

# RESEARCH METHODS

For Business and Marketing

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## FOREWORD

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I have taught BASV 316, *Introductory Methods of Analysis*, on-line for the University of Arizona in Sierra Vista since 2010 and enjoy working with students on research methodology. I wanted a textbook that presented research in a practical way so students could use the lessons learned in their own research projects. I found an excellent book but over the years the cost of that book increased to the point that I felt like it was an unfair burden on students.

I began by looking for an acceptable “open source” book since authors make those available to students free of charge and I could modify the book to meet my own objectives. I could not find any that were focused on business research though I tried for several years—and keep looking to this day. I did, though, find a few open source books about research in the social and psychological sciences that were reasonably close to what I needed. So, I modified those books to emphasize business research and then provided my work to students free of charge.

Bhattacharjee[2], Blackstone[3], and Price[11] all released books about research that formed the major sources for this book. Those books are all open source and published under a Creative Commons license that permitted me to copy and modify them.

Three goals shaped the choices made about the topics covered by the text and how those topics are presented.

- The topics must have relevance for business students.
- Both qualitative and quantitative research methods are given roughly equal attention since both types of research are used in business.
- The text is engaging and readable.

While the book is useful in its current form, I will continually update it based on emerging trends in research.

This book is published under a Creative Commons **Attribution-NonCommercial-ShareAlike** license, just like the books that provided its foundation. The source is available at my GitHub account: <http://bit.ly/2xIjzXL>. It is my hope that students can use this book to learn about business research and other instructors can modify and use it for their own classes.

— George Self



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## Part I

### BACKGROUND

Research methods are grounded in philosophy, statistics, sociology, and many other disciplines. The chapters in this section introduce these background concepts.



## Part II

### QUANTITATIVE METHODS

Quantitative methods are based in the measurement of concepts and the statistical analysis of those measures. Quantitative methods include activities like sampling, surveys, and experimental research.



## SURVEY RESEARCH

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How do retailers know what sorts of products their customers are likely to purchase? They use surveys to ask questions. Unfortunately, creating an unbiased survey that asks the right questions is a much more complex task than it may seem. This chapter introduces the art and science of survey design, from types of surveys, writing questions, and analyzing the results.



### 1.1 INTRODUCTION

Survey research is a method involving the use of standardized questionnaires or interviews to collect data about people and their preferences, thoughts, and behaviors in a systematic manner. Although census surveys were conducted as early as Ancient Egypt, survey as a formal research method was pioneered in the 1930-40s by sociologist Paul Lazarsfeld to examine the effects of the radio on political opinion formation of the United States. This method has since become a very popular method for quantitative research in business and social sciences. Because most students have completed many surveys, they often underestimate the skill and effort needed to create a valid survey. The process is time-consuming and tedious and requires many revisions.

The survey method is best suited for studies that have individual people as the unit of analysis. Although other units of analysis, such as groups, organizations or dyads (pairs of organizations, such as buyers and sellers), are also studied using surveys, such studies often use a specific person from each unit as a “key informant” or a “proxy” for that unit, and such surveys may be subject to respondent bias if the informant chosen does not have adequate knowledge or has a biased opinion about the phenomenon of interest. For instance, Chief Executive Officers may not adequately know employee’s perceptions or teamwork in their own companies, and may therefore be the wrong informant for studies of team dynamics or employee self-esteem.

Survey research has several inherent strengths compared to other research methods.

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Photo by Joshua Rawson-Harris on Unsplash

1. Surveys are an excellent vehicle for measuring a wide variety of unobservable data, such as people's preferences (e.g., political orientation), traits (e.g., self-esteem), attitudes (e.g., toward immigrants), beliefs (e.g., about a new law), behaviors (e.g., smoking or drinking behavior), or factual information (e.g., income).
2. Survey research is also ideally suited for remotely collecting data about a population that is too large to observe directly. A large area, such as an entire country, can be covered using mail-in, electronic mail, or telephone surveys using meticulous sampling to ensure that the population is adequately represented in a small sample.
3. Due to their unobtrusive nature and the ability to respond at one's convenience, questionnaire surveys are preferred by some respondents.
4. Surveys are more easily generalized than other research techniques since data can be collected from very large samples at a relatively low cost.
5. Because surveys are standardized in that the same questions, phrased in exactly the same way, are posed to all participants they are more reliable than other methods of gathering data.
6. Interviews may be the only way of reaching certain population groups such as the homeless or illegal immigrants for which there is no sampling frame available.
7. Large sample surveys may allow detection of small effects even while analyzing multiple variables, and depending on the survey design, may also allow comparative analysis of population subgroups (i.e., within-group and between-group analysis).
8. Survey research is economical in terms of researcher time, effort and cost than most other methods such as experimental research and case research.

At the same time, survey research also has some disadvantages.

1. It is subject to a large number of biases such as non-response bias, sampling bias, social desirability bias, and recall bias.
2. While surveys are flexible in the sense that any number of questions on any number of topics may be asked, the researcher is also stuck with that instrument even if it is later shown to contain confusing items.
3. Survey questions must be written such that a broad range of people will understand each of them. Because of this, survey results may suffer from validity concerns not found in methods that are more flexible.

## 1.2 TYPES OF SURVEYS

There is much variety when it comes to surveys. This variety comes both in terms of time, when or how frequently a survey is administered, and in terms of administration, how a survey is delivered to respondents. This section develops both types of concepts.

### 1.2.1 *Time*

In terms of time, there are two main types of surveys: cross-sectional and longitudinal.

#### 1.2.1.1 *Cross-Sectional*

Cross-sectional surveys are those that are administered at just one point in time. These surveys offer researchers a snapshot in time and provides an idea about how things are at the particular point in time. These surveys are call “cross-sectional” since they will take a snapshot across multiple analytical units. For example, a survey may be administered to staff members in the human resources department of five different companies or customers of several different movie theaters on the same evening.

An example of a cross-sectional survey is a study of e-cigarette use among adolescents conducted by Dutra and Glantz[6]. They used a cross-sectional survey of more than 40,000 students from more than 200 middle and high schools across the United States. They determined that the use of e-cigarettes was “...associated with higher odds of ever or current cigarette smoking...”

Another example of a cross-sectional survey, Jørgensen, et. al.[8], investigated if workplace health promotions depend on the work environment. They surveyed 10,605 Danish workers and determined that lower participation in health promotions is dependent on when they are offered (during or afterwork), the social support at work for the programs, and whether their work has high physical demands.

