6 Finding a Variable's and Concept's Measurements

Chapter Summary

The focus of this chapter is measurement. The logic of measurement is something we take for granted: we do not question the validity of these measuring systems and instruments. In deciding how variables should be measured, the researcher is faced with three major issues that require careful consideration. First, what is it that varies in the variable? Second, by what instrument are we going to measure the way(s) the variable varies? And third, what units will be used to report our measurements of this variation? So how do we know whether variables have or have not changed? We measure variables in different situations, such as at two points in time. The process involves four main steps: define concepts, select variables, devise measuring instruments, and devise units of measurement.

To measure a variable, we need both a **measuring instrument** and **units of measure** in which to report variation in measures taken of the variable. In the social and behavioural sciences, researchers do not enjoy the same level of agreement about the nature of common variables, and they have not reached general agreement on how common variables ought to be measured. Given the confusion that can occur as a result of having so many choices, researchers need to clarify variable measures carefully. The practice of adopting measures for variables strengthens several areas of the research process. It focuses the data collection; streamlines and makes efficient the data collection process; allows for disciplined and consistent observation of variables in different situations; and creates a context in which data analysis and findings can be expressed clearly.

Once a measure for a variable has been identified, data collection for the measure can be organized and conducted. In alignment with previous chapters, there are different approaches to measurement from a quantitative and qualitative perspective. There are three basic data collection techniques that researchers use for measuring variables: observation, interviewing, and examining records and documents (**content analysis**). These three basic techniques can be used either quantitatively or qualitatively. A scientific observation is guided by a research question and systematically measured and recorded in ways that make the phenomenon being studied countable (the chapter details both a qualitative and quantitative example of observations). In an **interview**, **survey**, or a **questionnaire**, researchers measure variables by gathering answers to questions (again, either qualitative or quantitative). Sometimes an **attitude scale** (for example, a **Likert scale**) can be used to measure variations in an attitude. The construction of a questionnaire to measure opinions, values, attitudes, and beliefs is much more complex than simply asking questions of fact. The third common data-gathering technique is to measure varia-

bles by using the information kept in records or official reports of organizations, government agencies, or persons. Content analysis can be either qualitative or quantitative and is a different way to examine the records. It is similar to an observation study, where the thing being analyzed is the content itself. The content is usually produced or created for another purpose besides research (e.g., television shows, advertisements, newspapers, etc.).

In discussing the measurement of variables, we must pay close attention to validity and reliability. **Validity** speaks to how well our measurement/variable represents the concept we are trying to measure. Ask yourself the question "Are we measuring what we think we are measuring?" **Reliability** speaks to how accurately the measure measures. Ask yourself the question "If I was to measure the same thing twice with my measurement, would I get the same results?"

It is very important to develop valid and reliable measures. For quantitative research, this involves developing systematic data-recording forms and data summarization forms. For qualitative research, variable measurement comes after the data have been collected and is part of the analytical process.

Key Terms

Attitude scale An attitude scale is a device to measure variations in an attitude. Its values range between two points, and all respondents can be placed on that scale according to their responses to the questionnaire. (p. 106)

Categorical variable A level of measurement. At the nominal level, it is a type of factor that has many different categories, but the categories are equivalent to one another. In other words, the different categories of the concept can be considered the same value. For instance, men are not higher in value than women; they are simply a different category. (p. 98)

Content analysis A type of data collection that involves the examination of various forms of communication—usually in written form. Researchers access the written data and prepare codes and themes as they review and re-review the material to come up with a better understanding of a phenomenon. (p. 113)

Interview A research design that involves asking questions of research participants. It can take several forms: structured interviews, semi-structured interviews, and unstructured interviews. Qualitative researchers prefer semi and unstructured interviews, whereas quantitative researchers always use structured interviews to collect data. (p. 92)

Interview schedule/guide A list of questions or topics that will be asked to participants in a qualitative interview. The questions need not be asked in the order in which they are listed, nor must the interview ask the questions exactly as worded. The interviewer's job is to ensure the questions are answered at some point in the interview process, but allowing participants to use their own words as much as possible. Typically used in semi-structured and unstructured interviews. (p. 100)

Likert scale A type of attitude scale. Refers to the responses appearing after a question/statement on a survey. Typically, the Likert scale has five responses: 1 – strongly disagree, 2 – disagree, 3 – neither agree or disagree, 4 – agree, and 5 – strongly agree. (p. 106)

Measurement instrument The tool that is used to collect data in your study. For surveys, the measuring instrument would be the questionnaire. For an unstructured or semi-structured interview, the measurement instrument would be the interview guide. (p. 88)

Observation An approach guided by a research question in which the researcher simply watches what happens. This approach can be either qualitative or quantitative. A way of collecting data that involves close monitoring of events, individuals, or phenomena. (p. 93)

Questionnaire (survey) Also referred to as a survey. A list of questions that are answered by respondents participating in a quantitative research design. The questions may be read and responded to by the respondent on paper or on computer. The questionnaire may also be administered by an interviewer who reads the questions as worded on the survey and records the responses provided by the respondent. (p. 100)

Reliability Refers to the ability of a concept to provide the same results after repeated measurements. Consistent measurements—those that provide similar results with similar populations—are said to be reliable measures of a concept. For example, researchers are able to identify sufferers of post-traumatic stress disorders in repeated surveys, which means the questions asked are reliable. (p. 118)

