Chapter 1

The Role of Marketing Research in Management Decision Making

	LEARNING OBJECTIVES
	1. Review the marketing concept and the marketing mix.
	2. Comprehend the marketing environment within which managers must make decisions.
	3. Examine the history of marketing research.

Question

Comment on the following statement by the owner of a restaurant in a downtown area: “I see customers every day whom I know on a first-name basis. I understand their likes and dislikes. If I put something on the menu and it doesn’t sell, I know that they didn’t like it. I also read the magazine *Modern Restaurants*, to keep up with industry trends. This is all of the marketing research that I need to do.”

Answer

- This restaurant owner may know customers by name, but the assertion about understanding their tastes may be over-confident. An item on the menu may not sell because the customers are not familiar with it. Or, it may be perceived as too expensive. There could be many reasons why a product might not sell as well as the owner wants it to. By conducting marketing research, the owner could better determine the preferences of customers and potential customers. This would save the money, effort, and time of changing the menu selection. While a national magazine can determine national trends in the restaurant business, these trends are not always completely applicable at the local level. Marketing research could help the owner become familiar with the favorite foods in the local geographic market.

Question

Marketing research has traditionally been associated with manufacturers of consumer goods. Today an increasing number of organizations, both profit and nonprofit, are using marketing research. Why do you think this trend exists? Give some examples.

Answer

Marketing research helps all organizations follow the principle of the “marketing concept.” Profit-making organizations face increasing amounts of competition from U.S. companies, as well as from global companies. Also, both profit-making and nonprofit organizations are serving an increasingly diverse clientele. Marketing research helps to identify target customers and their needs in a rapidly changing environment.

Question

What differences might you note among marketing research conducted for (a) a retailer, (b) a consumer goods manufacturer, (c) an industrial goods manufacturer, and (d) a charitable organization?

Answer

- A retailer might use marketing research to track trends in demographics, to determine effective advertising strategies, and to find products or services desired by the customer.
- A consumer goods manufacturer might use marketing research to help determine the probability of success of a new product or to keep current on its competitors' activities and success. It might also use it to ascertain the best target market for current products.
- An industrial goods manufacturer might use marketing research to project future needs of customers or to determine the level of products that will be demanded.
- A charitable organization might use marketing research to determine what services are most needed in a demographic target market and to find the most effective vehicle for delivering those services. It might also use marketing research to identify potential donors and to find the most effective way to appeal to them.

Question

Comment on the following: Ralph Moran is planning to invest $1.5 million in a new restaurant in Saint Louis. When he applied for a construction financing loan, the bank officers asked whether he had conducted any research. Ralph replied, “I checked on research and a marketing research company wanted $20,000 to do the work. I decided that with all the other expenses of opening a new business, research was a luxury that I could do without.”

Answer

- If Mr. Moran is willing to spend $1.5 million on a new restaurant without conducting marketing research, he should be prepared to lose that money. Without marketing research, he may not know his potential customers or their desires. Nor will he know if those desires or needs are currently being met by existing businesses, or at what price or quality level the customers would be willing to try a new restaurant. His advertising may be at best ineffective or at the worst offensive. For example, what if he were to advertise barbecue pork ribs in an area that is predominantly Jewish? Given all of this, $20,000 seems a small price to pay to increase the chances of success of a business with so large an investment.

Question

What is meant by “return on quality”? Why do you think that the concept evolved? Give an example.

Answer

- Return on Quality means two things. First, that the quality being delivered is the quality desired by the target market. Second, that added quality must have a positive impact on profitability. The concept may have evolved because of the large number of quality programs that were begun in the 1980’s and 1990’s which did not improve the financial position of the companies who started them. National Bank Corporation, mentioned in the text, measures every improvement in service quality in terms of added profitability.

Question

Given an example of (a) the descriptive role of marketing research, (b) the diagnostic role of marketing research, and (c) the predictive function of marketing research.

Answer

- An example of the descriptive role of marketing research is a bank or other financial institution performing research to determine the demographics of its customers.
- An example of the diagnostic role of marketing research is the bank using the demographics of customers and the demographics of the area population to determine if a certain age group needs to be targeted with promotion.
- If the bank uses the information gathered above, the predictive function of marketing research should allow it to predict the reaction of the target group to the advertising and the percentage increase in new accounts.

Question

Read case 1.1- Give Me a Coupon That I Can Use Online!

Answer the following questions:

1. How might a firm like Home Depot use this information? Would Amazon.com use the same couponing strategy as Home Depot?

2. Do you think that Home Depot might need more research before it develops a couponing strategy? If so, what does it need to know?

3. Do you think it is necessary for online retailers to conduct marketing research?

Why?

Answer

1. Home depot could use an in store application for smart phones. The smart phone would display coupons that could be used for that day to purchase this kind of products Amazon.com should have coupons appear when items are transferred to the purchase cart online

2. Yes. Home depot should analyze how many of its customers use in store coupons from their smart phones.

3. Yes. Online retailers should conduct marketing research and correlate the consumer decision process with the usage of online coupons.

Question

Read Case 1.2 -- Can Anyone be a Market Researcher?

Questions

- **Go to Google's Consumer Survey website. After clicking through how it works, and examples, do you feel competent to create an Internet survey? Why or why not?**

- **Do you think the marketing research industry should be concerned about Google Consumer Surveys? Why?**

Answer

1. The Google Consumer Survey method is easy to understand and use, because it is well designed and menu driven.

2. Yes, because Google has a methodology which possibly gives its survey method the ability to infer demographic information to its surveys without asking demographic questions.

Question

Most traditional consumer surveys conclude with a series of demographic questions such as gender, age, location, and so forth. Google Consumer Surveys don't ask these questions. Instead it infers approximate demographic and location information using the respondent's IP address and DoubleClick cookie.

The respondent's nearest city can be determined from their IP address. Income and urban density can be computed by mapping the location to census tracts and using census data to infer income and urban density. Gender and age group can be inferred from the types of pages the respondent has previously visited in the Google Display Network using the DoubleClick cookie.

Google says that is information is used to ensure each survey receives a representative sample and to enable survey researchers to see how sub-populations answered questions. Inferring this demographic data enables Consumer Surveys researchers to ask fewer questions in a survey, which in turn increases the number of consumers that respond.

Do you think this methodology is better than simply asking the demographic questions? Do you see any problems with Google's methodology?

Answer

It depends upon how good is Google's method algorithm for estimating demographics. Shorter questionnaires historically have higher response rates than longer questionnaires.

Google uses a number of factors such as IP addresses and DoubleClick cookies to map respondent location. Then Google infers demographics from based on the average demographics for a given "mapped" area. This method would be effective for a survey covering a large geographic area with few responses from any one area. However, if the survey is limited to a small geographic area, the effect of the average demographic may not be a valid representation of the respondent(s) in question.

Chapter Two

The Marketing Research Industry and Research Ethics

LEARNING OBJECTIVES

1. Appreciate the structure of the marketing research industry.
2. Comprehend the nature of corporate marketing research departments.
3. Understand the types of marketing research suppliers.
4. Examine how corporations use marketing research.
5. Review the current state of the marketing research industry.
6. Appraise ethical trends and unethical practices among marketing research suppliers, clients, and marketing research field services.

Question

- Read **Case 2.2 – Coke Juices Up a Market Test (P.44)**

1. **Were Coke's attempts to fix the market test unethical? If so, was Coke guilty of unethical behavior, or was it just the fault of some misguided employees?**

Question

2. Burger King is Coke's second largest fountain drink customer after McDonald's. The Richmond test started out very poorly, and it was clear that unless results improved, the national Frozen Coke promotion was not going to happen. Coke was worried that without the promotion it would not make its fountain sales objectives for the year. At that point, it was decided to stimulate value-meal sales in Richmond. Did the desired end (meeting sales goals) justify the actions taken? Why or why not?

Question

3. Should Coke fire those responsible, counsel them, or do nothing?

Answer

Case 2.2 – Coke Juices Up a Market Test (P.44)

1. It depends upon the purpose of the market test. If the purpose is to gather sample data as an estimate of what market sales would be for the drinks, then the test is biased and the results are tainted. If the purpose is to induce behavior so that respondents can give feedback concerning a specific product, then the inducement is appropriate. Generally, market tests are conducted to gauge market potential for a product or service, hence, Coke was “juicing” the test results.

Answer

Case 2.2 – Coke Juices Up a Market Test (P.44)

2. The problem with such inducements is that they artificially stimulate demand, thereby biasing the results with abnormal market behavior. Hence, the artificial stimulation of demand biased the results, and cannot be justified.

3. The intent to distort data that has the kind of financial implications associated with the market test would probably call for the firing of those responsible.

Question

A custom ad hoc research firm is attempting to develop a template for measuring community assessment, that it can market and administer communities in general. It decides to construct a relatively comprehensive questionnaire with the goal of determining which questions are the most important generally in a community assessment. Who would the research firm want to sample for such a study and who would provide the sample frame?

Answer

There are a number of possible answers here. One possible suggestion would be finding a sampling firm that would provide a national sample of respondents. Probably doing the survey online would be the most efficient approach, and utilizing a research panel from a sampling firm that would guarantee a certain number of usable responses for a reasonable price per usable response.

Question

Where are the majority of the large global marketing research firms based?

a. Japan

b. Canada

c. France

d. Germany

e. United States

Answer

- E

Question

In survey research, it is especially important to protect respondents'________.

a. responses
b. integrity
c. professionalism
d. anonymity
e. none of these

Answer

- Ans: D

Question

The idea that a person performs the act that benefits the most people, regardless of personal feelings or the societal constraints such as laws is most closely related to which ethical theory?

- Act utilitarianism
- Rule utilitarianism
- Casuist
- Act deontology
- Rule deontology

Answer

- Ans: A

Question

The major ethical theories discussed in the chapter include all of the following except:

- Existentialism
- Utilitarianism
- Deontology
- Casuist

Answer

- Ans: A

Chapter Three

Problem Definition, Exploratory Research, and the Research Process

	LEARNING OBJECTIVES
	1. Analyze the problem definition process.
	2. Learn the steps involved in the marketing research process.
	3. Understand the components of the research request.
	4. Appreciate the importance of the marketing research proposal.
	5. Examine what motivates decision makers to use marketing research information.

Question

Critique the following methodologies and suggest more appropriate alternatives:

a. A supermarket is interested in determining its image. Cashiers drop a short questionnaire into the grocery bag of each customer prior to bagging the groceries.

Answer

- This method has the advantage of potentially reaching all customers. However, the customer might not find the questionnaire in the bottom of the grocery bag. The customer also might not know how or when to return it if (s)he did find it.
- A better alternative might be to hand each customer a questionnaire as he or she enters the store, provide a specific location to return it, and provide a coupon or other reward for completing the survey.
- The store might also want to consider whether it is interested only in what customers think, or whether a better method might be to determine the opinions of the general population surrounding the store.

Question

b. To assess the extent of its trade area, a shopping mall stations interviewers in the parking lot every Monday and Friday evening. After people park their cars, interviewers walk up to them and ask them for their Zip codes.

Answer

One problem identified with this method is interviewing customers only on Monday and Friday evenings. How many different customers might be missed? Many people take shopping trips on weekends, particularly on Saturdays.

Also, many customers would be frightened, and then offended by being approached in the parking lot, particularly in the evening. This might also put the interviewers in danger. A better solution might be to station interviewers at the major entrances to the mall at different days and times throughout the week.

Question

c. To assess the potential for new horror movies starring alien robots, a major studio invites people to call a 900 number and vote yes if they would like to see such movies or no if they would not. Each caller was billed a $2 charge.

Answer

Your sample will probably not be representative of the target market. Only those with extreme feelings would call to answer this question. Many people would have an opinion, but will not be willing to pay $2 to voice it.

A better alternative might be to film short sequences that would be typical of the films in question, and then invite a random sample of people to view the film clip in a theater or a private room in a shopping mall. Those viewers could then be interviewed regarding their opinions.

Question

- **Read REAL-LIFE RESEARCH**
- **Case 3.1- Let's Go Out to Eat**

1. **Would you say that this was an exploratory study? If not, what are the research questions?**
2. **Is this research causal or descriptive? Why?**
3. **Explain how the Olive Garden might use this information; McDonald's**.

Answer

1. This is not an exploratory study. The research questions are how to up sell customers in a restaurant and how to provide exceptional service to increase sales.

2. This is a descriptive study. It describes the experiences of customers and contact personnel in a restaurant environment.

Answer

3. Olive garden can have servers suggest higher priced menu items to customers as well as appetizers, desserts and mixed drinks. Mc Donald’s can use this information to train their drive up window personnel to cross sell hamburgers and French fries.

Question

_____________ is preliminary research conducted to increase the understanding of a concept, to clarify the exact nature of the problem to be solved, or to identify important variables to be studied.

A. Pilot study

B. Experience survey

C. Case analysis

D. Exploratory research

E. Situation analysis

Answer

- Ans: D

Question

- A/An _________________ is a survey using a limited number of respondents and often employing less rigorous sampling techniques than are employed in large quantitative studies.
- a. pilot study
- b. experience survey
- c. case analysis
- d. situation analysis
- e. none of these
-
- Ans: A

Question

A/An _________________ is a survey using a limited number of respondents and often employing less rigorous sampling techniques than are employed in large quantitative studies.

a. pilot study

b. experience survey

c. case analysis

d. situation analysis

e. none of these

Answer

- Ans: A

Question

What does the *iceberg principle* refer to?

A. Most data analysis techniques tend to be outdated.

B. Research objectives are not often clearly defined.

C. Symptoms are often mistaken for problems in business.

D. none of these

Answer

- Ans: B

Question

“We believe that raising the price of membership of our country club will make it more desirable, and will increase our membership base” is an example of a(n) _______.