One problem with cross-sectional surveys is that the events, opinions, behaviors, and other phenomena that such surveys are designed to assess are generally not stagnant. Thus, generalizing from a cross-sectional survey about the way things are can be tricky. Perhaps something can be concluded about the way things *were* in the moment that the survey was administered, but it is difficult to know whether things remained that way afterwards. For example, imagine how Americans might have responded to a survey about terrorism on September 10, 2001, compared to September 12, 2001. The point is not that cross-sectional surveys are useless, but researchers must remember that these surveys are a snapshot in time.

### 1.2.1.2 *Longitudinal*

Longitudinal surveys are those that include observations made over some extended period of time. There are three types of longitudinal surveys: trend, panel, and cohort.

**TREND SURVEY** The first type of longitudinal survey is a trend survey. This type of study takes place over a long period of time, often years, and involves multiple surveys of many different people. As one example of a trend survey, Dobrow, Ganzach, and Liu[5] studied job satisfaction in light of employee's age and tenure. They surveyed 21,670 people in 34 "waves" of data collection spanning 40 years. They found that as tenure in an organization increased people tend to be less satisfied with their jobs, however, as people age and move from job to job their satisfaction increased.

**PANEL SURVEYS** Unlike a trend survey, a panel survey uses the same people each time it is administered. As you might imagine, panel studies can be difficult and costly. Imagine trying to administer a survey to the same 100 people every year for five years in a row. Keeping track of where people live, when they move, and when they die takes resources that researchers often do not have. Panel surveys, however, can be quite powerful.

The [Youth Development Study \(YDS\)](#)[9], administered by the University of Minnesota, is an excellent example of a panel study. Since 1988, [YDS](#) researchers have administered an annual survey to the same 1,000 people. Study participants were in ninth grade when it began and they are now in their thirties. Several hundred papers, articles, and books have been written using data from the YDS. One of the major lessons learned from this panel study is that work has a largely positive impact on young people. Contrary to popular belief about the impact of work on adolescents' performance in school and transition to adulthood, work increases confidence, enhances academic success, and prepares students for success in their future careers. This panel study provided important information about the affect of work on young people.

As an example of a panel survey for business, Huhtala, Kaptein, and Feldt conducted a two-year study concerning how the ethical culture of organizations influence the well-being of managers[7]. They found that managers in low or decreasing ethical cultures experienced changes in their well-being over the two years of the study.

**COHORT SURVEYS** In a cohort survey, a researcher identifies some category of people that are of interest and then regularly surveys the people who fall into that category. The same people do not necessarily participate from year to year, but all participants must meet whatever categorical criteria fulfill the researcher's primary interest. Common



cohorts that may be of interest to researchers include people of particular generations or those who were born around the same time period, graduating classes, people who began work in a given industry at the same time, or perhaps people who have some specific life experience in common. An example of this sort of research can be seen in Christine Percheski's work on cohort differences in women's employment[10]. Percheski compared women's employment rates across seven different generational cohorts, from Progressives born between 1906 and 1915 to Generation Xers born between 1966 and 1975. She found, among other patterns, that professional women's labor force participation had increased across all cohorts. She also found that professional women with young children from Generation X had higher labor force participation rates than similar women from previous generations, concluding that mothers do not appear to be opting out of the workforce as some journalists have speculated.

In another cohort study, Wright and Hinson surveyed public relations practitioners over a ten-year period from 2005 until 2015[14]. While some of the same practitioners would have participated over that entire span, it is reasonable to assume that at least a few of the respondents changed during that period, but they were all public relations experts in a company. They found that both Facebook and Twitter were the dominant means of public relations communication while LinkedIn and YouTube were not as popular. The survey respondents, though, agreed that social media were changing the way public relations is practiced. It would be interesting to see how the perceptions of public relations experts have changed since 2016 given the heavy reliance on Twitter in the United States by the Trump administration.

All three types of longitudinal surveys share the strength that they permit a researcher to make observations over time. This means that if whatever behavior or other phenomenon the researcher is interested in changes, either because of some world event or because people age, the researcher will be able to capture those changes. Table 1 summarizes each of the three types of longitudinal survey.

Type	Description
Trend	Researcher examines changes in trends over time; the same people do not necessarily participate in the survey more than once.
Panel	Researcher surveys the exact same sample several times over a period of time.
Cohort	Researcher identifies some category of people that are of interest and then regularly surveys people who fall into that category.

Table 1: Compare the Three Types of Longitudinal Survey

**RETROSPECTIVE SURVEYS** Retrospective surveys are similar to other longitudinal studies in that they concern changes over time, but like a cross-sectional study, they are administered only once. In a retrospective survey, participants are asked to report events from the past. By having respondents report past behaviors, beliefs, or experiences, researchers are able to gather longitudinal-like data without actually incurring the time or expense of a longitudinal survey. Of course, this benefit must be weighed against the possibility that people's recollections of their pasts may be faulty. Imagine, for example, that people are asked in a survey to respond to questions about where, how, and with whom they spent last Valentine's Day. Since Valentine's Day cannot be more than 12 months ago, chances are good that they may be able to respond accurately. But if the question is to compare last Valentine's Day with the six previous Valentine's Days the result would be much different.

### 1.2.2 Administration

Surveys vary not just in terms of when they are administered but also in terms of how they are administered. One common way to administer surveys is in the form of self-administered questionnaires. This means that research participants are given a set of questions, in writing, to which they are asked to respond. Self-administered questionnaires can be delivered in hard copy format, typically via mail, or increasingly more commonly, on-line. Both modes of delivery are considered here.

**HARD COPY SURVEY** Hard copy self-administered questionnaires may be delivered to participants in person. For example, people who are gathered in one place, like students in class, members of a church, or inmates are frequently given surveys in person. Researchers may also deliver surveys by going door-to-door and either asking people to fill them out right away or making arrangements for the researcher

to return to pick up completed surveys. Though the advent of on-line survey tools has made the door-to-door delivery of surveys nearly extinct, an occasional survey researcher may still use this method, especially around election time.

If a researcher is not able to visit each member of the sample to personally deliver a survey, sending it through the mail may be another consideration. While this mode of delivery may not be ideal (imagine how much less likely someone would be to return a survey where the researcher was not standing on the doorstep waiting), sometimes it is the only available or the most practical option.

Often survey researchers who deliver their surveys via snail mail may provide some advance notice to respondents about the survey to get people thinking about and preparing to complete it. They may also follow up with their sample a few weeks after their survey has been sent out. This can be done not only to remind those who have not yet completed the survey to please do so but also to thank those who have already returned the survey. Most survey researchers agree that this sort of follow-up is essential for improving mailed surveys' return rates[1].

