Unit 5

Planning and Designing the Research Project

Overview

In Unit 4 we discussed the main elements of the research process with specific focus on the literature review and methodology. We also discussed ethical considerations for planning a research project. Now that we know what needs to be done, we need to get started on planning our research project. Research design is used to structure the research, to show how all of the major parts of the research project, that is, the sample, variables and measures, treatment and methods of data collection work together to try to address the central research questions. It is important to note that all the elements of the research project must work together towards answering the main research questions. In Unit 5 we discuss planning and designing or structuring a research project. We need to draw on all of what we have already discussed and learned in the first four units, as the research project starts to come together.

This unit consists of four sessions as follows:

Session 5.1: Population, Sample Design and Sampling – Core Issues

Session 5.2: Probability versus Non-Probability Sampling

Session 5.3: Validity and Reliability in Social Research

Session 5.4: Relationship between Reliability and Validity

Unit Objectives

At the end of this unit you should be able to:

1. Define the terms population, sample and sample design as used in a social research project
2. Describe the relationship between the population, the sample and the sample design
3. Explain the importance of sampling in social research
4. Distinguish between probability and non probability sample designs used in social research
5. Explain the need for validity in the social research study
6. Explain the need for reliability in the social research study

Readings and Resources

Boxill, Ian, Claudia Chambers and Eleanor Wint. (1997). *Introduction to Social Research: With Implications to the Caribbean.* Barbados; Jamaica; Trinidad: Canoe Press University of the West Indies. (pg. 37-38)

Crocker, L., and Algina, J. (1986). *Introduction to Classical and Modern Test Theory.* Philadelphia: Harcourt Brace Jovanovich College Publishers:

Gregory, R.J. (1992). *Psychological Testing: History, Principles and Applications.* Boston: Allyn and Bacon.

Introduction to reliability and validity: Retrieved at: http://www.youtube.com/watch?v=1bRkzDv6AQE&feature=related

Mohammed, P. ed. (2002). *Gendered realities: Essays in Caribbean feminist thought.* Jamaica: UWI Mona Press.

Roberts, P., et al. (2006). Reliability and validity in research. *Nursing Standard*. 20, 44, 41-45.

Relationship between sample and population in research. Retrieved at: http://www.experiment-resources.com/research-population.html#ixzz278ZO6PPI

Trochim, W.M.K. (2006). Research Methods Knowledge Base. Web Center for Social Research Methods. Retrieved at: http://www.socialresearchmethods.net/kb/contents.php

Session 5.1

Population, Sample Design and Sampling – Core Issues

You have chosen your topic, reviewed the literature and decided on an aspect of that topic worthy of investigation based on what was found in the literature or, rather, what was found to be lacking. You have written your statement of the problem and research questions and/or hypotheses. Based on this you now know your independent and dependent variables, as well as your unit of analysis. It is now time to design the research.

The first thing to ask is, who will be the researched? This answer comes from the unit of analysis and speaks to your ***research population.*** The research population is generally a large collection of individuals or objects that is the main focus of a scientific query or a well-defined collection of individuals or objects known to have similar characteristics. All individuals or objects within a certain population usually have a common, binding characteristic or trait. Government officials are a well-defined group of individuals, which can be considered as a population. However, due to the large sizes of populations, researchers often cannot test every individual in the population because it is too expensive and time-consuming. This is where sampling comes in.

A ***sample*** is simply a subset of the population. The concept of sample arises from the inability of the researcher to test all the individuals in a given population. The sample must be representative of the population from which it was drawn. Sample size is also important to statistical analysis but we will return to this later on. For now, you need to know that the main function of the sample is to allow the researcher to conduct the study of individuals from the population so that the results of the study can be used to derive conclusions that will apply to the entire population. This is important when conducting research within the positivist tradition, that is, when data is collected about the subjects and that data is analyzed and predictions made. It is much like a give-and-take process. The population "gives" the sample, and then it takes conclusions from the results obtained from the sample. In the post positivist tradition of research however, a researcher may not wish to generalize. The researcher may just want to explore an issue or topic or perhaps have a deeper understanding of a topic. For example, a teacher may simply want to understand a problem in her/his classroom. In such a case the researcher/teacher is simply interested in finding an answer for his/her specific situation/context and not in applying the findings to similar classrooms and thus not to generalize.