A. objective

B. management problem

C. hypothesis

D. marketing research problem

E. none of these

Answer

- Ans: C

Question

To test the effectiveness of changes in an advertising campaign, a marketing research firm decides to implement certain changes in Atlanta, other changes in Dallas, and no change to the ad campaign in Denver. With regard to the products in question, the purchasing propensities in the three cities are equal. What type of research design is the marketing research firm invoking?

A.exploratory study design

B.observational study design

C.descriptive study design

D.causal study design

E.all of these

Answer

- Ans: D

Question

The researcher cannot compute the statistical reliability of this type of sample.

A.probability sample

B.experimental sample

C.nonprobability sample

D.observational sample

E.all of these

Answer

- Ans: C

Question

In analyzing the effects of shelf placement on sales, shelf placement of the product is the ________.

a. independent variable

b. dependent variable

c. spurious variable

d. temporal variable

e. none of these

Answer

- Ans: A

Question

In depth discussions, usually consisting of 8-12 participants, led by a moderator and generally limited to one particular concept, idea or them are:

a. Study groups

b. Accuracy groups

c. Focus groups

d. Case groups

Answer

- Ans: C

Question

- A firm is experiencing a 15% sales decline over the past year. The firm contracts with a marketing research firm to survey its customers to determine why sales are declining. Suggest how the principals in the marketing research firm should respond to their client’s demands.

Answer

- The researchers should explain that declining sales are not the problem, and that an exploratory research effort preceding a survey will be necessary to clarify exactly what the problem might be. After the exploratory effort, clear research objectives can be established, and a more formal process can proceed.

Question

Describe the (3) three types of basic methods of research. Which ones would be used for descriptive research or causal research? Why?

Answer

- Ans: Surveys, Observations, and Experiments, the textbook lists multiple characteristics of each type. Surveys and observations are usually used for descriptive research, and experiments and sometimes surveys are used for causal.

Chapter Four Q and A

Secondary Data and Big Data Analytics

LEARNING OBJECTIVES

1. Understand the advantages and disadvantages of secondary data.
2. Comprehend data mining and behavioral targeting.
3. Learn the advantages of big data analytics, how to make it actionable, and the importance of data visualization.

Question

- **Why has big data analytics become so popular with firms like United Airlines, American Express, and Ford Motor Company?**

Answer

- All major firms collect data related to customer shopping, transactions, and customer service feedback. Big Data analytics uses statistical and other mathematical software tools to discover non-obvious patterns of preference and behavior that might be hidden in these databases. The objective of this analysis is to identify information that marketers can use to formulate strategies and tactics to increase the firm’s profitability.

Question

It has been said that big data analytics turns the scientific method on its head. What does this mean?

Answer

- Traditionally, marketing research has started with problem recognition, well defined problems and methods of collecting data in which the market researcher has a lot of control over. The data is put neatly into rows and columns in a statistical database, and the market researcher can analyze those relationships defined by the research study objectives. With big data analytics, however, the process is more discovery oriented. The software can analyze data patterns in the database and utilize data in a form in which was not possible with traditional statistical analysis. Hence, the traditional steps of the scientific method are not followed as they once were.

Question

- **Why are secondary data often preferred to primary data?**

Answer

- Secondary data are already collected, so access should be much faster. Secondary data should be less costly to obtain than primary data. In some cases, as when investigating historical events, secondary data is all that is possible to obtain.

Question

- **Read**
  - **REAL-LIFE RESEARCH 4.1 The Interesting and Curious World of Nate Silver**

- **Q: Will be data analytics put marketing researchers out of business? Why? More precisely, will mathematical algorithms replace marketing researchers?**

Answer

- The ability to make output usable for more managers, those without extensive training in statistical analysis will not terminate traditional marketing research. There will always be a need for people who understand the basic concepts of marketing research, and be able to translate broad management problems into more precise marketing research problems. Big Data is just a tool. There still has to be somebody with knowledge of what the tool is doing to facilitate the interpretation of the output.

Chapter Five Q and A

Qualitative Research

LEARNING OBJECTIVES

1. Define qualitative research and understand its popularity.
2. Learn about focus groups, how to conduct them, and their advantages and disadvantages.
3. Compare other forms of qualitative research with focus groups.
4. Appreciate the future of qualitative research.

Question

- **What are the major differences between quantitative and qualitative research?**

Answer

- Qualitative research is performed using small samples. Its findings are not subject to quantification or quantitative analysis, but are subjectively evaluated. The questions used are probing and require much information from the respondent. Quantitative research is performed using large sample sizes. Its findings are analyzed using statistical methods. Fewer special skills are required to administer quantitative research, and respondents are asked questions that probe on a limited basis.

Question

- **What are some of the possible disadvantages of using focus groups?**

Answer

- The immediacy and apparent understandability of focus groups may be misleading. They may be composed of a small sample that is not representative of the population of interest. The type of person recruited may not be a typical customer. The setting may make participants uncomfortable, or the style of the moderator may bias the discussion. Some participants may try to dominate the discussions, which would lead to results that were not representative of the entire group.

Question

Read Case 5.1 – McDonald's Listening Tour

1. Is the listening tour really qualitative research? Why or why not?

2. After the findings are presented to management, should quantitative research be done?

Question

3. Couldn't McDonald's just have done focus groups instead?

4. Besides focus groups, what qualitative techniques might McDonald's used?

Answer

1. A listening tour infers that the type of information secured is of a qualitative nature. The responses are free-flowing and open-ended, hence, qualitative research.

2. It depends upon the kind of results management gets. If management thinks a quantitative study is need to validate the qualitative results, then it might do one. However, if the preponderance of evidence about McDonald's is from a broad audience and well defined, a quantitative study may not be necessary.

Answer

3. Focus groups might limit the types or top of mind responses, given McDonald's appeal is to a very diverse audience.

4. Answers can vary, but a cartoon drawing could ask the respondent to "draw a picture of a typical McDonald's customer, both adult and child. Story Completion could ask respondents to finish the sentence: the health of McDonald's patrons who go there at least twice a week is?

Question

Which of the following academic backgrounds would a qualitative researcher most likely have?

a)Math

b)Natural sciences

c)Psychology

d)Computer sciences

e)None of these backgrounds are qualified for qualitative research.

Answer

- Ans: C

Question

The most common type of qualitative marketing research is ________.

a)projective techniques

b)cartoon test

c)sentence completion

d)focus groups

e)none of these

Answer

Ans: D

Question

Which of the following is *not* an example of a projective test?

a. word association

b. sentence completion

c. cartoon test

d. photo sorts

e. All of these are examples of projective tests.

Answer

- Ans: E

Question

32. A word association test is_______________.

a. Drawing a comparison between two items in terms of their similarities.

b. Drawing a comparison between a product and a person.

c. A test in which respondents complete sentences or stories in their own words.

d. A test in which the interviewer says a word and the respondent must mention the first thing that comes to mind.

Answer

- Ans: D

Question

- Distinguish between quantitative and qualitative research, especially with respect to the appropriateness of each.
-

Answer

- Ans: Exhibit 5.1 in the textbook distinguishes between qualitative and quantitative research with qualitative research being more appropriate in the exploratory stages of a project when insights and not quantification is needed. Later, if the project is descriptive in nature, and the goal is to get a representative response, quantitative research is more appropriate.

Chapter Six

Traditional Survey Research

LEARNING OBJECTIVES

1. Understand the reasons for the popularity of survey research.
2. Learn about the types of errors in survey research.
3. Distinguish the types of surveys.
4. Gain insight into the factors that determine the choice of particular survey methods.

Question

- **The owner of a hardware store in Eureka, California, is interested in determining the demographic characteristics of people who shop at his store versus those of people who shop at competing stores. He also wants to know what his image is relative to the competition. He would like to have the information within three weeks and is working on a limited budget. Which survey method would you recommend? Why?**

Answer

- A telephone survey is fast and has a relative low cost. This seems to fit the needs of the client. The sample frame used for the survey could be focused on telephone exchanges in the area surrounding Eureka.

Question

- **Discuss the statement: “A mall intercept interview is representative only of people who shop in that particular mall. Therefore, only surveys that relate to shopping patterns of consumers within that mall should be conducted in a mall intercept interview.”**

Answer

- If all of the persons shopping at a mall were very similar, this statement would be true.
- However, shopping malls are located in urban areas in densely populated regions. One needs only to visit a mall to see that persons from a wide range of demographics shop there.
- If the people who shop at the mall are representative of the population of the surrounding area of the city, or even of the nation, then a random sample of the shoppers would be representative of that population. The findings would be able to be generalized.

Question

- **Discuss the various sources of sample design errors and give examples of each.**

Answer

- The first type of sampling error is random error. This error occurs because of chance variation in the sample. To reduce the influence of random error, a larger sample should be employed. The larger the sample, other things being equal, the more it represents the population from which it came. For example, perhaps you interviewed fifty people in a population of 50,000 on the merits of building a prison and got results very contrary to what you expected. This could be due to chance, because the sample was so small. Given a larger sample, the results may be more closely aligned with expectations.

Answer (cont'd)

- The second type of sampling error is systematic error which includes three types of biases.
  - The first is frame error, which results because of using an incomplete or inaccurate sampling frame. An example of this is choosing your respondents from a phone book and missing all those with unlisted numbers, people who have moved, and people with new listings.
  - The second type of bias is population specification error. This error is a result of not carefully defining the population of interest from which a sample is drawn. For example, if you were interested in the attitudes of consumers who had purchased a particular brand of tooth paste, yet specified the population as people who shop at a particular grocery store, then your sample may not match your population of interest.
  - The third type of bias is selection error which occurs as a result of not choosing a particular respondent for some reason outside of the research project. For example, an interviewer using the mall intercept method typically leaves out the elderly, because he or she doesn't want to talk to older people.

Question

What types of error might be associated with the following situations?

a. Conducting a survey about attitudes toward city government using the telephone directory as a sample frame.

b. Interviewing respondents only between 8:00 a.m. and 5:00 p.m. on features they would like to see in a new condominium development.

c. Asking people if they have visited the public library in the past two months.

d. Asking people how many tubes of toothpaste they used in the past year.

e. Telling interviewers they can probe using any particular example they wish to make up.

Answer

a) Sample frame error.
b) Sample selection error.
c) Response bias.
d) Response bias.
e) Interviewer error.

Question

When survey respondents deliberately falsify their income this is known as which type of bias?

a)interviewer bias

b)nonresponse bias

c)measurement instrument bias

d)response bias

e)selection bias

Answer

- Ans: D

Question

Which of the following is currently the least popular type of data collection?

a)Internet surveys

b)mall-intercept interviews

c)door-to-door interviews

d)telephone surveys

Answer

Ans: C

Question

The Bureau of the Census reported that a more accurate estimate of the total population in the U.S. could be accomplished by a carefully selected sample, rather than with a census. What broad classification of errors is the researcher indirectly alluding to?

a)random error

b)selection error

c)measurement error

d)frame error

e)none of these

Answer

Ans: C

Question

Why is it important to consider measurement error in survey research?

Answer

Ans: Measurement error occurs when there is a variation between the information being sought and the information obtained by the measurement process. Measurement error is very important in survey research because if the questions being asked, or the way in which they are being asked, are not consistent and accurate, then the data received are of far less value.

Chapter Seven Q and A

Online Marketing Research

LEARNING OBJECTIVES

1. Examine the online world as it applies to marketing research.
2. Use the Internet to gather secondary data for marketing research.
3. Understand the nature of online focus groups, online individual depth interviews, and marketing research online communities.
4. Appreciate online survey research and ways to conduct it.
5. Learn the importance of online panel management in maintaining data quality.
6. Appraise the growing use of surveys on smart devices and the importance of social media marketing research.

Question

- **Explain the relationship between blogs, MROC's and marketing research**

Answer

- Blogs are a source of information that can be tracked chronologically. First, the information can be used as sources of secondary data. Second, the process can be studied as a form of observational research. For example, word-of-mouth research can be studied by following how quickly information provided by a blog disseminates into the public. However, blogs place no controls over content. There is no guarantee that the information in a blog will be of any value. MROC's are invited blogs. The dialogue is ongoing and more "on topic." Respondents are invited based on qualifying characteristics. There would be much less "waste" in responses from an MROC where the objectives of the ongoing dialogue are known to the respondent.

Question

Discuss the advantages and disadvantages of online focus groups.

Answer

- Online focus groups are made up from databases of individuals who volunteer to participate. The databases can be screened to make up groups of individuals that meet certain criteria that are important to the research sponsor.
- Benefits are the lack of geographic barriers, greater access to individuals with special characteristics, much lower cost, faster turn-around time, and (possibly) greater candor on the part of participants.
- Criticisms of online focus groups are the lack of interaction between participants, difficulty in evaluating non-verbal responses, difficulty for the research sponsors to observe the group in action, a range of security and privacy issues, and problems with outside interference.
- As long as the researcher and the sponsor understand these limitations it is possible to get useful information from either sort of focus group.

Question

- **Explain the difference between a traditional marketing research survey and a social media community project?**

Answer

- Much social media marketing research is different from traditional survey research. Rather than a product manager asking a research team to determine X, Y, and Z, and then have the researchers conduct the survey and provide the requested feedback, social media research is more interactive, via a few questions, and observations over time. Social media, such as Facebook, Twitter, Pinterest, and LinkedIn, give opportunities to marketing researchers to better understand their customers and potential customers. By analyzing social media exchanges about a product or service, researchers can learn what factors customers use to determine value as well as the way they speak about the product, service or brand.

Question

Which of the following is not characteristic of Internet surveys?

a)online self-administered interview

b)significant interviewer bias

c)medium to high risk concerning representativeness

d)purchased list of non-profiled respondents

Answer

Ans: B

Question

Which of the following are not disadvantages of traditional online focus groups?

a)lessened group dynamics

b)lack of nonverbal inputs

c)exposure to external stimuli less efficient

d)All are disadvantages of online focus groups.