**ON-LINE SURVEY** Online delivery of surveys are another approach to the administration challenge. This delivery mechanism is becoming increasingly common, no doubt because it is easy to use, relatively cheap, and may be quicker than knocking on doors or waiting for mailed surveys to be returned. To deliver a survey on-line, researchers may subscribe to a service that offers on-line delivery or use some delivery mechanism that is available for free, like *SurveyMonkey*. One advantage to using a service like *SurveyMonkey*, aside from the advantages of on-line delivery, is that results can be provided in formats that are readable by data analysis programs such as *R* and *Excel*. This saves researchers the step of having to manually enter data into an analysis program, as is necessary for hard copy surveys.

Many of the suggestions provided for improving the response rate on a hard copy questionnaire apply to on-line questionnaires as well. One difference, of course, is that the sort of incentive that can be provided in an on-line format differ from those that can be given in person or sent through the mail. Many on-line surveys only come with the incentive of knowing that the respondent is helping other people. It is possible, though, to provide some sort of coupon to a local store or *Amazon*. Commonly, on-line surveys provide some sort of food, like a "free drink," from the restaurant that is administering the survey. Finally, it is possible to have respondents provide some sort of contact information, like an email address, and then have a drawing for a free *Fire* tablet or some other prize. Using these sorts of rewards raises questions about the validity of the results. If people

are only participating in a survey to have a chance at a prize then are they going to simply pattern-respond (choose all “A” answers, for example) or will they take the time to thoughtfully respond?

Sometimes surveys are administered by researchers posing questions directly to respondents rather than them read the questions on their own. These types of surveys are a form of interviews, which is discussed elsewhere in this book. It is enough at this point to mention that interview methodology differs significantly from survey research in that data are collected via a personal interaction.

Whatever mechanism is selected, there are both strengths and weaknesses which must be considered. While on-line surveys may be faster and cheaper than mailed surveys, it may be that not everyone in the sample has easy access to a computer and the Internet. On the other hand, mailed surveys are more likely to reach the entire sample but also more likely to be ignored. The choice of which delivery mechanism is best depends on a number of factors including the researcher’s resources, the respondent’s resources, and the time available to distribute surveys and wait for responses.

### 1.3 DESIGNING EFFECTIVE QUESTIONNAIRES

Invented by Sir Francis Galton, a questionnaire is a research instrument consisting of a set of items intended to capture responses from respondents in a standardized format. Items may be either structured or unstructured. Structured items ask respondents to select an answer from a set of choices. The responses are then aggregated into a composite scale or index for statistical analysis. On the other hand, unstructured questions ask respondents to provide a response in their own words using a free-flow type of entry. Questions should be designed such that respondents are able to read, understand, and respond to them in a meaningful way so surveys would not be appropriate for certain demographic groups such as children or the illiterate.

One type of questionnaire survey is a self-administered mail survey, where the same questionnaire is mailed to a large number of people and respondents complete and return the survey at their own convenience. Mail surveys are advantageous in that they are unobtrusive and inexpensive to administer. However, response rates from mail surveys tend to be quite low since most people ignore survey requests. There may also be long delays, perhaps several months, before receiving the responses. That means that researchers must continuously monitor responses and send reminders to non-respondents. Questionnaire surveys are also not well-suited for issues that require clarification or require detailed responses. Finally, a longitudinal research design can send a survey to the same group of respondents

several times over a long period but response rates tend to fall precipitously from one period to the next.

A second type of survey is a group-administered questionnaire. A sample of respondents is brought together at a common place and time and each respondent is asked to complete the survey questionnaire while in that room. Respondents enter their responses independently without interacting with each other. This format is convenient for the researcher and high response rate is assured. Also, if respondents do not understand any specific question, they can ask for clarification. These types of surveys are most useful in an organization where it is relatively easy to assemble a group of employees in a conference room or lunch room, especially if the survey is approved by corporate executives.

A more recent type of questionnaire survey is an on-line or web survey. These surveys are administered over the Internet using interactive forms. Respondents may receive an electronic mail or text message request for participation in the survey with a link to a site where the survey may be completed. Alternatively, the survey may be embedded in an e-mail and can be completed and returned immediately. These surveys are very inexpensive to administer, results are instantly recorded in an on-line database, and the survey can be easily modified if needed. However, if the survey website is not password-protected or designed to prevent multiple submissions, the responses can be easily compromised. Furthermore, sampling bias may be a significant issue since the survey cannot reach people that do not have computer or Internet access, such as many of the poor, senior, and minority groups; moreover, the respondent sample will be skewed toward a younger demographic who are on-line much of the time and have the time and ability to complete such surveys. Computing the response rate may be problematic, if the survey link is posted in Facebook, Twitter, or other social media sites instead of being e-mailed directly to targeted respondents.

### 1.3.1 *Effective Questions*

The first thing needed to write effective survey questions is identifying what, exactly, is being sought. Though it seems obvious, missing important questions when designing a survey is far too common. Suppose researchers want to understand how students make a successful transition from high school to college and what factors contribute to that success. To understand those factors, the researchers will need to include questions about all of the possible factors that could contribute to success. They would consult the literature on the topic, but should also take the time for brainstorming and talking with other researchers (and even high school students) about what may be important in the transition to college. It may not be possible to include

every single factor on a survey since that may make the survey pages long, but some thought would generate a list of the most important factors.

While it is important to include questions on all topics that are important to the research question, an “everything-but-the-kitchen-sink” approach is counterproductive since it puts an unnecessary burden on the survey respondents. Remember that respondents have agreed to volunteer their time and attention so they deserve respect in only asking on-topic questions.

Once the question topics are identified the questions need to be drafted. Questions should be as clear and to the point as possible. This is not the time for researchers to show off their creative writing skills; a survey is a technical instrument and should be written in a way that is as direct and succinct as possible. As much as possible, every question on the survey should be relevant to every person who is asked to respond. This means two things: first, that respondents have knowledge about the topic and second, they have experience with the events, behaviors, or feelings being probed. For example, a sample of 18-year-old respondents should not be asked how they would have advised President Clinton concerning his impeachment. For one thing, few 18-year-olds are likely to have any clue about how to advise a president; moreover, today’s 18-year-olds were not even alive during Clinton’s impeachment, so they would have had no experience with the event. In the example of successful college transition, respondents must understand the phrase “transition to college” and have actually experienced that transition themselves.