The selection of your sample for the research problem you are investigating is very important. It is important because that sample is expected to be an accurate representation of the population you are studying. When we think of sampling we are essentially saying,

"Who are we conducting the research study on and is it representative of the wider population to which I may want to generalize my findings? Let us look at the following case:

> *My study is examining the factors contributing to dropouts among youths in Secondary Schools in Jamaica.*

In view of the above case, who would you say constitute the sample and from where would the sample be taken? That is, from which population?

According to the case above, the population would be ALL secondary schools in Jamaica. In addition you would need to identify ALL dropouts from these schools, all male and female dropouts. From this population, you would then need to draw a sample since time and resources may not permit you to investigate all secondary school dropouts across Jamaica. How do you decide on this representative sample? You could look at 2 male and 2 female dropouts in each school, or all the male and female dropouts in just one school. If so, which school? Can one secondary school really represent all the characteristics of the different secondary schools in Jamaica? These are some of the questions you would need to ask when thinking about your sample.

There are different types of sampling techniques to help you select an appropriate sample for the particular research problem you are investigating and the population that you wish to represent. In the next session we look at the two main types of sampling: probability and non probability sampling techniques. Each sampling technique has various types of sampling used to draw samples for the research project.

Learning Activity 5.1

Envisioning a politics of change within Caribbean gender relations. In: Mohammed, Patricia ed., *Gendered realities: essays in Caribbean feminist thought*

[Mohammed] Asserts that the ways in which men and women collectively relate to each other and among themselves reveal an asymmetry of power with respect to access to resources, privilege, knowledge and status. Suggests ways in which men could support the efforts of women to create change in the nature of gender relations. Connects the politics of change in gender relations to the wider programme of engendering democracy, which should be envisioned as a societal project designed to extend the benefits of full citizenship to women and non-hegemonic men. Discusses the pervasiveness of violence in the relationships between men and women, with a focus on domestic violence, public harassment, and sexual harassment in the workplace, and the need for legislation to address sexual harassment. Observes the inevitability of change in gender relations and encourages men's active involvement in the construction of new processes of social interaction.

1. In the above abstract, what is she measuring?
2. Identify the population being studied.
3. What would be the sample for the population identified?

Session 5.2

Probability Versus Non Probability Sampling

There are different types of ***sampling techniques*** to help select an appropriate sample for the particular research problem you are investigating. The most scientifically accurate strategy (that is, probability that all the characteristics of the population are represented in the sample) is to use ***random sampling***. However, since you will be working with people and not with test tubes in a lab, it is unlikely that you will be able to use this type of sampling – random sampling – also referred to as ***probability sampling***.

Probability sampling includes the following (Trochim 2006):

- Simple random sampling
- Stratified random sampling
- Systematic random
- Cluster random
- Multi-stage sampling

We will discuss three of the main probability sampling techniques above.

Simple Random Sampling

Let's assume that we are doing some research with a small service agency that wishes to assess clients' views of quality of service over the past year. First, we have to get the sampling frame organized. To accomplish this, we'll go through agency records to identify every client over the past 12 months. If we're lucky, the agency has good, accurate computerized records and can quickly produce such a list. Then, we have to actually draw the sample. Decide on the number of clients you would like to have in the final sample. For the sake of the example, let's say you want to select 100 clients to survey and that there were 1000 clients over the past 12 months. Then, the sampling fraction is $f = n/N = 100/1000 = .10$ or 10%. Now, to actually draw the sample, you have several options. You could print off the list of 1000 clients, tear then into separate strips, put the strips in a hat, mix them up real good, close your eyes and pull out the first 100.