Answer

- Ans: D

Question

A marketing research online community (MROC) can help do which of the following?

a)Map the psyche of consumer segments

b)Brainstorm new ideas

c)Co-create and test new products

d)Observe natural consumer behavior

e)All of these

Answer

- Ans: E

Chapter Eight

Primary Data Collection: Observation

LEARNING OBJECTIVES

1. Develop a basic understanding of observation research.
2. Learn the approaches to observation research.
3. Understand the types of machine observation.
4. Appreciate how online tracking is changing and its growing use in social media.
5. Learn how virtual shopping environments are created and used in marketing research.

Question

- Target Stores is evaluating several locations for locating a new Super-Target Super-Center. To do this, a traffic counting machine records the number of cars passing each location every day of the week for a 3-month period. This is an example of which kind of observation situation?
- a. people watching people
- b. people watching phenomena
- c. machines watching people
- d. machines watching phenomena
- e. none of these
-

Answer

- Ans: D

Question

Observing consumers' behavior through a one way mirror is a common type of ________.

a) open observation

b) disguised observation

c)structured observation

d)unstructured observation

Answer

- Ans: B

Question

Which type of research is most closely associated with human observation?

a)qualitative

b)quantitative

c)ethnographic

d)mixed methods

Answer

- Ans: C

Question

Observational research is most effective if the observed behavior occurs ________.

a)intermittently

b)infrequently

c)rationally

d)frequently

e)none of these

Answer

- Ans: D

Question

The customer service department of a large department store recently received a complaint about a store associate. The store associate's manager has been unable to detect any problems with the associate's performance. Then the service department received another complaint concerning the same associate. Which of the following would be the best approach to investigate the situation?

a)depth interview with associate

b)mystery shoppers

c)depth interview with customers

d)close observation by the department manager

e)one-way mirror observations

Answer

- Ans: B

Question

Eye tracking devices cannot document which of the following?

a) Visibility

b)Engagement

c)Viewing patterns

d)Communication hierarchy

e)All of these can be documented

Answer

- Ans: E

Question

Tracking helps answer which of the following questions?

a)“where?”

b)“how much?”

c)“how often?”

d)all of these

e)none of these

Answer

- Ans: D

Question

- **Fisher-Price has asked you to develop a research procedure for determining which of its prototype toys is most appealing for 4- and 5-year-olds. Suggest a methodology for making this determination.**

Answer

- Put three or four children in a room with the toys. Observe them from behind a one-way mirror. Count the number of times a child goes back to a toy or the length of time the children play with each one. Since children's' attention spans can be brief, those toys which are played with for the longest period of time might be the most appealing. Also, carefully note the role of group dynamics. Children are naively egocentric. They may want a toy simply because another child wants it. If this is perceived to be a problem, the group of children may need to be narrowed to one child at a time in the playroom. Another way to deal with the "mine" problem is to have duplicates or even triplicates of the toys.

Question

- **What are the biggest drawbacks of observation research?**

Answer

- One disadvantage of observation research is that only behavior and physical characteristics can be examined. Also, only public behavior is observed. A researcher cannot determine how many products are used or why they are used that way. Observed behavior may not be projectable to the future. Just because a consumer makes a purchase or a decision today does not guarantee that he or she will do the same tomorrow. Finally, observation research can be time-consuming and costly if the observed behavior occurs rather infrequently.

Question

- **It has been said that "people buy things not for what they will do, but for what they mean." Discuss this statement in relation to observation research.**

Answer

- People often buy objects for social status, prestige, for what others think about their purchases, and what it does for their self-concept. If we assume this hypothesis to be correct, then observational research may be less useful because it produces data regarding external events rather than internal motivations. Observation research could, however, be used in an attempt to measure the effect of physiological arousal on product purchase, thereby providing a crude measure of motives via internal psychological or emotional states.

Chapter Eight

Primary Data Collection: Observation

LEARNING OBJECTIVES

1. Develop a basic understanding of observation research.
2. Learn the approaches to observation research.
3. Understand the types of machine observation.
4. Appreciate how online tracking is changing and its growing use in social media.
5. Learn how virtual shopping environments are created and used in marketing research.

Observation in Marketing Research

- Observation
  - The systematic process of recording actual behavioral patterns of people, objects, and events as they happen.
  - *The systematic process of recording patterns of occurrences or behaviors without normally communicating with the people involved.*

The Nature of Observation Research

Natural vs. Contrived:

- Is the setting made up by the researcher or are you observing a naturally occurring event?

Open vs. Disguised:

- Does the subject know the purpose of the research?

Human vs. Machine:

- Can a machine better capture data – or not?

Structured vs. Unstructured:

- Is the researcher taking detailed notes or is the researcher making more general observations?

Direct vs. Indirect –

- ***Example "Garbologist":*** Going through one's garbage – or "stuff" to analyze consumption patterns.

Natural Setting

Subjects are observed in the environment where the behavior normally takes place.

- Shopping in a store
- Using or consuming a product at home

Contrived Setting

Subjects are observed in an environment that has been specially designed for recording their behavior.

- “fake” store
- Computer simulation

THE RESEARCH SETTING: NATURAL AND CONTRIVED SETTINGS

- **Natural setting – A location or site where a behavior of interest normally occurs**
  - Researcher does not have to arrange or manipulate the setting
  - Making observations can be difficult
- **Contrived setting, or structured setting – A location or site arranged to mimic the natural setting within which a behavior of interest normally occurs**

STRUCTURE

The degree of standardization used with the data collection instrument.

Structured Observation

Method of observation in which the phenomena to be observed (typically behaviors) can be defined precisely along with the categories used to record the phenomena.

Record #: 83

☐ male ☑ female

First soup can picked up for examination:

☑ Campbell's
☐ Progresso
☐ Lipton
☐ Knorr
☐ other: ________

Total # cans picked up for examination, any brand: 3

Brand selected:
(leave blank if none selected)

☑ Campbell's
☐ Progresso
☐ Lipton
☐ Knorr
☐ other: ________

Time (in front of soup shelves): 12 seconds

Unstructured Observation

Method of observation in which the researcher has a great deal of flexibility in terms of what to note and record.

Purchaser first paused in front of the Campbell's brand. He glanced at the price on the shelf, picked up a can of Campbell's, glanced at its picture and list of ingredients, and set it back down. He then checked the label and price for Progresso. He set that back down and after a slight pause, picked up a different flavor can of Campbell's than he originally looked at, placed it in his cart, and moved down the aisle.

Disguised vs. Undisguised Observation

With **disguised observation**, subjects are not aware that they are being observed.

With **undisguised observation**, subjects are aware that they are being observed.

Why Use Observation Research?

- Observation is often the best method for generating valid data about individuals' behavior.
  - ➢Parents were asked whether the color of a new toy would matter. All said No.
  - ➢After the study , as a reward for participation, researchers offered the parents a toy to take home.
  - ➢Clamored for purple and blue toys.

Primary Advantage of Observational Research

- In the telephone survey, 96 percent of people said they always washed their hands after using a public bathroom.
- Chicago and San Francisco 89%
- Atlanta, and New York 85%
- 98 percent of women washed
- 20 percent of people using the restrooms at Pennsylvania Station and Grand Central Terminal in New York did not wash their hands

Advantages of Observation Research

- You see what people actually do - *rather than what they say they do*
- Firsthand information is less prone to biases
- The observational data can be executed quickly and relatively accurately
- Electronic collection such as scanners is more efficient than manual counts
- Clients can also observe their customers along with the researcher

Key Terms & Definitions

Disadvantages of Observation Research

- Only physical or behavior can be measured
- Can't measure attitudes, beliefs, intentions, or feelings
- Not always a good representation of the general population
- Interpretation is somewhat subjective depending on observation type
- Data analysis is generally more qualitative than quantitative
- It can be expensive and time consuming if subjects not readily available
- Data can be time sensitive making predictive analysis tricky

Ethnographic Observation Research

The study of human behavior in its natural context, involving observation of behavior and physical setting.

Advantages:

- It is reality-based; it can show exactly how consumers live with a product, not just what they say about it or how they remember using it.
- It can reveal unexpressed needs and wants; it can discover unexploited consumer benefits.
- It can reveal product problems.
- It can show how, when, where, and why people shop for brands.
- It can show who in the family actually uses a product.
- It can take advantage of consumers' experience with the category and their hands-on creativity.
- It can test new products in a real context.
- It can reveal advertising execution ideas that derive directly from consumer experience.
- It can form a better relationship with your consumers based on an intimate knowledge of their lifestyles.

Example One: Parking Interviews

Ellen Isaacs, with a team from the Palo Alto Research Center,

•Objective: how people searched for parking, and whether the signage was clear, especially when driving by during rush-hour.

•Focus on

- challenges people encountered,
- the way parking restrictions were defined,
- what worked and didn't work with the existing infrastructure,
- what could be improved to make parking better.

•The findings were used to inform the design of new parking systems.

•Her ted talk link:

•https://www.youtube.com/watch?v=nV0jY5VgymI

Machine Observation

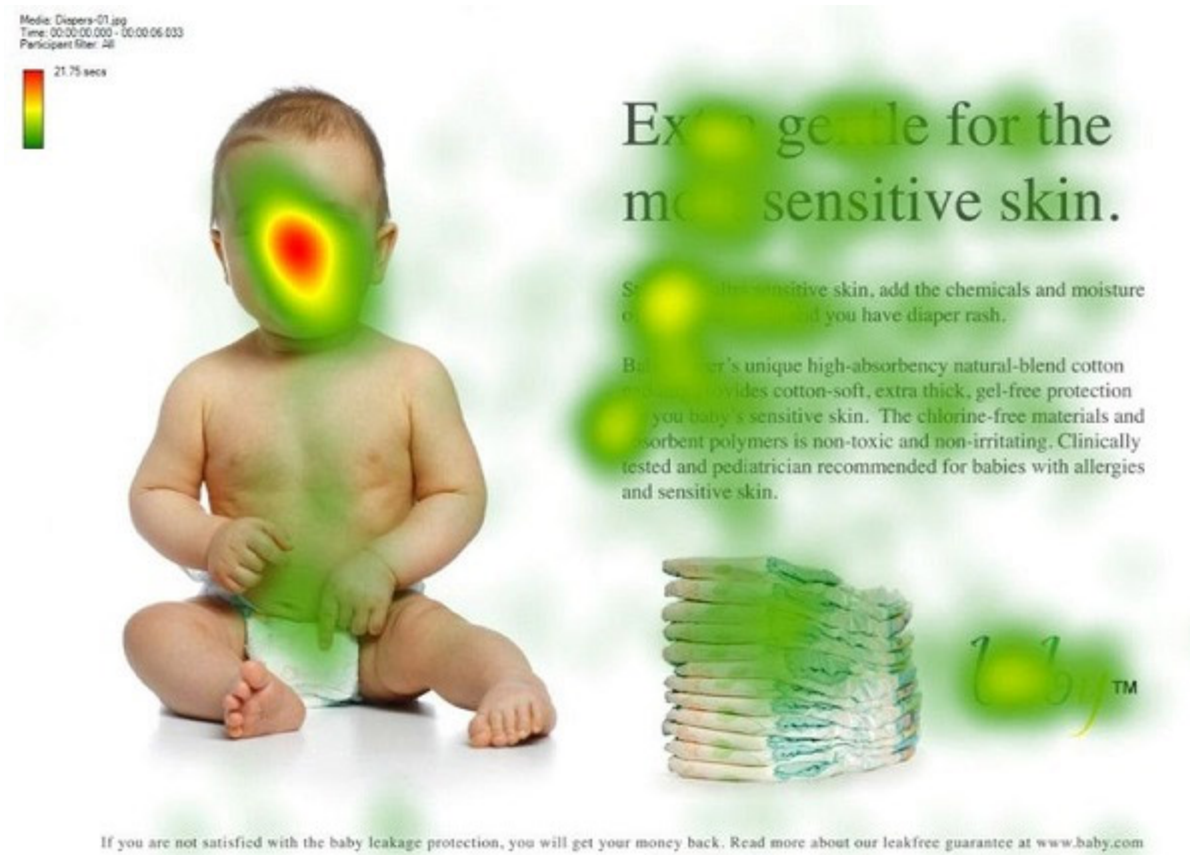
Observations made by machines rather than people.

Techniques Include:

- Neuromarketing:
    - Electroencephalograph
    - Galvanic Skin Responses
    - Eye Tracking
    - Facial Action Coding Services (FACS)
- Television Audience Measurement
- Instore Tracking
- TiVo Targeting, Cablevision Targeting
- Symphony IRI Consumer Network

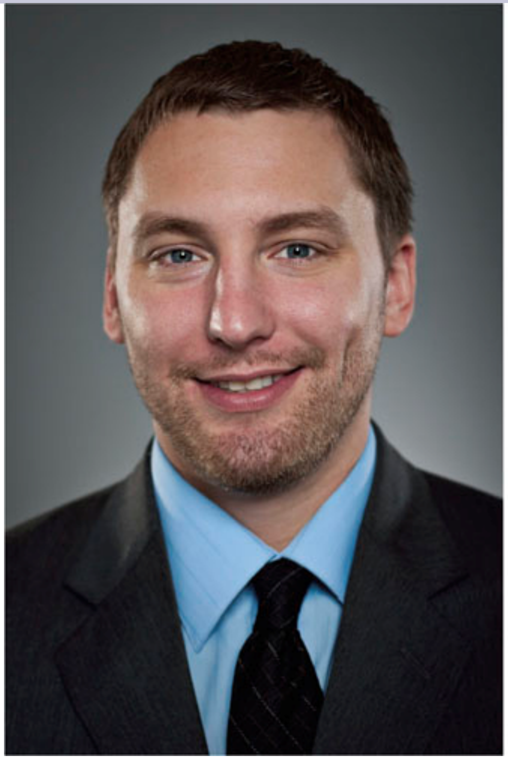
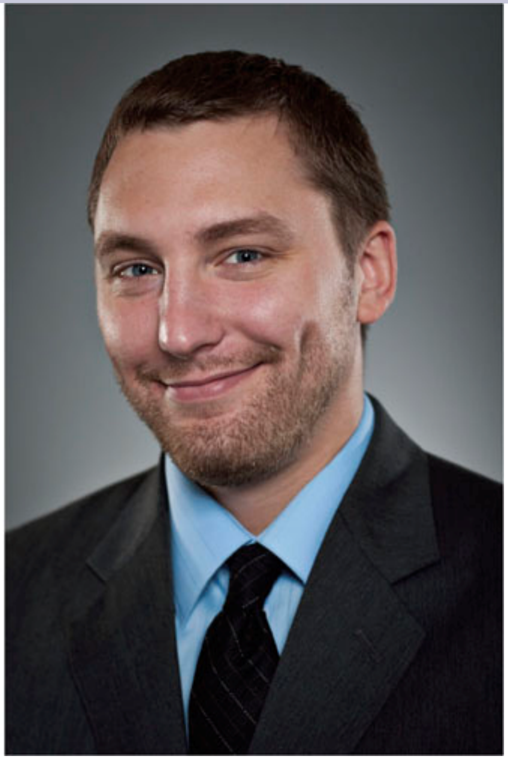
Eye Tracking

Eye Tracking



Eye Tracking

Can You Spot a Fake?