If a survey includes items that only a portion of respondents will have had experience it should include a “filter question.” A filter question is designed to identify some subset of survey respondents who are asked additional questions that are not relevant to the entire sample. Using the successful college transition survey mentioned above, if alcohol abuse is determined to be relevant to college success it would not be appropriate to ask “How often did you drink alcohol during your first semester in college?” That presupposes alcohol use and many students may abstain altogether. It would be better to include a statement like “If you drank alcohol during your first semester of college please answer questions 13 and 14, otherwise skip to question 15.”

Responses obtained in survey research are very sensitive to the types of questions asked. Poorly framed or ambiguous questions will likely result in meaningless responses with very little value. Dillman[4] recommends several rules for creating good survey questions.

- Is the question clear and understandable: Survey questions should be stated in a very simple language, preferably in active voice, and without complicated words or jargon that may not be understood by a typical respondent. All questions in the question-

naire should be worded in a similar manner to make it easy for respondents to read and understand them. The only exception is if your survey is targeted at a specialized group of respondents, such as doctors, lawyers and researchers, who use such jargon in their everyday environment.

- Is the question worded in a negative manner: Negatively worded questions, such as “should your local government not raise taxes,” tend to confuse respondents and lead to inaccurate responses. Such questions should be avoided. More importantly, in all cases double-negatives must be avoided.
- Is the question ambiguous: Survey questions should not include words or expressions that may be interpreted differently by different respondents (e.g., words like “any” or “justice”). For instance, if survey includes a question like, “what is your annual income,” it is unclear whether it is referring to only wages or also dividend, rental, and other income. Different interpretation by different respondents will lead to incomparable responses that cannot be interpreted correctly.
- Does the question have biased or value-laden words: Bias refers to any property of a question that encourages subjects to answer in a certain way. Biased language or tone tends to skew observed responses. It is often difficult to anticipate in advance the biasing wording, but to the greatest extent possible, survey questions should be carefully scrutinized to avoid biased language.
- Is the question double-barreled: Double-barreled questions are those that can have multiple answers. For example, a question like “Are you satisfied with the hardware and software provided for your work?” may confuse respondents who may be satisfied with the hardware but not the software. It is always best to separate double-barreled questions into separate questions.
- Is the question too general: Sometimes, questions that are too general may not accurately convey respondents’ perceptions. If a survey question asked “How big is your firm,” which could be interpreted differently by respondents, ask more specific questions like “how many people does the firm employ,” or “what is the firm’s annual revenue.”
- Is the question too detailed: Avoid unnecessarily detailed questions that serve no specific research purpose. For instance, does the research project require the ages for each child in a household or is just the number of children enough? Conversely, it is usually better to gather too many details than not enough.

- Is the question presumptuous: If a survey asks “what are the benefits of a tax cut,” there is a presumption that the respondent sees the tax cut as beneficial. Many people, though, may not view tax cuts as being beneficial since that generally leads to decreased funding for public services. Questions with built-in presumptions should be avoided on a survey.
- Is the question imaginary: A popular question in many television game shows is “if you win a million dollars on this show, how will you spend it?” Most respondents have never been faced with such an amount of money and have never thought about it so their answers tend to be random and trite, such as take a tour around the world. Imaginary questions have imaginary answers, and those cannot be used for valid inferences.
- Do respondents have the information needed to correctly answer the question: Often times, the assumption is that subjects have the necessary information to answer a question when, in reality, they do not. Even if a response is obtained the responses tend to be inaccurate. For instance, the CEO of a company should not be asked about the day-to-day operational details of their company since they do not work at that level.
- Is there a socially desirable response: respondents usually try to answer questions in a way that will match social norms. For example, if a group of students were asked if they cheat on exams they would likely not admit to that behavior since cheating is not socially acceptable.

### 1.3.2 *Response Options*

While posing clear and understandable questions is important, so, too, is providing respondents with unambiguous response options. This assumes that the questions are closed-ended, that is, respondents are only permitted to select from a group of options. This puts a burden on the researcher to provide respondents an effective set of response options. Researchers should keep the following in mind when writing responses.

- Response options should be mutually exclusive. If a survey asks the respondents to indicate an age group and the selections are “less than 20,” “20 – 30,” “30 – 40,” “40 – 50,” “above 50” then which should a 30-year-old person select since that age is in two groups? This is one of those points about question construction that seems fairly obvious but is easily overlooked.
- Response options should be exhaustive. Every possible response should be covered in the set of response options that you provide. For example, if a survey asks the respondents to indicate



sex then “male” and “female” would not be enough since there are other potential responses. At the very least, surveys should include options like “do not care to respond” or “none are correct” for questions that may include controversial information.

Of course, surveys need not be limited to closed-ended questions. Researchers can include open-ended questions, which do not include response options, as a way to gather additional details. An open-ended question asks respondents to reply to the question in their own way, using their own words. These questions are generally used to find out more about a survey participant’s experiences or feelings about whatever they are being asked to report in the survey. If, for example, a survey includes closed-ended questions asking respondents to report on their involvement in extracurricular activities during college, an open-ended question could ask respondents why they participated in those activities or what they gained from their participation. Allowing respondents to reply in their own words can make the experience of completing the survey more satisfying and often reveals new information that had not occurred to the researcher.

Two opposite respondent behaviors that should be considered by researchers are fence-sitting and floating. Fence-sitting is when a respondent tends to select a “no opinion” option rather than take a stance while floating is when a respondent tends to select an opinion when, in fact, they may have none. These behaviors are especially evident when Likert questions are asked. Consider the two possible response selections for a poll question asking about a fictitious “Proposition 100.”

Do you agree with this statement: If Proposition 100 is passed my taxes will increase?

1. Strongly disagree – disagree – neither agree nor disagree – agree – strongly agree
2. Strongly disagree – disagree – agree – strongly agree

The first set of responses permit a respondent to “fence-sit” and select a neutral opinion while the second set force the respondent to indicate some level of agreement. Either of these response sets could be viable depending on the goal of the research project. For questions that probe socially undesirable behavior (like cheating on exams) it may be appropriate to give respondents the option to remain neutral while in other cases the researcher may want to force respondents to take a stance.

A matrix, which lists a set of questions that use the same response categories, creates a compact presentation that is easy to understand and encourages participation. Following is an example matrix for an imaginary set of election propositions.

Do you support these propositions?				
Prop	Strongly Support	Support	Do Not Support	Strongly Do Not Support
100	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
115	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
220	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Responses to closed-ended questions are captured using one of the following response formats.