Stratified Random Sampling

This type of sampling is also sometimes called **proportional** or **quota** random sampling and involves dividing your population into homogeneous subgroups and then taking a simple random sample in each subgroup. There are several major reasons why you might prefer stratified sampling over simple random sampling. First, it ensures that you will be able to represent not only the overall population but also key subgroups of the population, especially small minority groups. If you want to be able to talk about subgroups, this may be the only way to effectively ensure you'll be able to. If the subgroup is extremely small, you can use different sampling fractions (*f*) within the different strata to randomly over-sample the small group (although you'll then have to weight the within-group estimates using the sampling fraction whenever you want overall population estimates). When we use the same sampling fraction within strata we are conducting *proportionate* stratified random sampling. When we use different sampling fractions in the strata we call this **disproportionate** stratified random sampling. Second, stratified random sampling will generally have more statistical precision than simple random sampling. This will only be true if the strata or groups are homogeneous. If they are, we expect that the variability within-groups is lower than the variability for the population as a whole. Stratified sampling capitalizes on that fact.

Cluster Random Sampling

The problem with random sampling methods when we have to sample a population that's disbursed across a wide geographic region is that you will have to cover a lot of ground geographically in order to get to each of the units you sampled. Imagine taking a simple random sample of all the residents of New York State in order to conduct personal interviews. By the luck of the draw you will wind up with respondents who come from all over the state. Your interviewers are going to have a lot of traveling to do. It is for precisely this problem that **cluster** or **area random sampling** was invented. In cluster sampling, we follow these steps:

- divide the population into clusters (usually along geographic boundaries)
- randomly sample the clusters
- measure all units within the sampled clusters

Non-probability samples are characterized by the unavailability of ways to estimate the chance factor of each sample. They do not use techniques for randomization, nor do they assume the mean of the sampling distribution is equal to the mean of the sample. They are used when a list of the population (sampling frame) does not exist. They are convenient and inexpensive in that you do not need to have an entire list of the research population and as the researcher you have more flexibility in deciding which sample is easiest to identify and locate for the study. Their limitations, however, are that they may not be representative of the research population and thus generalizations cannot be made but this can be lessened by exercising caution and expertise and by replication of the studies.

Non-probability sampling (Boxill et al. 1997) includes the following:

1. Accidental sampling
2. Judgmental (purposive) sampling
3. Quota sampling
4. Snowball (mudball) sampling
5. Dense sampling
6. Saturation sampling

Judgmental (Purposive) Sampling

In judgmental sampling the researcher uses experts to choose samples that are representative based upon their expertise and prior knowledge. In other words, the distinguishing feature of this sampling is that the researcher uses his or her own judgment (or the judgment of experts) as to whom to select and how many, based on the aims of the research project and prior knowledge of the population and its elements.

Quota Sampling

Quota sampling is in many ways equivalent to stratified sampling. This technique involves stratifying the population and sampling each stratum proportionate to its representation in the population. For instance, suppose we wanted to do a study of race/ethnic relations in Barbados, and the census reports showed that 80 percent of the population was black, 16 percent was mixed, 3 percent was white and 1 percent was of East Indian origin. Let us say that we require a sample which reflects the proportions of each racial/ethnic group in the population. If our sample were 1,000, eight hundred would be black, 160 would be mixed, 30 would be white, and 10 would be of East Indian descent.

Quota sampling requires the researcher to be familiar with his or her population. Like other non-probability samples, quota samples suffer from interviewer bias since they allow interviewers a great deal of discretion in choosing their respondents.

Snowball sampling (Mudball Sampling)

Snowball or 'mudball' sampling is a technique used by researchers to identify and sample an elusive population. However, members of the target population should be in contact with each other formally and informally. The first stage includes interviewing a small number of persons with the required information in the target population and using them as informants to identify other potential respondents in that population. Remember the analogy to a snowball which begins small but becomes larger as it rolls downhill.

Learning Activity 5.2

1. Based on your research problem, choose one sampling technique that could be used for your study. Give 2 advantages and 2 disadvantages for each sampling technique that you chose.
2. Return to the forum to critique the work of one of your peers.
   a) Is the sample suggested by your peer a feasible one? Will your peer have the time and funds to select such a sample?
   b) Were you convinced that the sample chosen for the proposed research is the best?