Which One Is Fake?

• Is it even clear if consumers like what you're selling? Some might tell you they like your product even if they don't. Who's really interested and who's just being polite?

• A true smile will involve the eyes as well as the mouth. Also, a true smile will curve the lips while a fake smile won't. In a fake smile, the corners of the mouth will move outward, not upward.

Virtual Shopping

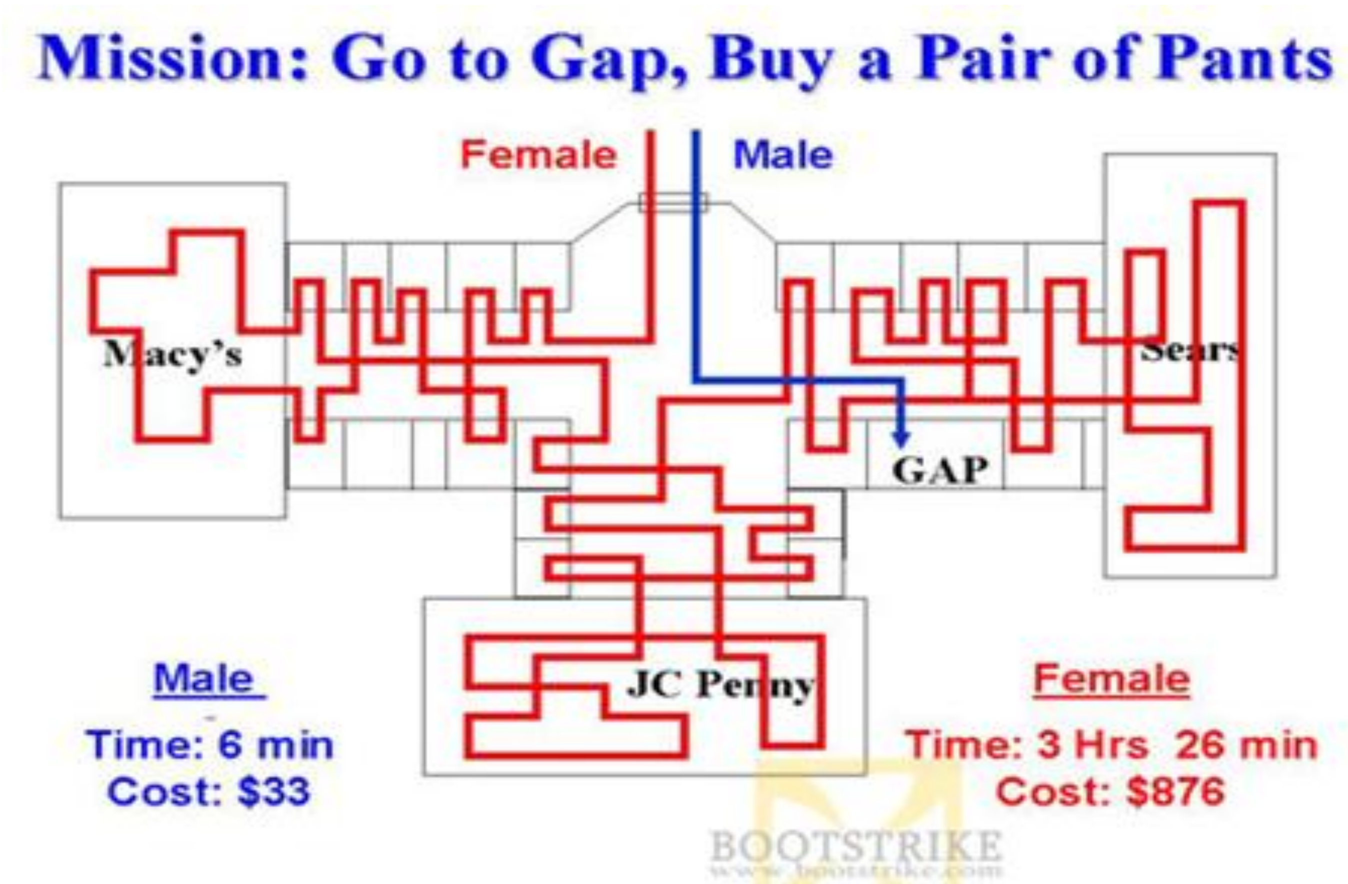
Advantages:

1. Duplicates the distracting clutter of an actual market
2. Can set up and alter the tests quickly
3. Production costs are low after set up
4. Very flexible

Read in the text how Kimberly-Clark uses virtual shopping.

https://www.youtube.com/watch?v=UNMHH0kIpPE

Man and Woman Shopping Behavior



Chapter Nine

Primary Data Collection: Experimentation and Test Markets

LEARNING OBJECTIVES

1. Understand the nature of experiments.
2. Gain insight into requirements for proving causation.
3. Learn about the experimental setting.
4. Examine experimental validity.
5. Compare types of experimental designs.
6. Understand extraneous variables
7. Analyze experimental design, treatment, and effects.
8. Examine the limitations of experimental research.
9. Evaluate selected experimental designs.
10. Gain insight into test marketing.

Three Types of Primary Data Research

Exploratory Research
(*explore*)

Descriptive Research
(*describe*)

Causal Research
(*establish cause and effect*)

Types of Exploratory Research

- Literature Search
- Depth Interviews
- Focus Groups
- Case Analyses
- Projective Methods
- Experience survey

Descriptive Research

- Has six specifications:
  - **Who**
  - **What**
  - **When**
  - **Where**
  - **Why**
  - **How**
- Surveys and Observations

Causal Research

The purpose of causal research is to test cause and effect relationships:

$$\mathbf{X} \longrightarrow \mathbf{Y}$$

condition X causes event Y

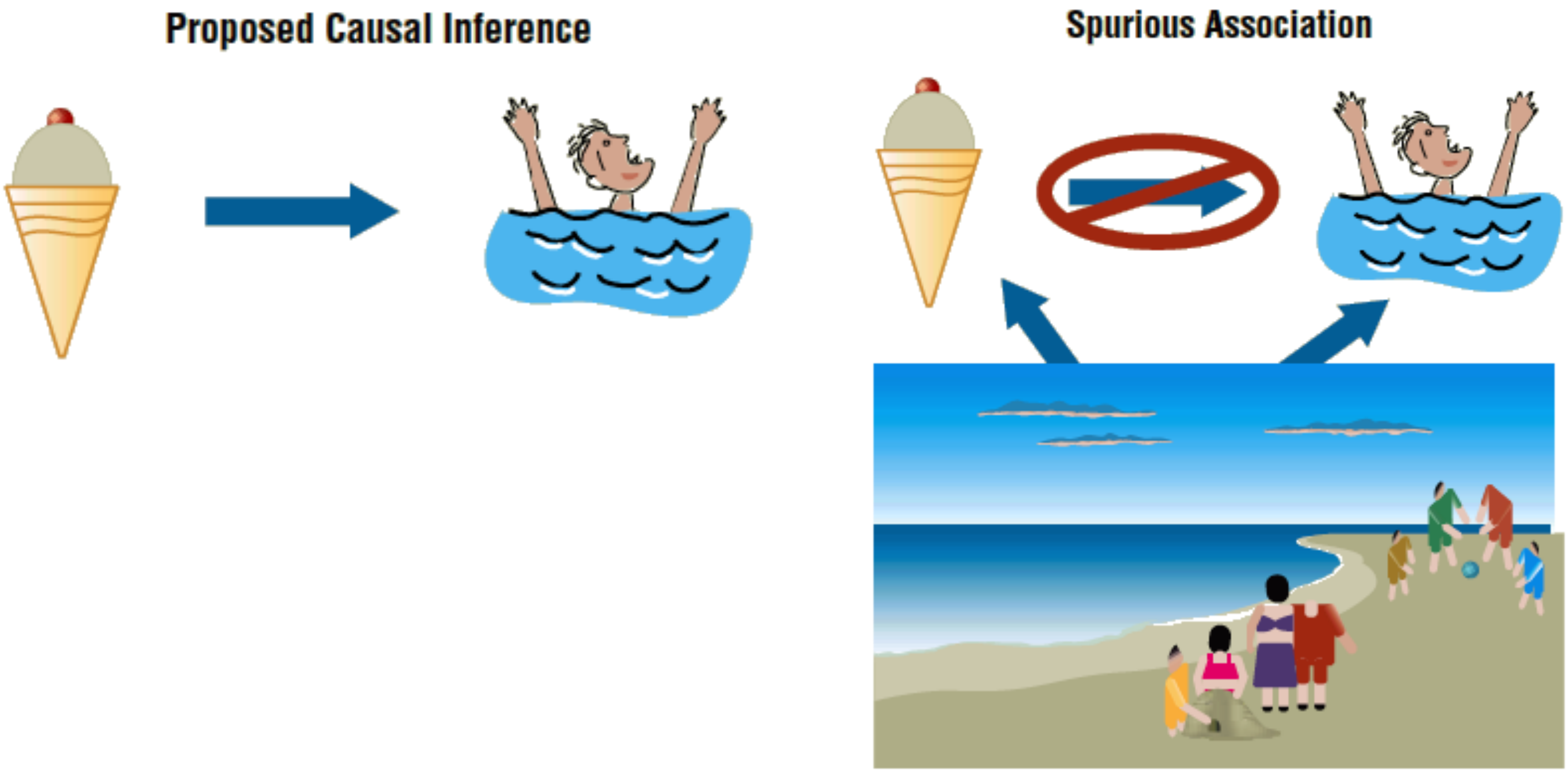
Causal Research

- Evidence of Causality
  - Time Order
    - Evidence that shows X occurs before Y
  - Consistent variation
    - Evidence of the extent to which X and Y occur together or vary together in the way predicted by the hypothesis
  - Elimination of Other Explanations
    - Evidence that allows the elimination of factors other than X as the cause of Y

Evidence of Causality

- Because we can never know for certain that we have eliminated all other possible causes of an effect, we can never state with certainty that X caused Y.

The Spurious Effect of Ice Cream



Spurious Relationship

- Shoe size and reading performance for elementary school children.
- Number of police officers and number of crimes.
- Number of doctors in region and number of people dying from disease.
- Tea drinking and lung cancer

Causal Research

- Causation is often tested through experimentation
- Experimentation includes independent (condition X) and dependent (event Y) variables
- The basic point of an experiment is to change the levels of one or more X variables and examine the resulting impact on Y variables
- At the same time, it is very important to control (i.e., hold constant) other variables that might impact Y variables

What is an Experiment?

An Experiment:

• A research approach in which one variable is manipulated and the effect on another variable is observed.

Key Variables:

•***Independent*****:** variables one controls directly such as price, packaging, distribution, product features, etc.

• ***Dependent:*** variables one does not directly control such as sales or customer satisfaction - *(might control them by manipulating the independent variable)*

• ***Treatment:*** the independent variable manipulated during and experiment to measure its effect on the dependent variable

• ***Extraneous:*** factors one does not control but has to live with, such as the weather

Experimental Setting

Laboratory:

Experiments conducted in a controlled setting.

Field:

Tests conducted in an actual environment, such as a marketplace.

Lab Experiment

Example 1

Purpose: test the web design attractiveness.

Step: present 2 different websites.

Measure the sessions of the respondents.

Example 2

Purpose: predict the movie box office revenue

Step: show movie trailers to respondents and ask them to provide response toward a purchase intention question.

Examples of True Experimental Designs

EXHIBIT 9.1 Examples of True Experimental Designs

Situation: California Tan wants to measure the sales effect of a point-of-purchase display. The firm is considering two true experimental designs.

After-Only with Control Group Design

Basic design:

Experimental Group:	(R)	$\times$	O_1
Control Group:	(R)		O_2

Sample: Random sample of stores that sell their products. Stores are randomly assigned to test and control groups. Groups can be considered equivalent.

Treatment (X): Placing the point-of-purchase display in stores in the experimental group for 1 month.

Measurements (O_1, O_2): Actual sales of company's brand during the period that the point-of-purchase displays are in test stores.

Comments:

Because of random assignment of stores to groups, the test group and control group can be considered equivalent.

Measure of the treatment effect of X is $O_1 - O_2$. If $O_1 = 125{,}000$ units and $O_2 = 113{,}000$ units, then treatment effect $= 12{,}000$ units.

Experimental Validity

Internal Validity:

The extent to which competing explanations for the experimental results observed can be ruled-out.

External Validity:

The extent to which causal relationships measured in an experiment can be generalized to outside persons, settings, and times.