- Dichotomous response, where respondents are asked to select one of two possible choices, such as true/false, yes/no, or agree/disagree. An example of such a question is: Do you think that the death penalty is justified under some circumstances: yes / no.
- Nominal response, where respondents are presented with more than two unordered options, such as: What is your industry of employment: manufacturing / consumer services / retail / education / health care / tourism & hospitality / other.
- Ordinal response, where respondents have more than two ordered options, such as: what is your highest level of education: high school / college degree / graduate studies.
- Interval-level response, where respondents are presented with a 5-point or 7-point Likert scale, semantic differential scale, or Guttman scale.
- Continuous response, where respondents enter a continuous (ratio-scaled) value with a meaningful zero point, such as their age or tenure in a firm. These responses generally tend to be fill-in-the blanks.

### 1.3.3 *Designing Questionnaires*

In addition to constructing quality questions and posing clear response options, it is also need to think about how to present written questions and response options to survey respondents. Questions are presented on a questionnaire, the document (either hard copy or on-line) that contains all of the survey questions and a place for responses. Designing questionnaires takes some thought and this section discusses issues in the construction of good survey questions.

One of the first things to do is to group survey questions thematically. In the college transition example discussed earlier in this chapter, perhaps a few questions would ask about study habits, others about friendships, and still others on exercise and eating habits.

Those topics would then become the themes around which the survey is organized. There are other potential arrangements. For example, perhaps it would make more sense to present questions about precollege life and habits and then present a series of questions about life after beginning college.

Once similar questions are grouped together, it is time to think about the order in which to present the groups. Most survey researchers agree that it is best to begin a survey with questions that will want to make respondents continue[4].

There is disagreement over where on a survey to place demographic questions such as those about a person's age, gender, and race. On the one hand, placing those questions at the beginning of the questionnaire may lead respondents to think the survey is boring, unimportant, and not something they want to bother completing. On the other hand, if the survey deals with sensitive or difficult topic, such as child sexual abuse or other criminal activity, respondents may be scared away by beginning with intrusive questions.

In truth, the order in which survey questions are presented is best determined by the unique characteristics of the research. Only the researcher, in consultation with people who are willing to provide feedback, can determine how best to order questions. To do so, researchers must consider the unique characteristics of the topic, questions, and, most importantly, sample. Keeping in mind the characteristics and needs of the people completing the survey should help researchers determine the most appropriate order in which to present questions.

It is also important to consider the time it will take respondents to complete the questionnaire. Surveys vary in length, from just a page or two to a dozen or more pages, which means they also vary in the time it takes for completion. The length of a survey depends on several factors. First, what is it that the researcher wishes to know? Wanting to understand how grades vary by gender and year in school certainly requires fewer questions than wanting to know how people's experiences in college are shaped by demographic characteristics, college attended, housing situation, family background, college major, friendship networks, and extracurricular activities. Keep in mind that even if a research question requires a good number of questions, researchers must keep the questionnaire as brief as possible. Any hint that a bunch of useless questions have been included just for the sake of gathering "just-in-case" data will make respondents not want to complete the survey.

Second, and perhaps more important, how long are respondents likely to be willing to spend completing the questionnaire? Asking busy people in a mall to complete a survey may make some resent the intrusion and they may not be willing to take more than a few minutes. However, people who are concerned about the survey topic,

like a survey of a political topic, may be willing to spend several minutes to complete it.

Some experts advise that surveys should take no longer than about 15 minutes to complete while others suggest that up to 20 minutes is acceptable. As with question order, there is no clear-cut, always-correct answer about questionnaire length. The unique characteristics of the study and sample should be considered in order to determine how long to make the questionnaire.

A good way to estimate the time it will take respondents to complete a questionnaire is through pretesting. Pretesting creates feedback on a questionnaire so researchers can improve it before it is administered. Pretesting can be quite expensive and time consuming if the survey is tested on a large sample of people who resemble the sample to whom it will be administered, but there is much to gain by pretesting with a small number of people to whom researchers have easy access. By pretesting a questionnaire, researchers can find out how understandable the questions are, get feedback on question wording and order, find out whether any of the questions are exceptionally boring or offensive, and learn whether there are places where they should have included filter questions. Pretests can also be timed to get an idea of the amount of time it will take respondents and whether there is “wiggle room” to add additional items.

Perhaps this goes without saying, but a questionnaire should also be attractive. A messy presentation style can confuse respondents or, at the very least, annoy them. Be brief, to the point, and as clear as possible. Avoid cramming too much into a single page, make your font size readable (at least 12 point), leave a reasonable amount of space between items, and make sure all instructions are exceptionally clear. Think about books, documents, articles, or web pages that you have read yourself—which were relatively easy to read and try to mimic those features in the survey presentation.

#### 1.3.4 *Question Sequencing*

In general, questions should flow logically from one to the next. To achieve the best response rates, questions should flow from the least sensitive to the most sensitive, from the factual and behavioral to the attitudinal, and from the more general to the more specific. Here are a few general rules for question sequencing:

- Start with easy non-threatening questions that can be easily recalled. Good options are demographics (age, gender, education level) for individual-level surveys and “firmographics” (employee count, annual revenues, industry) for firm-level surveys.
- Never start with an open ended question.

- If the survey follows an historical sequence of events, follow a chronological order from earliest to latest.
- Ask about one topic at a time. When switching topics, use a transition, such as “The next section examines your opinions about...”
- Use filter or contingency questions as needed, such as: “If you answered ‘yes’ to question 5, please proceed to Section 2. If you answered ‘no’ go to Section 3.”

#### 1.3.5 *Other Golden Rules*

To appropriate an old saying, “do unto your respondents what you would have them do unto you.” Be attentive and appreciative of respondents’ time, attention, trust, and confidentiality of personal information. Always practice the following strategies for all survey research:

- Time is valuable. Be respectful of the time it takes respondents to complete the survey. Keep the survey as short as possible and limit it to what is absolutely necessary. Respondents do not like spending more than 10 – 15 minutes on any survey, no matter how important it is. Longer surveys tend to dramatically lower response rates.
- Always assure respondents about the confidentiality of their responses, and how the data will be used (e.g., for academic research), protected, and reported (usually in the aggregate).
- For organizational surveys, assure respondents that they will receive a copy of the final results, and ensure that happens.
- Thank respondents for their participation in the study.
- Finally, always pretest the questionnaire, at least using a small convenience sample, before administering it to respondents in a field setting. Such pretesting may uncover ambiguity, lack of clarity, or biases in question wording, which should be eliminated before administering to the intended sample.

### 1.4 ANALYSIS OF SURVEY DATA

#### 1.4.1 *From Completed Questionnaires to Data*

The goal with survey data analysis is to condense large amounts of information into usable and understandable chunks.

The number of completed questionnaires received divided by the number of questionnaires distributed is called the “response rate.”