Session 5.3

Validity and Reliability in Social Research

Validity has been defined as the extent to which a test measures what it claims to measure (Gregory 1992). A measure is valid if it measures what it is supposed to measure and does so cleanly, that is, without accidentally including other factors. The focus here is not necessarily on scores or items, but rather inferences made from the instrument; that is, the behavioural inferences that one can extrapolate from test scores is of immediate focus. In order to be valid, the inferences made from scores need to be "appropriate, meaningful, and useful" (Gregory 1992). These distinctions illuminate the inextricable link between validity and reliability. For example, a testing instrument can *reliably* measure something other than the supposed construct, but an unreliable measure cannot be valid (Crocker & Algina 1986; Gregory 1992). Reliability is a necessary but insufficient condition on its own for validity. In other words, a valid instrument must by definition be reliable, but a reliable instrument may not necessarily be valid.

Violations of instrument validity severely impact the function and functioning of a testing instrument. In some ways, validity inadequacies impart even more serious consequences on an instrument than its reliability counterpart. This can be substantiated in the sense that validity is a comprehensive construct that cannot be definitively measured in any one given statistic, and that this instrumental testing property is often even less understood than reliability (Crocker & Algina 1986; Gregory 1992).

Effective validity studies not only demand the integration of multiple sources of evidence, but also must continually take place over time, i.e. a measure cannot be deemed valid in a simple instance of study. Rather, multiple studies must be implemented over different samples, and the collection of validity evidence must cover specified areas (Crocker & Algina 1986; Gregory 1992). Moreover, in recent years researchers have expanded the understanding of validity to comprise more dimensionality than previously recognized.

Reliability in Social Research

Reliability has to do with the quality of measurement. In its everyday sense, reliability is the "consistency" or "repeatability" of your measures (Trochim 2006). It refers to the degree to which a measure is consistent or dependable; the degree to which it would give you the same result over and over again, assuming the conditions remain the same.

Trochim (2006) gives a detailed example of what it means to say that a measure is "repeatable" or "consistent". We'll begin by defining a measure that we'll arbitrarily label **X**. It might be a person's score on a math achievement test or a measure of severity of illness. It is the value (numerical or otherwise) that we observe in our study. Now, to see how repeatable or consistent an observation is, we can measure it twice. We'll use subscripts to indicate the first and second observation of the same measure. If we assume that what we're measuring doesn't change between the time of our first and second observation, we can begin to understand how we get at reliability. While we observe a score for what we're measuring, we usually think of that score as consisting of two parts, the 'true' score or actual level for the person on that measure, and the 'error' in measuring it.

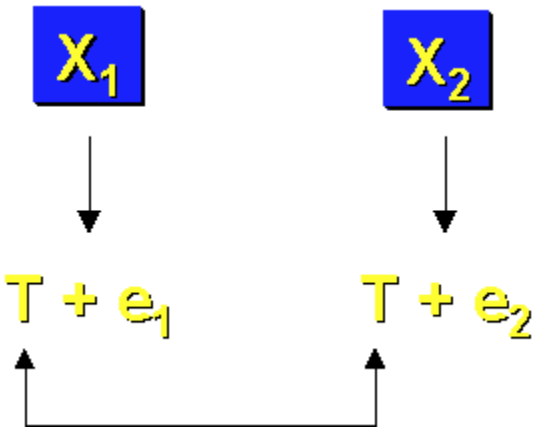

Figure 5.1
Reliability (adapted from Trochim 2006)

There are four major types of reliability; these you will become familiar with if you move to the advanced study of research methods and you get more deeply involved in research design later on. For now, however, all you need to know is what reliability is, why it is important to your research project and how to ensure that reliability and validity are maintained throughout your research project.