Internal Validity vs. External Validity

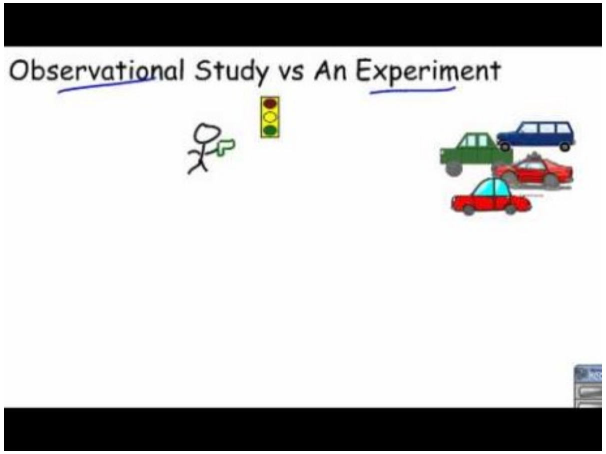
Internal Validity The degree to which an outcome can be attributed to an experimental variable and not to other factors. *Lab experiments tend to have higher levels of internal validity.*

External Validity The degree to which the results of an experiment can be generalized, or extended, to other situations. *Field experiments tend to have higher levels of external validity.*

YouTube Video

Observational Study vs Experiment

- https://www.youtube.com/watch?v=NG4lFmSO7VQ



Experimental Notation

"X" = Independent Variable:

Indicates the exposure of an individual or a group to an experimental treatment. This variable is something the researcher can change and manipulate (such as prices and new packages). It is hoped that the change in the independent variable will cause a change in the dependent variable.

"O" = Dependent Variable:

Indicates a variable the researcher cannot change directly. It is hoped that changing the independent variable will cause changes in the dependent variable (sales of the product). Thus the dependent variable is *"dependent"* on what the researcher does with the independent variable.

True Experimental Design

- Test whether imposing mandatory attendance policy would increase students' test grade
- O-Grade (dependent variable)
- X-imposing mandatory attendance after exam 1
- Control group: no mandatory attendance
- Experiment group: mandatory attendance

Experimental Design Examples

Given:

O = The Measurement of the Dependent Variable
X = The Manipulation/Change of Independent Variable
E = Experimental Effect - Change in Dependent Variable due to Change in the Independent Variable

Before and After With Control Group

$$\begin{array}{ccc} O_1 & X & O_2 \\ O_3 & & O_4 \end{array}$$

True experimental design that involves random assignment of subjects or test units to experimental and control groups and pre- and post -measurements of both groups.

Before and After With Control Group

$$O_1 \; X \; O_2$$
$$O_3 \quad\; O_4$$

True experimental design that involves random assignment of subjects or test units to experimental and control groups and pre- and post -measurements of both groups.

- Experimental group
  - O1=119, O2=127 (exam 1 and exam 2 grade)
- Control group
  - O3=120, O4=125 (exam 1 and exam 2 grade)

Effect= (O2-O1)-(O4-O3)=8-5=3.

The O4-O3 control the effect of extraneous variables.

Extraneous variables

Maturation:

Changes in subjects occurring during the experiment that are not related to the experiment but which might affect subjects' response to the treatment factor.

- E.g., Maturation- students get smarter from exam1 to exam 2 (they know how to study for the course).

Before and After With Control Group

$$O_1 \; X \; O_2$$
$$O_3 \quad\;\; O_4$$

True experimental design that involves random assignment of subjects or test units to experimental and control groups and pre- and post -measurements of both groups.

History: Intervention, between the beginning and end of an experiment, of outside variables that might change the dependent variable.

- E.g., professor might provide sample questions, which increases grade.

Mortality: Loss of test units or subjects during the course of an experiment which might result in a non-representativeness.

- E.g., Some students might drop from one group.

Note: The two threats are not controlled by the true experiment (lab experiment can control the history threat but it is hard for field experiment).

Experimental Design Examples

Given:

O_1 = Grade of experimental group
X = Attendance policy
O_2= Grade of control group

After Only With Control Group

Subjects in the experiment are randomly assigned to experiment and control groups respectively. No pre measurements of the dependent variable are taken.

Experimental Group	**X O_1**
Control Group	**O_2**

After Only With Control Group

Subjects in the experiment are randomly assigned to experiment and control groups respectively. No pre measurements of the dependent variable are taken.

Experimental Group	**X O_1**
Control Group	**O_2**

- Experimental group: O1=127 (exam 2 score)
- Control group: O2=125 (exam 2 score)

Effect=O1-O2=127-125=2

Assumption:

Randomization

Test Mortality same to each group (e.g., either no dropout or drop due to Covid).

Selected Experimental Designs

Pre-Experimental Design:

- *Designs that offer little or no control over extraneous factors.*

Two Key Design Types:

1. One-Shot Case Study
2. One-Group Pretest-Posttest

Experimental Design Examples

Given:

O = The Measurement of the Dependent Variable
X = The Manipulation/Change of Independent Variable
E = Experimental Effect - Change in Dependent Variable due to Change in the Independent Variable
Example: X-mandatory attendance policy, O- exam score

One Shot Case Study $X\ O_1$

Change the independent variable, then measure the change in the dependent variable to see if there was in fact a change in the dependent variable that the researcher might conclude resulted from the change in the independent variable.

Experimental Design Examples

Example: change x, measure the change in the O.
Problem: no pretest, no control group.

One Shot Case Study $\mathbf{X\ O_1}$

Change the independent variable, then measure the change in the dependent variable to see if there was in fact a change in the dependent variable that the researcher might conclude resulted from the change in the independent variable.

Experimental Design Examples

Given:

O = The Measurement of the Dependent Variable
X = The Manipulation/Change of Independent Variable
E = Experimental Effect - Change in Dependent Variable due to Change in the Independent Variable

One-Group Pretest-Posttest $\mathbf{O_1 X O_2}$

Same as **"One-Shot"** except measure the dependent variable before the change in the independent variables. The researcher is establishing a benchmark from which to gauge the change.

Experimental Design Examples

Problems

History threat: Observed change might be caused by other events outside the experiments.
Maturation threat: Respondents have grown older, smarter, more experienced.

One-Group Pretest-Posttest $O_1 X O_2$

Same as **"One-Shot"** except measure the dependent variable before the change in the independent variables. The researcher is establishing a benchmark from which to gauge the change.

True Experimental Design

Research using an experimental group and a control group to which test units are randomly assigned.

Two Key Design Types:

1. Before and After With Control Group
2. After Only With Control Group

Experimental Design Examples

Given:

O = The Measurement of the Dependent Variable
X = The Manipulation/Change of Independent Variable
E = Experimental Effect - Change in Dependent Variable due to Change in the Independent Variable

Before and After With Control Group

$$\begin{array}{ccc} O_1 & X & O_2 \\ O_3 & & O_4 \end{array}$$

True experimental design that involves random assignment of subjects or test units to experimental and control groups and pre- and post -measurements of both groups.

Experimental Design Examples

Given:

O = The Measurement of the Dependent Variable
X = The Manipulation/Change of Independent Variable
E = Experimental Effect - Change in Dependent Variable due to Change in the Independent Variable

After Only With Control Group

Subjects in the experiment are randomly assigned to experiment and control groups respectively. No pre measurements of the dependent variable are taken.

Experimental Group	$X\ O_1$
Control Group	O_2

Examples of True Experimental Designs

EXHIBIT 9.1 Examples of True Experimental Designs

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Measurements (O_1, O_2): Actual sales of company's brand during the period that the point-of-purchase displays are in test stores.

Comments:

Because of random assignment of stores to groups, the test group and control group can be considered equivalent.

Measure of the treatment effect of X is $O_1 - O_2$. If $O_1 = 125{,}000$ units and $O_2 = 113{,}000$ units, then treatment effect $= 12{,}000$ units.

Examples of True Experimental Designs

Before and After with Control Group Design

Basic design:

Experimental Group:	(*R*)	O_1	*X*	O_2
Control Group:	(*R*)	O_3		O_4

Sample: Same as after-only design.
Treatment (*X*): Same as after-only design.
Measurements (O_1 to O_4):
O_1 and O_2 are pre- and postmeasurements for the experimental group;
O_3 and O_4 are the same for the control group.

Results:
$O_1 = 113{,}000$ units
$O_2 = 125{,}000$ units
$O_3 = 111{,}000$ units
$O_4 = 118{,}000$ units

Comments:
Random assignment to groups means that the groups can be considered equivalent.
Because groups are equivalent, it is reasonable to assume that they will be equally affected by the same extraneous factors.
The difference between pre- and postmeasurements for the control group ($O_4 - O_3$) provides a good estimate of the effects of all extraneous factors on both groups. Based on these results, $O_4 - O_3 = 7{,}000$ units. The estimated treatment effect is $(O_2 - O_1) - (O_4 - O_3) = (125{,}000 - 113{,}000) - (118{,}000 - 111{,}000) = 5{,}000$ units.

MARKET TESTING

A controlled experiment done in a limited but carefully selected sector of the marketplace.

Test Markets

Real world testing of a new product or some element of the marketing mix using an experimental or quasi experimental design.

Types of Test Markets

- Traditional or standard test markets
- Scanner or electronic test markets
- Controlled test markets
- Simulated test markets

Types of Test Markets

Standard Test Market A test market in which the company sells the product through its normal distribution channels.

- McDonald’s perform test marketing in their own stores.
- McLobster
- On the menu with a big “NEW”

Types of Test Markets

Controlled Test Market An entire test program conducted by an outside service in a market in which it can guarantee distribution.

- Outside research service company: ACNielsen, IRI
  - Pay distributors to provide the required amount of shelf space for test products.
  - Monitor sales of the product.
  - get their products into test markets more quickly.
  - Often supply more realistic levels of distribution.
  - Provide better monitoring of product movement.

Simulated Test Market A study in which consumer ratings are obtained along with likely or actual purchase data often obtained in a simulated store environment; the data are fed into computer models to produce sales and market share predictions.

For Instance, customers have given a set amount of money and specific ads are shown to all the selected customers and asked them to purchase from given options.

Video for test marketing

- **Adventures in test marketing**
  - **https://www.youtube.com/watch?v=7wx5B2p8qyg**

Chapter Ten

The Concept of Measurement

LEARNING OBJECTIVES

1. Analyze the concept of measurement.
2. Define what is a concept.
3. Learn the nature of a construct.
4. Write a concept constitutively.
5. Define a concept operationally.
6. Create a measurement scale.
7. Evaluate the reliability and validity of a measurement.

Measurement Process

Measurement:

The process of assigning numbers or labels to persons, objects, or events in accordance with specific rules for representing quantities or qualities or attributes.

Rule: The guide, method, or command that tells a researcher what to do.

Constructs:

Specific types of concepts that exist at higher levels of abstraction.

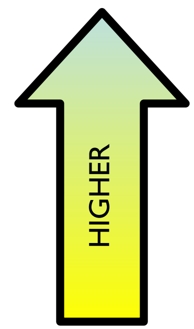
Scales of Measurement

Ratio

Interval

Ordinal

Nominal



Higher levels of measurement have all the properties of lower levels of measurement

Nominal Data

Scales that partition data into mutually exclusive and collectively exhaustive categories.

Classification Type Data:

- Yes or no questions
- Nouns in general
- Gender
- Race / Ethnicity
- Occupation
- Text open-ended questions

Analysis Approach:

- Cross tabulations / Percentages
- Sums and frequency counts
- *One can't tell the relative value of responses*

Ordinal Data

Scales that maintain the labeling characteristics of nominal scales and have the ability to order data.

Ranking Type Data:

- Best liked, worst liked
- Win, place, or show
- First, second, third
- Small, medium, and large
- Comparisons rankings -
  "rank these movies from best to worst"

Analysis Approach:

- Cross tabulations, sums and frequency counts
- Percentages, mode, mean for some types
- *One can tell the relative order of responses but not the distance between responses*

Interval Data

Scales that have the characteristics of ordinal scales, plus equal intervals between points.

Comparison Type Data:

- One a "1 to 10" scale
- Age, income, etc. as ranges

Analysis Approach:

- Standard deviation, variance, kurtosis
- Descriptive statistics - mean, median, mode
- Sums and ranged frequency counts
- Correlation
- *Can tell the relative value of responses and can tell the distance between responses*

Ratio Data

Scales that have the characteristics of interval, plus a meaningful zero point.

Flat Numeric Type Data:

- Age = 50 *(not an age range)*
- Income = $25,000 *(not an income range)*
- Number of children: ________

Analysis Approach:

- Standard deviation, variance, kurtosis
- Descriptive statistics - mean, median, mode
- Sums and ranged frequency counts
- Pearson correlation, regression
- Can tell the relative value of responses and can tell the distance between responses and how they relate to zero

Application Scenario

- Sherry Shire is a resident of Danfield, a community with a population of approximately 9,000 residents.

- She is thinking of pursuing her dream of opening her own espresso bar.
  – Four purveyors of espresso drinks in Danfield.

- Purpose:
  – identify the relative size of each Espresso vendor <u>based on consumer purchase frequency</u>.

Differences in Information Conveyed by Numbers

1A. For each coffee shop listed below, please indicate whether you have purchased an espresso drink there in the last week.

Central Perc	**(1) Yes**	(2) No
Village Market	(1) Yes	**(2) No**
Starbucks	**(1) Yes**	(2) No
Gino's Cappuccinos	(1) Yes	**(2) No**

1B. Please rank the following coffee shops according to how frequently you have purchased an espresso drink there in the last week, where 1 = most frequently, and 4 = least frequently.

1 _______ Central Perc
4 _______ Village Market
2 _______ Starbucks
3 _______ Gino's Cappuccinos

Differences in Information Conveyed by Numbers: Nominal

1A. For each coffee shop listed below, please indicate whether you have purchased an espresso drink there in the last week.