For example, if 100 people were surveyed and 75 returned completed questionnaires then the response rate is 75%. Though response rates vary, and researchers do not always agree about what makes a good response rate, response rates in the 20 – 40% range is not uncommon.

A lot of research has been done to determine how to improve survey response rate. Suggestions arising out of that research include...

- personalizing questionnaires by, for example, addressing them to specific respondents rather than to some generic recipient such as “madam” or “sir”
- enhancing the questionnaire’s credibility by providing details about the study, contact information for the researcher, and perhaps partnering with agencies likely to be respected by respondents such as universities, hospitals, or other relevant organizations
- sending out prequestionnaire notices and postquestionnaire reminders
- including some token of appreciation with mailed questionnaires even if small, such as a \$ 1 bill

The major concern with response rates is the problem of nonresponse bias. If only respondents who have strong opinions about the study topic return questionnaires then that would obviously bias the analysis. On the other hand, recent research indicates that low response rates did not make much difference in findings or in sample representativeness[13][15]. While the ideal response rate can be debated, researchers should aim for as high a response rate as possible.

Whatever the response rate, the data must be processed into manageable, and analyzable, bits. One major advantage of survey research is that the responses, especially from closed items, can be easily analyzed. For open items, researchers must first create a codebook, which is a document that outlines how the data is translated from words to numbers. As an example, Andrew Richards posited an approach to qualitative analysis in a team environment[12]. For his study, Richards eventually created a codebook to “...understand how physical education teachers navigate the sociopolitical realities of the contexts in which they work...”. Figure 1 shows an example of the codebook Richards developed for his project.

Themes	Subthemes	Definitions	Examples from Transcripts
Subject Marginalization	Lack of communication	Teacher believes physical education does not matter due to lack of communication about issues that affect the physical education environment.	"My stressful day, um probably when things pop up that are not... A lot of my stresses get raised from being an activities director. If the school calls me and says now they have to-- they have kids who are not coming, they change times, or I have a different schedule. My stuff is very organized and if it's not where I think it's supposed to be and I need it, that's very stressful for me" (1019, 210-217, individual interview)
	Lack of time and resources	Teacher believes physical education does not matter due to lack of teaching contact time and resources such as materials, equipment for PE, or teaching facilities.	"It's kind of rough because I don't have my own classroom. I don't have my own computer up there. I don't have a room that I can make into a welcoming environment so that's kind of rough" (1018, 110-112, individual interview)  "Right now that class is more just like babysitting. It's just a study hall, kind of boring. I don't have a classroom I'm in the gym balcony where the bleachers are at. I don't have space the kids complain" (1018, 120-122, focus group)
	Lack of support	Teacher believes physical education does not matter due to situations in which the physical educator does not feel support for ideas or initiatives.	"I think the colleagues, it wouldn't matter either way outside of the P.E. teachers, and I think the administration wouldn't care either way." (1018, 348-350, individual interview)  "At the elementary level that would be a big issue. As they get a little older, you know middle school, high school it's not as much probably fun. They don't see it in their eyes as much fun. The students themselves probably wouldn't care, there'd be a handful." (1019, 307-309, focus group)

Figure 1: Example Codebook

Data entry is the part of the survey where the data collected are entered into a computer for analysis. Most surveys are conducted online or using electronic devices like tablets so the data are already in digital format. It is also possible to use a data capture form that can be scanned into a computer. However, data that are collected using simple "paper and pencil" forms must be manually entered into a computer for analysis. This is a time consuming and, frankly, boring task that researchers must simply slog through in before beginning analysis.

After the data are in a digital format then there are several good tools researchers can use for analysis. Quantitative data can be analyzed with *R*, *SPSS*, or *Excel*. Of these tools, *Excel* is the one most students are familiar with but its application for research statistical analysis is somewhat limited. *SPSS* is very powerful but expensive. *R* is available as a free download, is very powerful, but has a rather steep learning curve. Qualitative data can be analyzed with tools like *NVivo*, *RQDA*, and *Coding Analysis Toolkit*. *NVivo* is very powerful but expensive. *RQDA* is an *R* package that is useful for qualitative data analysis. Since it is part of the *R* system it could be easily used in a mixed methods project where *R* is used for quantitative and *RQDA* is used for qualitative analysis. *Coding Analysis Toolkit* is a free online text analysis service.

Once the data are coded into a computer they must be analyzed. One of the simplest type of analysis is to look for patterns in the data. **Univariate** analysis is the most basic form of quantitative analysis and involves finding patterns across just one variable. For **continuous data**, analysis tools include the central measure, histograms, and box plots. For **discrete data**, analysis tools include frequency distributions and bar plots. Bivariate analysis looks for relationships between two variables and analysis tools include correlations and scatter plots.

Multivariate analysis looks for relationships between three or more variables.

Another common method of data analysis is hypothesis testing. In this case, researchers have postulated a hypothesis and then conduct research to either support or refute the hypothesis. Any of the pattern-finding tools mentioned in the previous paragraph can be used for hypothesis testing, but other more powerful tools are also available, like an Analysis of Variance (ANOVA) or Kruskal-Wallis H.

#### 1.4.2 *Biases in Survey Research*

Despite all of its strengths and advantages, survey research is often tainted with systematic biases that may invalidate some of the inferences derived from such surveys. Five such biases are the non-response bias, sampling bias, social desirability bias, recall bias, and common method bias.

**NON-RESPONSE BIAS** Survey research is generally notorious for its low response rates. A response rate of 15 – 20% is typical in a mail survey, even after two or three reminders. If the majority of the targeted respondents fail to respond to a survey, then a legitimate concern is whether non-respondents are not responding due to a systematic reason, which may raise questions about the validity of the study's results. For instance, dissatisfied customers tend to be more vocal about their experience than satisfied customers, and are therefore more likely to respond to questionnaire surveys or interview requests than satisfied customers. Hence, any respondent sample is likely to have a higher proportion of dissatisfied customers than the underlying population from which it is drawn. In this instance, not only will the results lack generalizability, but the observed outcomes may also be an artifact of the biased sample. Several strategies may be employed to improve response rates.

- **Advance notification.** A short letter sent in advance to the targeted respondents soliciting their participation in an upcoming survey can prepare them in advance and improve their propensity to respond. The letter should state the purpose and importance of the study, mode of data collection (e.g., via a phone call, a survey form in the mail, etc.), and appreciation for their cooperation. A variation of this technique may request the respondent to return a postage-paid postcard indicating whether or not they are willing to participate in the study.
- **Relevance of content.** If a survey examines issues of relevance or importance to respondents, then they are more likely to respond than to surveys that don't matter to them.