Session 5.4

Relationship between Reliability and Validity

Reliability and validity are not totally separate ideas but, in fact, they are related to each other. Again, Trochim (2006) provides a good metaphor and graphical depiction demonstrating the relationship between reliability and validity. He uses the example of a target. Think of the centre of the target as the concept that you are trying to measure. Imagine that for each person you are measuring, you are taking a shot at the target. If you measure the concept perfectly for a person, you are hitting the centre of the target. If you don't, you are missing the centre. The more you are off for that person, the further you are from the centre.

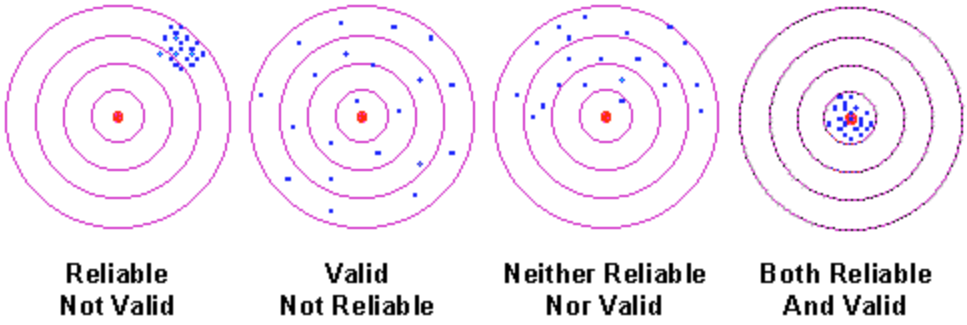

Figure 5.2
Relationship between reliability and validity (adapted from Trochim 2006)

The figure above shows four possible situations. In the first one, you are hitting the target consistently, but you are missing the centre of the target. That is, you are consistently and systematically measuring the wrong value for all respondents. This measure is reliable, but not valid (that is, it's consistent but wrong). The second shows hits that are randomly spread across the target. You seldom hit the centre of the target but, on average, you are getting the right answer for the group (but not very well for individuals). In this case, you get a valid group estimate, but you are inconsistent. Here, you can clearly see that reliability is directly related to the variability of your measure. The third scenario shows a case where your hits are spread across the target and you are consistently missing the centre. Your measure in this case is neither reliable nor valid. Finally, we see you consistently hit the centre of the target. Your measure is both reliable and valid. Reliability and validity, rather than being distinct, actually form a continuum.

Ensuring Reliability and Validity in Research

There are several tests and techniques that researchers employ to ensure reliability and validity of their research findings. Some of these include accurate operationalisation of constructs or concepts (unit 3), well trained researchers and data collectors, accurate reporting of results, a well-developed measurement instrument, for example a well-designed questionnaire and the use of more than one data collection method to validate findings. The main aim of all of these is to reduce the amount of error throughout the research process. While adhering as closely as possible to a set of procedures and techniques for reducing error, an attitude that seeks to ensure rigour in research is equally important (Roberts et al. 2006). Further, while procedures and techniques can reduce risks and errors, no research is totally error free or without some flaws. The researcher thus needs to be aware of this and acknowledge and report this as limitations in the research. In other words, while you may take all the necessary steps to ensure the highest level of reliability and validity of your research results, there is always the possibility of error at the design, measurement and analysis stages in the research process.

Learning Activity 5.3

The video below, through examples, discusses reliability and validity in research.

Introduction to reliability and validity:

http://www.youtube.com/watch?v=1bRkzDv6AQE&feature=related

Spend some time watching this video; afterwards, discuss with your peers several things that the researcher can do throughout the research process to ensure reliability and validity of research results.

Unit Summary

This unit has discussed issues involved in planning and designing the research project/study. Research design involves the research plan based on the topic, problem statement and research questions of the study. All of these things determine the type of design. Solid research starts with a solid plan and design. A good researcher must therefore examine all of the elements of the research process ensuring that each part supports the other.

References

Boxill, I., Chambers, C., and and Wint E. (1997). *Introduction to Social Research: With Implications to the Caribbean*. Barbados; Jamaica; Trinidad: Canoe Press University of the West Indies. (pg. 37-38)

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