Central Perc	**(1) Yes**	(2) No
Village Market	(1) Yes	**(2) No**
Starbucks	**(1) Yes**	(2) No
Gino's Cappuccinos	**(1) Yes**	(2) No

Meaning of numbers: Identification, or membership in a category

Appropriate Analyses: Percentage (frequency) for each category

Mode (most frequent category)

Differences in Information Conveyed by Numbers: Ordinal

1B. Please rank the following coffee shops according to how frequently you have purchased an espresso drink there in the last week, where 1 = most frequently, and 4 = least frequently.

1 _______ Central Perc
4 _______ Village Market
2 _______ Starbucks
3 _______ Gino's Cappuccinos

Meaning of numbers: Relative order on a characteristic

Appropriate Analyses: Percentage for each rank level

Median rank

Differences in Information Conveyed by Numbers

1B. Please rank the following coffee shops according to how frequently you have purchased an espresso drink there in the last week, where 1 = most frequently, and 4 = least frequently.

1 _______ Central Perc
4 _______ Village Market
2 _______ Starbucks
3 _______ Gino's Cappuccinos

1C. Please use the scale provided to indicate how frequently you have purchased an espresso drink in the last week at each of the following coffee shops.

Very Infrequently 0 1 2 3 4 Very Frequently

4 _______ Central Perc
0 _______ Village Market
2 _______ Starbucks
1 _______ Gino's Cappuccinos

Differences in Information Conveyed by Numbers: Interval

1C. Please use the scale provided to indicate how frequently you have purchased an espresso drink in the last week at each of the following coffee shops.

Very Infrequently 0 1 2 3 4 Very Frequently

4	_______ Central Perc
0	_______ Village Market
2	_______ Starbucks
1	_______ Gino's Cappuccinos

Central Perc twice as frequent as Starbucks?

Gino's Cappuccinos half as frequent as Starbucks?

1st difference (4 – 2) twice as large as 2nd difference (2 – 1)

Meaning of numbers: Legitimately allow relative comparison of differences (intervals sizes) on scale

Appropriate Analyses: Mean ratings

Percentage (frequency count) per scale point

Differences in Information Conveyed by Numbers

1C. Please use the scale provided to indicate how frequently you have purchased an espresso drink in the last week at each of the following coffee shops.

Very Infrequently 0 1 2 3 4 Very Frequently

_______ Central Perc
_______ Village Market
_______ Starbucks
_______ Gino's Cappuccinos

4
0
2
1

1D. In the last week, how many espresso drinks have you purchased at each of the following coffee shops?

12 _______ Central Perc
_______ Village Market
0 _______ Starbucks
4 _______ Gino's Cappuccinos

2

Differences in Information Conveyed by Numbers: Ratio

1D. In the last week, how many espresso drinks have you purchased at each of the following coffee shops?

12 ______ Central Perc
______ Village Market
0 ______ Starbucks
4 ______ Gino's Cappuccinos
2

Central Perc three times as frequent as Starbucks?

Gino's Cappuccinos half as frequent as Starbucks?

Yes!

Why?

Meaning of numbers: There is a natural, or absolute, zero which permits comparison of absolute magnitudes of numbers

Appropriate Analyses: Mean values

Difference Between Interval and Ratio Scales

Interval Scale
- Zero is just another scale position
- Zero = the scale point between -1 and +1

What is your attitude toward credit cards?

-3 -2 -1 0 +1 +2 +3

OR

0 1 2 3 4 5 6 7

- Ratio Scale
  - Zero has an absolute meaning
  - Zero = Absence of the property being measured

What is your credit card balance?

$ __________

Difference Between Interval and Ratio Scales

- Interval scale: where the <u>difference</u> between two values is meaningful.
  - E.g., The difference between a temperature of 100 degrees and 90 degrees is the same difference as between 90 degrees and 80 degrees.

Difference Between Interval and Ratio Scales

- Rank the restaurant on a 1-8 favorability scale.
  - Customer 1: 8
  - Customer 2: 4
- Can we say that customer 2's attitude to the restaurant is twice as favorable as that of customer 1?
- Answer : No!
- What we can say is the difference in altitude between a 8 and 4 is the same as the difference between 7 and 3.

Reliability and Validity

Reliability:

Degree to which measures are free from random error and, therefore, provide consistent data. The extent to which the survey responses are internally consistent.

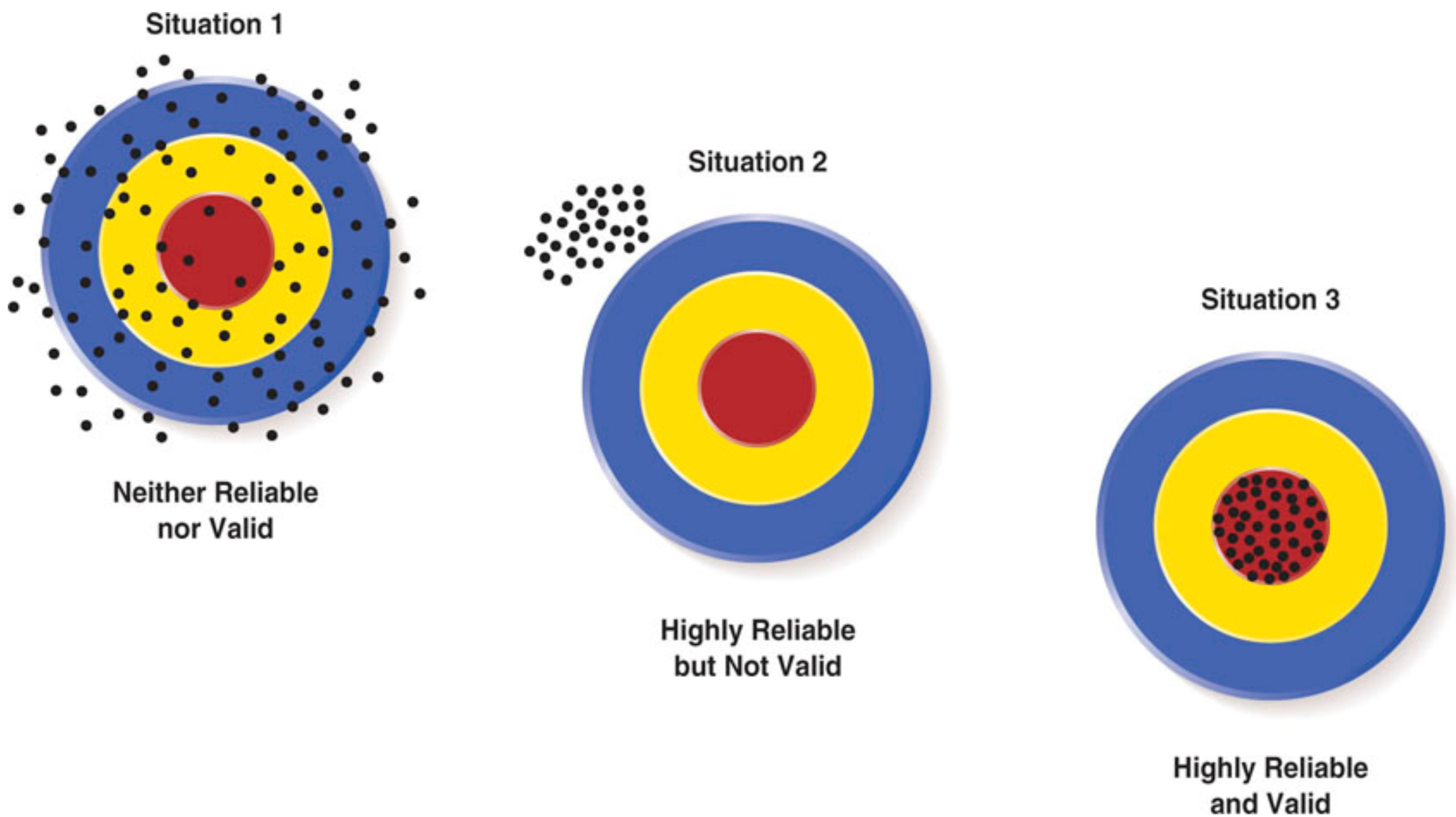
Validity:

Degree to which what the researcher was trying to measure was actually measured.

Reliability and Validity

- Validity
  - The degree to which a measure measures what it is supposed to measure
  - As systematic and/or random error increases, validity of a measure decreases
- Reliability
  - The degree to which a measure is consistent across time, evaluators, and the items forming the scale.
  - Systematic error is less troublesome than random error.
- Reliability is a necessary, but not sufficient , for establishing the validity.

Reliability and Validity



Testing Reliability

Test and Retest:

The ability of the same instrument to produce consistent results when used a second time under conditions as similar as possible to the original conditions.

Stability:

Lack of change in results from test to test.

Equivalent Form:

Ability of two very similar forms of an instrument to produce closely correlated results.

Testing Reliability

Internal Consistency:

The ability of an instrument to produce similar results when used on different samples during the same time period to measure a phenomenon.

Spilt Half Technique:

A method of assessing the reliability of a scale by dividing the total set of measurement items in half and correlating the results.

Testing Reliability

- **Test–retest reliability**

  is obtained by repeating the measurement with the same instrument, approximating the original conditions as closely as possible.

  A students measure the length of the object, the result of four measurements were 5.5cm, 5.51cm, 5.53cm, 5.55cm, then the length of the object is?

Difficulty

- *1. Difficult to locate and gain the cooperation of respondents for a second testing.*
- *2. The first measurement may alter a person's response on the second measurement.*
- *3. Environmental or personal factors may change.*

Testing Reliability

- **Equivalent Form Reliability**

  The difficulties encountered with the test–retest approach can be avoided by creating equivalent forms of a measurement instrument.

  uses one set of questions divided into two **equivalent** sets

  E.g., 100 questions that measure a construct.

  Randomly split the questions into two sets of 50 (set A and set B)

Step 1: Give test A to a group of 50 students on a Monday.

Step 2: Give test B to the same group of students that Friday.

Step 3: Correlate the scores from test A and test B.

Testing Reliability

- **Internal Consistency Reliability**

  Internal consistency reliability assesses the ability to produce similar results when different samples are used to measure a phenomenon during the same time period.

  E.g., same exam is used for different classes.

- Split-half technique: Method of assessing the reliability of a scale by dividing the total set of measurement items in half and correlating the results

Testing Validity

Face:

The degree to which a measurement seems to measure what it is supposed to measure.
e.g., what is your age/income/education level?

Content:

The representativeness, or sampling adequacy, of the content of the
measurement instrument.

Content Validity

- A scale’s content logically appears to reflect what was intended to be measured.

- E.g., test a person’s general spelling ability in English.
  - Includes all the words in the English (ideal).
  - Actually come up with a set of items that adequately represents the full range of words.
- E.g., measure a sales representative’s job satisfaction.
  - Duties, fellow workers, top management, sales supervisors, customers, pay and promotion opportunities.

Testing Validity

Criterion Related:

The degree to which a measurement instrument can predict a variable that is designated a criterion.

Construct:

The degree to which a measurer
represents and logically connects, via the underlying theory, the observed phenomenon to the construct.

Testing Validity

Criterion-Related Validity

Predictive:

The degree to which a future level of a criterion can be forecast by a current measurement scale.

- Purchase intent-purchase behavior
- High school GPA-College GPA

Concurrent:

The degree to which another variable, measured at the same point in time as the variable of interest, can be predicted by the measurement instrument.

- New depression tests-established test
- Nursing students practical test-paper test

Testing Validity

Construct Validity

Convergent:

The degree of correlation among different measures that purport to measure the same construct.

Discriminate:

The measure of the lack of association among constructs that are supposed to be different.

Construct Validity

Convergent Validity and Discriminant Validity

•E.g., job satisfaction

- Highly positively correlate with other related measure of job satisfaction. (convergent validity)
- Uncorrelated with role conflict, or organizational commitment (discriminant validity).

Chapter Eleven

Using Measurement Scales to Build Marketing Effectiveness

LEARNING OBJECTIVES

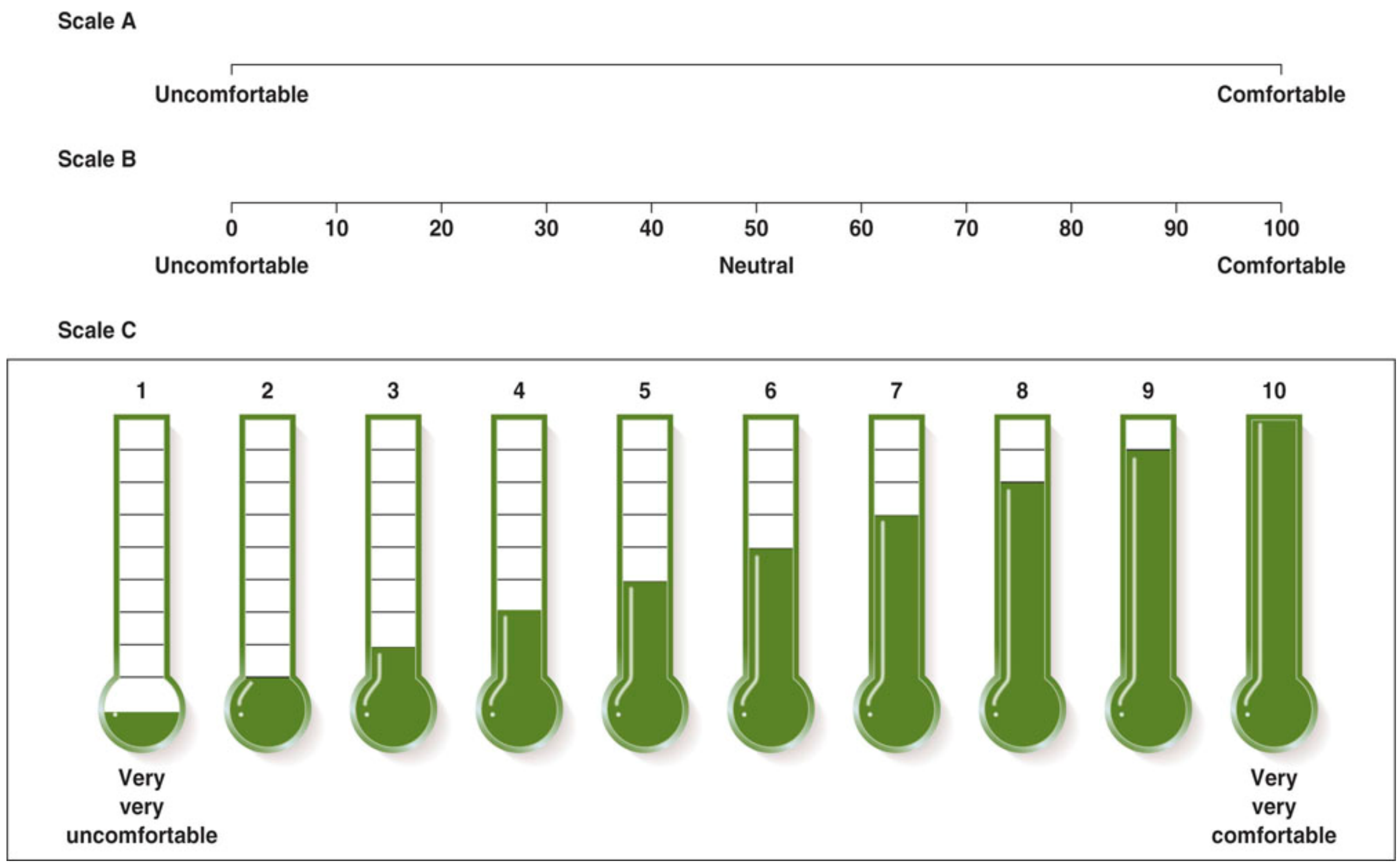
1. Explain the linkage among attitudes, behavior, and marketing effectiveness.
2. Understand the concept of scaling.
3. Compare the various types of attitude scales.
4. Examine some basic considerations in selecting a type of scale.
5. Realize the importance of attitude measurement scales in management decision making.