- **Respondent-friendly questionnaire** Shorter survey questionnaires tend to elicit higher response rates than longer questionnaires. Furthermore, questions that are clear, nonoffensive, and easy to respond tend to attract higher response rates.
- **Endorsement.** For organizational surveys, it helps to gain endorsement from a senior executive attesting to the importance of the study to the organization. Such endorsement can be in the form of a cover letter or a letter of introduction, which can improve the researcher's credibility in the eyes of the respondents.
- **Follow-up requests.** Multiple follow-up requests may coax some non-respondents to respond, even if their responses are late.
- **Interviewer training** Response rates for interviews can be improved with skilled interviewers trained on how to request interviews, use computerized dialing techniques to identify potential respondents, and schedule callbacks for respondents who could not be reached.
- **Incentives** Response rates, at least with certain populations, may increase with the use of incentives in the form of cash or gift cards, giveaways such as pens or stress balls, entry into a lottery, draw or contest, discount coupons, promise of contribution to charity, and so forth.
- **Non-monetary incentives** Businesses, in particular, are more prone to respond to nonmonetary incentives than financial incentives. An example of such a non-monetary incentive is a benchmarking report comparing the business's individual response against the aggregate of all responses to a survey.
- **Confidentiality and privacy.** Finally, assurances that respondents' private data or responses will not fall into the hands of any third party, may help improve response rates.

**SAMPLING BIAS** Telephone surveys conducted by calling a random sample of publicly available mobile phone numbers will systematically exclude people who do not own a mobile phone, and people who are unable to answer the phone (for instance, they are at work) when the survey is being conducted, and will include a disproportionate number of respondents who have who stay home during much of the day, such as the unemployed, the disabled, and the elderly. Likewise, on-line surveys tend to include a disproportionate number of students and younger people who are constantly on the Internet, and systematically exclude people with limited or no access to comput-

ers or the Internet, such as the poor and the elderly. Similarly, questionnaire surveys tend to exclude children and the illiterate, who are unable to read, understand, or meaningfully respond to the questionnaire. A different kind of sampling bias relate to sampling the wrong population, such as asking teachers (or parents) about academic learning of their students (or children), or asking CEOs about operational details in their company. Such biases make the respondent sample unrepresentative of the intended population and hurt generalizability claims about inferences drawn from the biased sample.

**SOCIAL DESIRABILITY BIAS** Many respondents tend to avoid negative opinions or embarrassing comments about themselves, their employers, family, or friends. With negative questions such as “do you think that your project team is dysfunctional,” the researcher may not get truthful responses. This tendency among respondents to “spin the truth” in order to portray themselves in a socially desirable manner is called the “social desirability bias,” which hurts the validity of response obtained from survey research. There is practically no way of overcoming the social desirability bias in a questionnaire survey, but in an interview setting, an astute interviewer may be able to spot inconsistent answers and ask probing questions or use personal observations to supplement respondents’ comments.

**RECALL BIAS** Responses to survey questions often depend on subjects’ motivation, memory, and ability to respond. Particularly when dealing with events that happened in the distant past, respondents may not adequately remember their own motivations or behaviors or perhaps their memory of such events may have evolved with time and no longer retrievable. For instance, if respondents are asked to describe their utilization of computer technology one year ago or even memorable childhood events like birthdays, their response may not be accurate due to difficulties with recall. One possible way of overcoming the recall bias is by anchoring respondent’s memory in specific events as they happened, rather than asking them to recall their perceptions and motivations from memory.

**COMMON METHOD BIAS** Common method bias refers to the amount of spurious covariance shared between independent and dependent variables that are measured at the same point in time, such as in a cross-sectional survey, using the same instrument, such as a questionnaire. In such cases, the phenomenon under investigation may not be adequately separated from measurement artifacts. This bias can be potentially avoided if the independent and dependent variables are measured at different points in time, using a longitudinal survey design, or if these

variables are measured using different methods, such as computerized recording of dependent variable versus questionnaire-based self-rating of independent variables.

## 1.5 SUMMARY

- whatever
- whatever



## Part III

### QUALITATIVE METHODS

Qualitative methods are based in the evaluation of non-numeric data, like photographs and text documents. These methods include activities like field work, unobtrusive, and interpretive research methods.



## Part IV

### MIXED METHODS

All quantitative and qualitative research methods have certain strengths and weaknesses. Mixed methods are an attempt to use more than one research method on a given project to utilize the strengths of each method while mitigating their weaknesses.





## Part V

### REPORTING

After a research project is completed, the investigator must report the results of the project, often in both written and oral forms. This chapter concerns the reporting process.



Part VI

APPENDIX



APPENDIX

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No appendix content yet.



## GLOSSARY

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applied research	Research that is intended to be applied to a situation rather than further the knowledge of some topic. For example, if a researcher completes a project designed to increase the sales of bottled water in a small town it would be considered applied research. <i>see</i>
basic research	Research that is intended to be further the knowledge of some topic rather than be applied to a specific situation. For example, if a researcher completes a project designed to refine some aspect of the Law of Supply and Demand it would be considered basic research. <i>see</i>
bivariate	A type of analysis involving two variables. Examples of bivariate analysis include finding a correlation and regression. <i>see</i> <a href="#">univariate</a>
concurrent validity	The degree that a measure relates to an outcome that is presumed to occur simultaneously. For example, the results of a new employee attitude test would be the same as an older test if those tests have high concurrent validity. <i>see</i> <a href="#">predictive validity</a>
construct validity	The degree to which a test measures what it claims to measure. For example, if a research project purports to investigate some aspect of local farmers' markets, does the project actually research that aspect? Construct validity is sometimes thought to be the overarching type of validity since research projects that do not address the construct of interest can have no other validity. <i>see</i> <a href="#">validity</a>

