (we will see sampling designs in the next   
section) which can be influenced by human choices.   
2.Sampling frame like list, indexing and records which serve as the platform of selection   
does not cover the sampling population accurately or completely.   
3.A section of sampling population refuses to co-operate.   
 There are also factors that may influence the degree of certainty in inferences drawn from   
a sample for research study. As we know, the size of samples influence findings such that   
large samples have more certainty than those based on smaller ones. Therefore, the larger   
the sample, the researcher will obtain more accurate findings.   
Another factor is the extent of variation in the sampling population where the greater the   
variation in the population will have greater uncertainty with respect to its characteristics.   
Therefore, it is crucial for a researcher to bear these in mind especially when selecting a   
sample for her/his respective research work.   
 1.4 **SAMPLING TECHNIQUES**   
Sampling techniques often depend on research objectives of a research work.   
Generally there are two types of sampling techniques that are widely deployed.   
These techniques are:   
(a)  
**Probability Sampling** This sampling technique includes sample selection which is based on random   
methods. The techniques that are based in this category are   
**random   
sampling, stratified sampling, systematic sampling   
and  
 cluster sampling.**   
(b)**Non-probablity Sampling**  
 This sampling techniques is not based on random selection. Some examples   
are   
**quota sampling, purposive/judgmental sampling, convenience  
 sampling and snowball sampling**  
 **1.4.1 Probability Sampling**   
The techniques in probability  
 sampling are as follows:   
(a)  
**Random Sampling**  
 Random sampling is used to increase the probability of the sample selected. By   
deploying this technique, each member of a population stands a chance to be   
selected. Lets say you are interested to survey the usage of e-commerce application   
in business-to-consumer (B2C).   
The sample you select needs to represent the types of e-commerce application and   
its usage. Due to financial and time constraints you are unable to survey the usage   
of all types of e-commerce application across the Malaysian network (N= 100,000).   
Therefore you decide to confine the study to e-commerce application for   
merchandise products in Malaysia (n=10,000) which is called the accessible   
population.   
From this accessible population, a sample of 100 e-commerce application is   
retrieved. How do we randomly select sample? It is understood that random sample   
is a procedure in which all individuals in the defined population have an equal and   
independent chance to be selected in the sample design. In the above example, the   
number of e-commerce application on merchandise products across Malaysian   
network is 10,000 and you may intend to draw a sample of 100. When you select   
the first application, it has 1:10,000 chances of being selected. Once the first   
application selected, the remaining will be 9,999 so that each application has   
1:9,999 of being selected as second case. Therefore, once each case is selected, the   
probability of being selected next changes because the population of selection has   
become one case smaller each time.   
(b)**Stratified Sampling**  
 In some IT surveys, a researcher may want to ensure individuals with certain   
characteristics are included in the sample to be studied. For such cases, stratified   
sampling is used. In this sampling design, a researcher will attempt to stratify   
population in such a way that the population within a   
stratum is homogeneous with   
respect to the characteristics on the basis of which it is being stratified. You must   
bear in mind that it is important for the characteristics chosen as the basis of   
stratification, are clearly identifiable in the population. For example, it is much   
easier to stratify the population on the basis of gender rather than age or income   
group. (c)  
**Systematic Sampling**   
In systematic sampling only the first unit is selected randomly and the remaining   
units of the sample are to be selected by a fixed period, it is not like a random   
sample in real sense, systematic sampling has confident points of having   
improvement over the simple random sample, as ample the systematic sample is   
feast more equally completed to the complete population. The execution of the   
method is very easy, less in cost and conveniently to use in case of a larger   
population.   
 A researcher has to begin by having a list names of members in the population, in   
random approach. Figure 1.1 below shows the order of the sampling.   
 Figure 1.1:   
Example of systematic sampling   
This sampling method is good as long as the list does not contain any hidden order.   
Systematic sampling is frequently in selecting specified number of records from   
computer documents.   