Attitude Measurement Scales

- Graphic rating scales
- Itemized rating scales
- Rank-order scales
- Paired comparisons
- Constant sum scales
- Semantic differential scales
- Stapel scales
- Likert scales
- Purchase-intent scales
- Scale conversions
- Net promoter score (NPS)

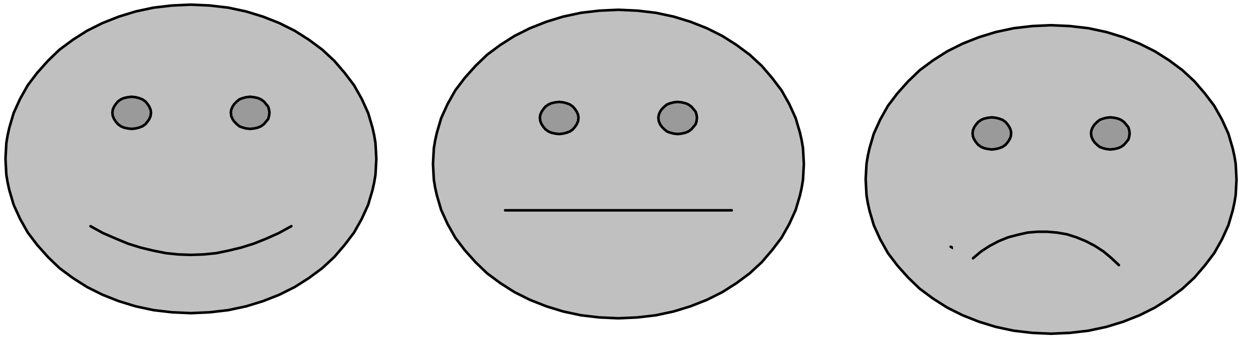
Graphic Rating Scales

Measurement scales that include a graphic continuum, anchored by two extremes.



Graphic Rating Scales

These scales are often used when interviewing children.



How do you feel when coming to marketing research class?

Itemized Rating Scales

The respondent selects an answer from a limited number of ordered categories.

	Important						**Not Important**
Odd Scale	**1**	**2**	**3**	**4**	**5**		
	Important						**Not Important**
Even Scale	**1**	**2**	**3**	**4**	**5**	**6**	

Rank Order Scale

Eye Shadow Scales

Please rank the following eye shadows, with 1 being the brand that best meets the characteristic being evaluated and 6 the worst brand on the characteristic being evaluated. The six brands are listed on card C. (HAND RESPONDENT CARD C.) Let's begin with the idea of having high-quality compacts or containers. Which brand would rank as having the highest quality compacts or containers? Which is second? (RECORD BELOW.)

	Q.48. Having High-Quality Container	Q.49. Having High-Quality Applicator	Q.50. Having High-Quality Eye Shadow
Avon	________	________	________
Cover Girl	________	________	________
Estee Lauder	________	________	________
L'Oreal	________	________	________
Natural Wonder	________	________	________
Revlon	________	________	________

Card C

Avon	Cover Girl	Estee Lauder
L'Oreal	Natural Wonder	Revlon

Paired Comparison:

Respondent is presented with two objects and asked to select one according to some criteria.

For each pair of drinks listed, place a check beside the one you would prefer if you had to choose between the two.

(Compare: Coke, Diet Coke, Pepsi, Diet Pepsi)

- Coke vs. Diet Coke
- Coke vs. Pepsi
- Coke vs. Diet Pepsi
- Diet Coke vs. Pepsi
- Diet Coke vs. Diet Pepsi
- Pepsi vs. Diet Pepsi

Pay attention: $N*(N-1)/2$

Paired Comparison

Here are some characteristics used to describe sun care products in general. Please tell me which characteristic in each pair is more important to you when selecting a sun care product.

a. Tans evenly	b. Tans without burning
a. Prevents burning	b. Protects against burning and tanning
a. Good value for the money	b. Goes on evenly
a. Not greasy	b. Does not stain clothing
a. Tans without burning	b. Prevents burning
a. Protects against burning and tanning	b. Good value for the money
a. Goes on evenly	b. Tans evenly
a. Prevents burning	b. Not greasy

Constant Sum Scale

Below are seven characteristics of women's tennis sportswear. Please allocate 100 points among the characteristics such that the allocation represents the importance of each characteristic to you. The more points that you assign to a characteristic, the more important it is. If the characteristic is totally unimportant, you should not allocate any points to it. When you've finished, please double-check to make sure that your total adds to 100.

Characteristics of Tennis Sportswear	Number of Points
Is comfortable to wear	______
Is durable	______
Is made by well-known brand or sports manufacturers	______
Is made in the United States	______
Has up-to-date styling	______
Gives freedom of movement	______
Is a good value for the money	______
	100 points

PEER EVALUATION FORM

GROUP PROJECT 1
Marketing Research

Name:
Course Number:
Section Number:

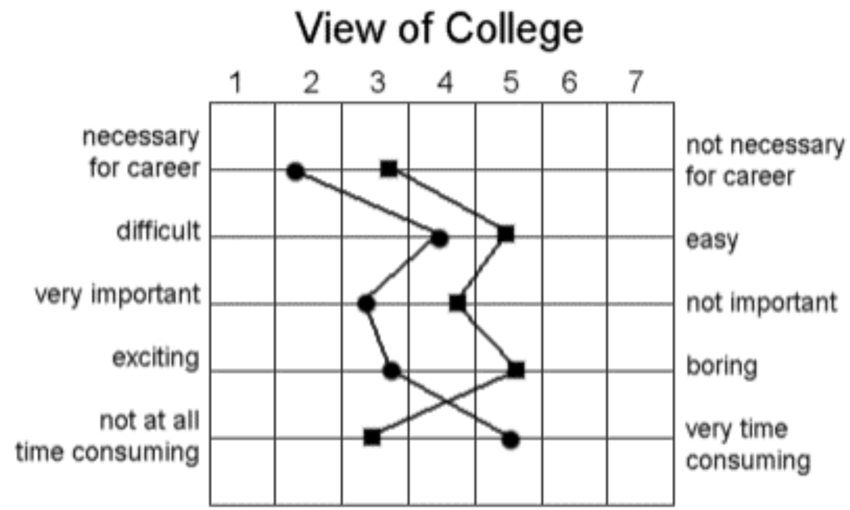
Instructions: List the names of the members of your group (including yourself). Divide 100 points among the group members based on each group member's contribution to the completion of the group project. For example, if there are 5 people in your group (including yourself) and you believe that everyone contributed equally you would assign 20 points to each.

Group Members	**Point Distribution**
______________________________	______ points
______________________________	______ points
______________________________	______ points
______________________________	______ points
	100 points (total)

Comments:____

Semantic Differential Scale:

The Semantic differential is seven point rating scale with endpoint associated with bipolar labels that have semantic meaning



Semantic profiles for students with (●) and without (■) prior work experince.

Staple Scale

+5	+5
+4	+4
+3	+3
+2	+2
+1	+1
Cheap Prices	Easy to Navigate
−1	−1
−2	−2
−3	−3
−4	−4
−5	−5

Select a “plus” number for words you think describe the Web site accurately. The more accurately you think the word describes the Web site, the larger the “plus” number you should choose. Select a “minus” number for words you think do not describe the Web site accurately. The less accurately you think the word describes the Web site, the larger the “minus” number you should choose. Therefore, you can select any number from 15 for words you think are very accurate all the way to −5 for words you think are very inaccurate.

Staple Scale:

It is a unipolar rating scale with 10 categories numbered from – 5 to + 5, without a neutral point (zero). Ratings may range from + 3 to -3, or + 5 to - 5, very accurate to very inaccurate.

When thinking about Samsung mobiles, do you believe that the word "innovative" aptly describes or poorly describes the company? On the scale of +5 to -5 how will you rank Samsung mobiles according to the word "innovative"?

- (+5) Describes very well
- (+4)
- (+3)
- (+2)
- (+1)

Innovative

- (-1)
- (-2)
- (-3)
- (-4)
- (-5) Poorly Describes

Likert Scale

How did you feel about the registration process when you became a new user?

	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
The registration was simple.	○	○	○	○	○
The registration questions were "nonthreatening."	○	○	○	○	○
Registration here will protect my privacy.	○	○	○	○	○
The registration did not take a long time to complete.	○	○	○	○	○
The registration informed me about the site.	○	○	○	○	○

Itemized Rating Scale

- Likert Scale
- Semantic Differential Scale
- Staple Scale

Itemized Rating Scale

	Basic Characteristics	Examples	Advantages	Disadvantages
Likert Scale	A five-point scale about degree of agreement	Attitude	Easy to construct and understand	Time-consuming
Semantic Differential Scale	A seven-point scale with bipolar labels	Brand, product, image	Versatile	Controversy as to whether the data is interval
Staple Scale	Unipolar ten-point scale, -5 to +5, without a neutral point (zero)	Attitude, firm images	Easy to construct and understand over phone	Confusing and difficult to apply

Purchase-Intent Scales:

- Scales used to measure a respondent's intention to buy or not buy a product.

Which of the following statements best describes the likelihood of you purchasing Nike athletic shoes within the next 6 months?

___I definitely will buy it
___I probably will buy it
___I am uncertain whether I will buy it
___I probably will not buy it
___I definitely will not buy it

Chapter Twelve

Questionnaire Design

LEARNING OBJECTIVES

1. Understand the role of the questionnaire in the data-collection process.
2. Become familiar with the criteria for a good questionnaire.
3. Learn the process for questionnaire design.
4. Understand how software, the Internet, and mobile devices are influencing questionnaire design.
5. Understand the impact of the questionnaire on data-collection costs.

Determine Wording of Each Question

<u>What wording issues need to be addressed?</u>

A day trip is defined here as leaving town for any recreational purpose and returning home the same day. In a typical month, how many day trips do you take? ____

<u>typical</u> month?

<u>ISSUE</u>: Avoid generalizations and ambiguous terms

<u>Example:</u>

A day trip is defined here as leaving town for any recreational purpose and returning home the same day. How many day trips did you take <u>last month</u>?

____

Determine Wording of Each Question

- Avoid Double-Barreled Questions
  - Carefully use *and* and *or*

Think back to the last meal you purchased at a fast-food restaurant. How satisfied were you with the price and the quality of service that you received?

_____ Very Dissatisfied
_____ Dissatisfied
_____ Somewhat Dissatisfied
_____ Somewhat Satisfied
_____ Satisfied
_____ Very Satisfied

Determine Wording of Each Question

What wording issue needs to be addressed?

How would you rate Motel 6 in terms of overall quality and affordability?

Low 1 2 3 4 5 High

and

ISSUE: Break double-barreled questions into separate questions (Watch out for *and* and *or*…).

How would you rate Motel 6 in terms of overall quality?

Low 1 2 3 4 5 High

How would you rate Motel 6 in terms of overall affordability?

Low 1 2 3 4 5 High

Determine Wording of Each Question

<u>What wording issue needs to be addressed?</u>

Using the scale provided, how would you rate the overall quality of the food served to you this evening?

__ Extremely High
__ Very High
__ Moderately High
__ Average
__ Moderately Low
__ Very Low
__ Extremely Low

<u>ISSUE</u>: Avoid ambiguous response alternatives

<u>Example:</u>

Using the scale provided, how would you rate the overall quality of the food served to you this evening?

Extremely Low 1 2 3 4 5 6 7 8 9 10 Extremely High

Determine Wording of Each Question

- Avoid Leading Questions
  - Example

Do you feel that limiting taxes by law is an effective way to stop the government from picking your pocket every payday?

_____ Yes   _____ No   _____ Undecided

Determine Wording of Each Question

- Avoid Unstated Alternatives
  - An alternative answer that is not expressed in a question's options
  - Thorough exploratory research and questionnaire pretesting are key

Would you like to have a job, if this were possible?
_____ Yes _____ No

81% said they would like to have a job
19% said they would not like to have a job

Would you prefer to have a job, or do you prefer to be a stay-at-home mom?