Scale A series of questions on a survey that have been designed and tested to provide valid and reliable measurements of a particular concept. Scales measuring varied concepts such as post-traumatic stress disorder, consumer habits, anxiety, and other issues are commonly used and may require permission from the original authors before they are used in your study. Scales provide a reliable measurement of these concepts and allow you to compare the results of your survey to others who have used the scale. (p. 106)

Unit of analysis The object of study. Social science research typically studies the individual. Sometimes, however, the unit of analysis might be a larger group such as a family, business, or organization. Awareness of the unit of analysis is significant in both qualitative and quantitative research. (p. 114)

Unit of measure The format of the data collected by a survey takes. A unit of measure would be kilograms if we were collecting data on a person's weight. Hours would be the unit of measurement if we were asking someone about how many hours they studied for their research methods test. If the question were about the temperature, Celsius would be the unit of measure. (p. 88)

Validity Refers to whether or not the variable accurately represents or measures the concept of interest. There are many different forms of validity including face validity, construct validity, external validity, internal validity, criterion-related validity, and content validity. (p. 118)

Study Questions

Scroll down for answers.

1. What is the logical order of issues that a researcher must overcome when finding a variable's measurements?

2. What are some examples for how the following variables might be measured: social class, ethnicity, and academic performance?

3. You want to observe illegal driver behaviour on your city's streets. What is the research objective in its operationalized form? Specify the concept, the variable, how the variable would be measured, and the unit of measurement.

4. What are five rules for the construction of a scale?

5. How does variable measurement differ between quantitative and qualitative approaches to research?

6. What are the six steps in the checklist for research involving observation in quantitative research?

7. What are the steps for preparing a quantitative content analysis of television?

8. What is the purpose of a data summarization sheet?

9. What is the difference between an interview guide and a questionnaire?

10. Is validity a concern for qualitative researchers? Why or why not?

Video Resource

No Film School (2018), *The Bechdel Test: Everything you need to Know*
https://www.youtube.com/watch?v=Meq3CyuKOjM

"The Bechdel Test" is an example of an observation guide that helps viewers (and researchers!) assess the gender representations in film. The test asks viewers to watch films to see whether they have at least:

- two female characters
- who talk *to each other*
- about something other than a man

This video explains the Bechdel Test in just over five minutes.

Answers to Study Questions

1. A researcher must overcome issues when finding a variable's measurements in the following order:
   - Define the concepts.
   - Select the variables.
   - Devise instruments for measuring the variables (e.g., a questionnaire/survey).
   - Devise the variable's units of measurement. (p. 88)

2. Social class, ethnicity, and academic performance can be measured in the following ways:
   - Social class: level of education (number of years), type of occupation (type of job), income (annual income in dollars)
   - Ethnicity: identification by ethnic group
   - Academic performance: final grades received in university courses (pp. 89–90)

3. Your list should look like this:
   - Operationalized research objective: traffic light infringements at one city intersection over a four-week period
   - Concept: illegal driver behaviour
   - Variable: traffic light infringements
   - Measurement of variable: number of drivers who drive through the intersection when the light is red
   - Unit of measurement: traffic light infringements (pp. 93–95)

4. The five rules for the construction of a scale are as follows:
   - Scales should have about 20 to 50 items (student projects should have no more than 15 items).
   - Each item should clearly state just one issue.
   - Each item must relate to a single theme.
   - The range of responses must be in one dimension and provide responses across the whole range of responses.
   - The more specific the response categories, the more accurate and precise the information will be. (pp. 108–109)

5. For quantitative research, variable measurement involves developing systematic data-recording forms and data summarization forms. For qualitative research, variable measurement comes after the data have been collected and is part of the analytical process. (p. 121)

6. A checklist for research involving observation in quantitative research:
   - Have you clarified and narrowed your hypothesis or research objective? What are the key concepts?
   - What variables are to be studied?
   - How is each variable measured?
   - Have you devised an observation checklist or some other means of systematically recording your observations?

- Have you practised using your checklist?
- In what units will the results be reported? (p. 100)

7. The steps for preparing a quantitative content analysis of television:
   - Clarify and narrow your hypothesis or research objective. What are the concepts involved?
   - Identify variables related to the concepts under study. This may involve watching some television programs to become familiar with what there is to be observed.
   - Devise a way to measure the variables. Develop a checklist to count how often the things you have selected to observe appear—for example, the number of advertisements featuring the elderly or the number of advertisements in which women play roles of authority.
   - Decide what programs to examine. Decide whether your unit of analysis is a time period or a specific program, or a number of advertisements over a period of time.
   - Devise a data summarization sheet.
   - Collect your data by doing the observations you propose.
   - Summarize the results on the data summarization form. (pp. 113–114)

8. A data summarization sheet or form preserves all of the data required by the study for later analysis. (p. 102)

9. An interview guide contains a list of questions, but unlike a questionnaire, the questions do not have to be asked in the order provided and new questions can be asked based on the outcome of the conversation between the researcher and the participant. (p. 100)

10. Yes, validity is a concern for qualitative researchers. Data are collected differently and the way we define and identify variables vary, but we are still concerned that the variables accurately measure the concepts we are interested in. (p. 118)