(d)**Cluster Sampling**  
 In cluster sampling, the unit of sampling is not referring to an individual entity but   
rather a group of entities. For example, in an organisation there are 25 departments   
and in each department there are an estimated 20 IT administrators. You need a   
sample of about 100 staff but this would mean going to many departments if   
random sampling approach is used. Using cluster sampling, you may select 5   
departments randomly from a total of 25 departments. You study all the staff in the   
5 departments you chose. The advantage that can be highlighted here is: it saves   
cost and time especially if the population is scattered. The disadvantage is that it is   
less accurate compared to other techniques of sampling discussed.   
1.4.2 **Non-Probability Sampling**   
In some research scenarios, it is not possible to ensure that the sample will be selected   
based on random selection. Non-probability sampling is based on a researchers   
judgement and there is possibility of bias in sample selection and distort findings of the   
study. Nonetheless, this sampling technique is used because of its practicality. It can save   
time and cost, and at the same time, it is a feasible method given the spread and features   
of a population. Some common sampling methods are quota sampling, purposive/  
judgmental sampling , convenience sampling and snowball sampling  
. (a)  
**Quota Sampling**  
 The main reason directing quota sampling is the researchers ease of access to the   
sample population. Similar to stratified sampling, a researcher needs to identify the   
subgroups and their proportions as they are represented in the population. Then, the   
researcher will select subjects based on his/ her convenience and judgement to fill   
each subgroup. A researcher must be confident in using this method and firmly state   
the criteria for selection of sample especially during results summarisation.   
(b)**Purposive Sampling or Judgmental Sampling**  
 The sampling design is based on the judgement of the researcher as to who will   
provide the best information to succeed for the objectives study. The person   
conducting the research need to focus on those people with the same opinion to   
have the required information and be willing of sharing it.  
 (c)  
**Convenience Sampling**  
 Using this sampling method, a researcher is free to use anything that they could   
find in the research outline. The sample is selected based on preferences and ease of   
sampling respondents. This sampling is easier to conduct and less expensive.   
However, it has poor reliability due to its high incidence of bias. C  
onvenience   
sampling seems to be dominant especially in cases of organisations that conduct   
web surveys, mail their responses to a survey questions and SMS their opinions to a   
question. Although convenience sampling can cater to a lot of data, it is not reliable   
in terms whether the sample represents the real population or not.   
(d)**Snowball sampling**   
Is a design process of selection usually done by using, networks. It is useful when the   
researcher know little about a group or organisation to study; contact with few   
individuals will direct him to other group. The selection of the study sample will be   
useful for communication aspect, in making decision or indifussion of knowledge to   
people. The disadvantage is that the choice of the whole sample balances on the choice   
of individuals from the beginning of the stage, belonging to a particular clique or have   
ample biases. It will difficult to use when the sample becomes larger and larger  
 **Sampling**   
is a process of selecting samples from a group or population to  
 become the   
foundation on estimating and predicting outcome of the population.   
**Two main techniques**of sampling:  
 probability   
and  
 non-probability.   
**Probability sampling**is based on random selection while non-probability  
 sampling   
is not based on random selection.   
Probability sampling consists of   
**random sampling, stratified sampling,  
 systematic   
sampling and cluster sampling**  
. Non-probability sampling consists of   
**quota sampling, purposive sampling  
 and   
convenience sampling**  
. In cluster sampling, the unit of sampling does not refer to an individual entity but a   
group of entities.   
 Internet Resources   
Easton, V. J. & McColl, J. H. (2007) Statistics Glossary: Sampling [Electronic   
Version ]http://www.stats.gla.ac.uk/steps/glossary/sampling.html   
Galloway,  
 A. (1997). Sampling: A Workbook [Electronic version] http://  
www.tardis.ed.ac.uk/~kate/qmcweb/scont.htm   
Trochim,  
 W. K. (2007).   
Research method tutorials  
 [Electronic version] http://  
www.socialresearchmethods.net/kb/sampling.php  
Non-probability sampling  
Sampling  
Probability sampling  
Sampling design  
Purposive sampling  
Sampling population  
Random sampling  
Sampling statistics