content validity	A determination of whether a measure correctly assesses the construct's content. For example, if a research project is attempting to determine the drivers for total sales in a store but only measured the price of the merchandise being sold then ignoring factors like advertising, competition, and even the general economy of the region would call into question the content validity of the study. <i>see</i> <a href="#">validity</a>
continuous data	Continuous data are a type of quantitative data that can represent any measured value, including fractions and decimals. In mathematics terms, continuous data are members of the real number system. <a href="#">23</a> , <i>see</i> <a href="#">quantitative data</a>
convergent validity	The closeness that two measures relate to, "converge on," a single construct. For example, if a research project measures the amount of sales of carbonated drinks, fruit juices, and bottled water in a store it would be expected that those would converge on a construct of "drink sales." <i>see</i> <a href="#">discriminant validity</a>
criterion validity	The degree to which a measure is related to an outcome. <i>see</i> <a href="#">validity</a>
dependent variable	Dependent variables are the outcomes for an observation. For example, if a medical researcher conducts an experiment where a drug is administered and then the patient's blood pressure is measured, the blood pressure reading is the dependent variable; that is, the blood pressure depends on the drug being administered. <i>see</i> <a href="#">independent variable</a>
descriptive research	Research that is designed to describe observed phenomena. The goal is to improve understanding rather than explore new ideas. <i>see</i> <a href="#">exploratory research</a>
discrete data	Discrete data are a type of quantitative data that can be counted with integers. In mathematics terms, discrete data are integers, though negative values are rather rare. <a href="#">23</a> , <i>see</i> <a href="#">quantitative data</a>



discriminant validity	The degree that a measure does not measure, “discriminates between,” one of two competing constructs. For example, a measure of the sale of toiletries in a department store would not be related to the construct of “drink sales.” <i>see</i> <a href="#">convergent validity</a>
explanatory research	Research that is designed to explain an observed phenomena or process. <i>see</i> <a href="#">exploratory research</a>
external validity	The degree to which a research project’s results can be applied outside the context of the study. For example, if the results of a research project that studied manufacturing firms in the mid-west could be applied to firms in the south then that study would have high external validity. <i>see</i> <a href="#">validity</a>
face validity	A determination of whether an indicator is a reasonable measure of an underlying construct “on its face.” For example, is the amount of money spent on live theater tickets a measure social class? <i>see</i> <a href="#">validity</a>
independent variable	Independent variables are those that create an observed effect. For example, if a farmer conducts an experiment where different types of fertilizer are applied to two fields in order to see which is more effective then the type of fertilizer is the independent variable; that is, the type of fertilizer is the variable that is creating the observed effect. <i>see</i> <a href="#">dependent variable</a>
internal validity	The degree to which a research project avoids confounding multiple variables within the study. A project with high internal validity facilitates selecting one explanation over an alternate since the number of confounding variables are controlled. <i>see</i> <a href="#">validity</a>

interval data	Interval data are a type of quantitative data that are measured along a scale where each point is an equal distance from the next. It is possible to compare the distance between two points on an interval scale; for example, the difference between 90 and 100 degrees is the same as the difference between 40 and 50 degrees. However, since an interval scale does not have a zero point, stating 100 degrees is twice as hot as 50 is not possible. <i>see</i> <a href="#">quantitative data</a>
nominal data	Nominal data are a type of qualitative data that are grouped but with no order implied in the grouping. As an example, the gender of survey respondents is nominal data. <i>see</i> <a href="#">qualitative data</a>
nonparametric	Nonparametric data are data that do not conform to a distribution, are skewed, or are qualitative in nature. Statistical tests that work with nonparametric data are generally less powerful and predictive than tests that work with parametric data. <i>see</i> <a href="#">nonparametric</a>
ordinal data	Ordinal data are a type of qualitative data that are grouped where the groupings have an implied order. As an example, the “satisfaction” rating on a customer survey typically permits respondents to choose from several levels where one level is somehow better than another. <i>see</i> <a href="#">qualitative data</a>
paradigm	A pattern or model of how things work in the world. <i>see</i> <a href="#">theory</a>
parametric	Parametric data are data that conform to a distribution, usually a normal distribution. Statistical tests that work with parametric data are generally much more powerful and predictive than tests that work with nonparametric data. <i>see</i> <a href="#">nonparametric</a>

positivist	A researcher who uses positivist techniques on research projects. <i>see</i> <a href="#">positivism</a>
predictive validity	The degree to which a measure predicts an outcome. For example, does increasing beer sales (a measure) predict increasing potato chip sales? <i>see</i> <a href="#">concurrent validity</a>
qualitative data	Qualitative data approximates or describes attributes that cannot be directly measured, like employee morale, customer relationships, and management effectiveness. Typically, qualitative data attempt to answer questions like “why” and “how come.” <i>see</i> <a href="#">quantitative data</a>
qualitative research	Qualitative research typically intends to explore observed phenomena with a goal of developing hypotheses and dive deep into a problem. Qualitative data collection involves semi-structured activities like focus groups and ethnographies. <i>see</i> <a href="#">quantitative research</a>
quantitative data	Quantitative data are numeric measurements of attributes, like the number of employees, the median value of housing, and total revenue. Quantitative data are gathered and analyzed using statistical methods. <i>see</i> <a href="#">qualitative data</a>
quantitative research	Quantitative research typically uses numerical data and statistical analysis to find patterns and generalize results to a large population. Quantitative data collection involves structured activities like surveys, interviews, and systematic observations. <i>see</i> <a href="#">qualitative research</a>
ratio data	Ratio data are a type of quantitative data that are measured along a scale where each point is an equal distance from the next and there is a zero point. An example of ratio data is people’s heights, which is measured along a uniform scale, e.g. inches or centimeters. Because there is a true zero point, it is possible to determine that one person is twice as tall as another. <i>see</i> <a href="#">quantitative data</a>

reliability	A descriptor for the consistency of a concept's measure. It is desirable to achieve the same, or nearly same, values for each sampling. For example, if the mean age of the people in one sample is 30 while in another is 50 then this would indicate a problem with reliability of the data. <i>see</i> <a href="#">validity</a>
statistical conclusion validity	The degree to which the conclusions found in a research project are correct. Studies with high statistical conclusion validity minimize the two types of statistical errors: Type I (finding a correlation when there is none) and Type II (failing to find a correlation when one exists). <i>see</i> <a href="#">validity</a>
theory	A system of ideas that is intended to explain phenomena. Theories that are accepted by scientists have been repeatedly tested and can be used to make accurate predictions. Unlike common usage, a scientific theory is a tested, falsifiable explanation for phenomena. <i>see</i> <a href="#">paradigm</a>
translational validity	The degree to which a construct has been measured by a research project. Translational validity is divided into two types: face and content. <i>see</i> <a href="#">validity</a>
univariate	A type of analysis involving a single variable. Univariate analysis findings include the central measure, standard deviation, and frequency distributions. Graphic tools include box plots for continuous data and bar plots for discrete data. <a href="#">23</a> , <i>see</i> <a href="#">bivariate</a>
validity	A descriptor of whether a research project is measuring the variable under question. For example, if a project hypothesis is that older men tend to tip more than younger men then the validity of the study would be in question if the researcher only sampled men under the age of 40. <i>see</i> <a href="#">reliability</a>

YDS

Youth Development Study. [8](#)



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