32% said they would prefer to have a job
68% said they prefer to be a stay-at-home mom.

Determine Wording of Each Question

- Avoid Assumed Consequences
  - When a question is not framed to clearly state the consequences and this generates different responses from individuals who assume different consequences.
  - Questions should be framed to clearly state the consequences when possible.
  - Example

Would you like to double the number of job offers you receive as a senior?
_____ Yes _____ No

Would you like to double the number of job offers you receive as a senior if that means devoting an additional 10 hours per week to studying so as to raise your grade point average?
_____ Yes _____ No

Determine Wording of Each Question

- Are you in favor of TAMUC providing every student with a personal computer?

Determine Wording of Each Question

- Are you in favor of TAMUC providing every student with a personal computer?
- ...even though it will mean a substantial increase in tuition?

Examples

- “Have you recently tried and enjoyed the new Burger King Big King sandwich?” Double questions and is leading (biased).
- “Many people have recently watched the movie, Titanic. Have you seen it?” Leading to bias
- “How satisfied were you with the all new and improved Clean-O laundry detergent?” Introduced bias.
- “How many days do you sleep until 8:00 a.m.?” Vague.

Examples

- *How do you like the flavor of this high-quality Maxwell House coffee?* bias - leading question
- *What do you think of the taste and texture of this Sara Lee coffee cake?* Double-Barreled questions
- *We are conducting a study for Bulova watches. What do you think of the quality of Bulova watches?* Client introduced - bias

Chapter Nine

Primary Data Collection: Experimentation and Test Markets

LEARNING OBJECTIVES

1. Understand the nature of experiments.
2. Gain insight into requirements for proving causation.
3. Learn about the experimental setting.
4. Examine experimental validity.
5. Compare types of experimental designs.
6. Understand extraneous variables
7. Analyze experimental design, treatment, and effects.
8. Examine the limitations of experimental research.
9. Evaluate selected experimental designs.
10. Gain insight into test marketing.

Question

- Design a test of a new pricing strategy for orange juice concentrate. The brand is an established brand, and we are only interested in testing the effect of a 5 percent price increase and a 5 percent price decrease. All other elements of the marketing mix will remain the same.

Answer

- Randomly select three experimental groups. Expose Group 1 to the product at the 5% price increase, expose Group 2 to the 5% price decrease, and expose Group 3 (the control group) to the original price. Use a questionnaire to measure post-test attitudes about product pricing and purchase intentions.

Question

- A soft drink company has determined in taste tests that consumers prefer the taste of their diet product when sweetened with Splenda in comparison to Equal. Now they are interested in determining how the new sweetener will play in the marketplace. Design a test market that will achieve this goal.

Answer

- Select four test market cities. Offer the soft drink sweetened with Splenda in two test markets, and sweetened with Equal in two test markets. Try to match markets as closely as possible to minimize the effect of extraneous variables.
- Compare the results on a daily basis for at least 90 days. This should be a pretty important decision because the cost of test marketing can run into the millions of dollars. Perhaps a similar design could be used employing simulated test markets. The cost would be much lower.

Question

- A national pizza chain wants to test the effect on sales of four different discount coupons. Design a test that will do this in a way that gives a clear read. Your focus should be on the effect on sales volume. Financial analysis after the test results are in will address the revenue and profit impact.

Answer

- Randomly select five experimental groups. Distribute Coupon A to one group, Coupon B to a second group, and so on. The fifth group, the control group, would get no coupon.
- Compare the pizza purchase and coupon redemption rates of the five groups. One thing to watch for would be whether subjects who received a particular coupon actually use it as part of the purchase process. Compare results for the five groups to see which makes the largest number of pizza purchases.

Question

- A national value-priced hotel chain needs to understand the business impact of including a free buffet style breakfast to guests.
- Design and justify a test that will do this. Do some preliminary investigation to determine what items the target market of guests would prefer in a breakfast buffet. Do a follow-up survey to get a preliminary idea of the impact on purchase behavior the buffet might have. Will there be any change in price? Once it has been established that guests in the target market would want the breakfast buffet, a test market could be conducted to see “real” results.

Answer

- Select six hotels from the chain that are as much alike as possible. Capture demand statistics for the year prior to the test. Assign three of the units as test sites (offer the breakfast buffet), and three units as control sites (no buffet). Continue to measure demand for another six-month period. Compare pre-test and test market performance of the six properties. Differences in demand may be due to the availability of the breakfast buffet.

Question

Read PRACTICING MARKETING RESEARCH

What Happens When Your Selection Bias Is the Interviewer's Gender?

Question: What types of possible (even if subtle) bias might result from male respondents answering an e-mail survey sent or signed by a female?

Answer

- Given the email survey didn't have a picture of the female interviewer, there would not have been any interviewer bias, except that the male respondent knew a female sent the questionnaire.
- If there were any subtle differences in the print or language in the survey, that could account for differences. If the surveys were identical, then only gender would have possibly accounted for the difference in response rate. It has been long established in telephone interviews that females get more response per capita than males; hence, telephone call centers are populated largely with females.

Question

- The “treatment” is also referred to as which of the following?

a) increase in sales
b) change in market share
c) gross margin
d) independent variable
e) none of these

Answer

- Ans: D

Question

Which of the following types of research allows the researcher to show causation?

a)survey

b)observation

c)experiment

d)none of these

Answer

- Ans: C

Question

Research that is designed to determine whether a change in one variable likely caused change in another variable is referred to as _______________.

a)exploratory research

b)causal research

c)descriptive research

d)none of these

Answer

- Ans: B

Question

Concomitant variation occurs when 2 variables are ________.

a)causally related

b)experimentally related

c)correlated

d)none of these

Answer

- Ans: C

Question

In an experiment where the marketer is interested in finding out the impact of shelf position on a product's sales, the shelf position is considered the ___________variable.

a)correlation

b)dependent

c)independent

d)concomitant

e)none of these

Answer

- Ans: C

Question

Which of the following is the main disadvantage of laboratory experiments?

a)Exploratory research is enhanced.

b)The laboratory setting may not be a good representation of the real-world setting.

c)Concomitant variation is not possible.

d)Elimination of causal factors is increased.

e)none of these

Answer

- Ans: B

Question

Test markets are which of the following type of experiment?

a)controlled experiment

b)exploratory experiment

c)field experiment

d)laboratory experiment

e)none of these

Answer

- Ans: C

Question

An experiment is designed to test how consumers go about choosing life insurance policies. If this experiment uses a sample of college students, it would likely *not* have ________.

a)internal validity

b)extraneous validity

c)external validity

d)laboratory validity

Answer

Ans: C

Question

Suppose during an experiment, a researcher used several observers to record the results. The results of the experiment were perplexing to the researcher. In such a case one might expect ____________ to have occurred, distorting the results of the experiment.

a)maturation

b)history

c)instrument variation

d)mortality

e)selection bias

Answer

Ans: C

Question

This true experimental design involves random assignment of subjects to experimental and control groups, but no pre-measurement of the dependent variable.

a)Solomon four-group design

b)before and after with control group

c)after only with control group

d)one group pretest and posttest design

e)none of these

Answer

- C

Question

Which of the following is often the most important data produced by a test market?

a)purchase data

b)awareness data

c)competitive response

d)source of sales

e)none of these

Answer

- Ans: A

Question

- Your client is interested in determining which of two Internet banner ads is more effective. Design a field experiment. Be sure to identify the independent and dependent variables.

Answer

- Ans: The independent variable is whether the respondent sees ad A or ad B. The dependent variable would possibly be the click through rate of each ad. Students should mention that these ads should be shown randomly to subjects, and whichever ad had a higher click through would be deemed most effective.

Chapter Ten

The Concept of Measurement

LEARNING OBJECTIVES

1. Analyze the concept of measurement.
2. Define what is a concept.
3. Learn the nature of a construct.
4. Write a concept constitutively.
5. Define a concept operationally.
6. Create a measurement scale.
7. Evaluate the reliability and validity of a measurement.

Question

Give an example of a scale that would be reliable but not valid. Also give an example of a scale that would be reliable but not valid. Also give an example of a scale that would be valid but not reliable.

Answer

- If we were trying to measure customer satisfaction, but the questionnaire consistently measured customer loyalty, the scale would be reliable in that it measured the construct consistently.
- However, it would not be valid, because it did not measure what was intended. If a questionnaire measures customer service accurately, but the results are significantly different when the survey is repeated a week later, it is not reliable.

Question

What are three methods of assessing reliability?

Answer

- **Test-retest reliability** – Repeat the same survey two weeks later with the same sample of people.
- **Equivalent form** – Use similar questionnaires, and then compare the correlations of similar test items.
- **Internal consistency** – use same instrument with two different samples, or sometimes split the sample into halves.

Question

What are three methods of assessing validity?

Answer

- **Face validity** - The researcher has to make a judgment as to whether the measure “looks like” it measures what it is supposed to.
- **Content validity** - Does the scale provide adequate coverage of the topic under study? For example, research has identified five sexes. (That’s true.) If accurate measurement of the respondents’ sex is important to the research, then only offering two choices, Male and Female, is inadequate to provide content validity.
- **Criterion-related validity** - How well can the measurement instrument predict a variable?

Question

If a restaurant customer satisfaction questionnaire lacked a question concerning the quality of the food being served, we'd say the questionnaire lacked_______ validity.

a. content

b. face

c. construct

d. criterion-related

e. none of these

Answer

Ans: A

Question

When a researcher wants to show the differences separating two objects, the ideal type of scale to use is ___________________.

- a. nominal
- b. ordinal
- c. interval
- d. none of these

Answer

- Ans: C

Question

Which of the following is not a way to assess reliability?

a)test-retest reliability
b)equivalent form reliability
c)internal consistency reliability
d)spilt-half technique
e)criterion- related reliability

Answer

Ans: E

Question

Revise the following assessment of customer satisfaction for Jim Dandy's Hamburger Joint so that content validity is achieved.

Please indicate your satisfaction with Jim Dandy's Hamburger Joint using a scale of 1=very satisfied, 2=somewhat satisfied, and 3=not satisfied.

_____a. location of the restaurant

_____b. cleanliness of restrooms

_____c. friendliness of staff

_____d. speed of service

_____e. restaurant cleanliness

_____f. availability of condiments

_____g. efficiency of drive-up window

_____h. hours of operation

Answer

Ans: All of the attributes above are important to the assessment of satisfaction at Jim Dandy's. However, there is one serious violation of content validity: there is no assessment of food quality.

Question

- Define Validity. Then provide an example of Face Validity and an example of a question that has a Face Validity problem.

Answer

- Validity is the degree to which what the researcher is trying to measure is actually measured, such as the extent to which a question or series of questions in a questionnaire actually measure a concept. Face Validity is the degree to which a measure seems to measure what it is supposed to measure. An example would be as follows:

  A question asking college students to respond to an age category question when the target market is defined as traditional college age students.

Question: Please indicate your age by marketing the appropriate blank below:

_____0-18 _____19-34 _____35-54 ____55 and over

The categories above would not be appropriate for traditional college ages students and therefore would not adequately measure a population consisting of college students. A better scale would be as follows:

_____0-18 _____19-21 _____22-25 ____26 and over

Question

- The local Ford dealership is interested in collecting data to answer the following information research question: How likely are young adults to purchase a new automobile within a year after graduating from college? Design a nominal, ordinal, interval, and ratio scale measurement that will enable the dealership to collect the required data. In your opinion, which one of your designs would be most useful to the dealership and why?

Answer

- Nominal Scale Design:

How likely are you to purchase a new automobile within one year after graduating from college?

[ ] Do intend to purchase

[ ] Do not intend to purchase

Answer

Ordinal Scale Design:

Please check the one response that best expresses how likely you are to purchase a new automobile within one year after graduating from college?

[ ] Definitely will purchase

[ ] Unlikely will purchase

[ ] Probably will purchase

[ ] Definitely will not purchase

Answer

Interval Scale:

Which one of the following percentages ranges best approximates the likelihood of you purchasing a new automobile within one year after graduating from college?

[ ] less than 10% chance

[ ] 11% - 49% chance

[ ] 50 – 79% chance

[ ] 90 – 100% chance

Answer

Ratio Scale:

In the space provided below, please write the percentage value that best approximates the likelihood [chance] of you purchasing a new automobile within one year after graduating from college.

____

Chapter Eleven

Using Measurement Scales to Build Marketing Effectiveness

LEARNING OBJECTIVES

1. Explain the linkage among attitudes, behavior, and marketing effectiveness.
2. Understand the concept of scaling.
3. Compare the various types of attitude scales.
4. Examine some basic considerations in selecting a type of scale.
5. Realize the importance of attitude measurement scales in management decision making.

Question

- **What are some of the arguments for and against having a neutral point on a scale?**

Answer

- One of the disadvantages of having a neutral point is that researchers run the risk of respondents choosing the neutral category for most responses. This outcome can be a problem when researchers are trying to determine a positive or negative attitude about the characteristic of interest that is being measured.
- If the researcher does not use a neutral point, then some valuable information may be lost in that some people may choose not to answer the question because they truly feel neutral or indifferent. The key to resolving this issue occurs at the exploratory research stage. The key question is, “are neutral responses necessary given the question being asked?” If the differences of opinion are fairly sharp, and people are opinionated at the exploratory stage, then the neutral response is not necessary. However, if the question deals with something in which respondents could be neutral, then the midpoint neutral response should be there.

Question

- **The local department store in your home town has been besieged by competition from the large national chains. What are some ways that target customers' attitudes toward the store could be changed?**

Answer

- If there are several large chains, the local store cannot compete only on product assortment or price. It must find some other sustainable competitive advantage. Research could be conducted to determine what the customers' current attitudes toward the store are and what they value most in a department store. If the customers value personal service, the store must provide it and use this element in their promotions and advertising. If the customers believe in home-town values, the store could focus on its history in the community, while promoting an updated image.

Question

- **Develop a Likert scale to evaluate the parks and recreation department in your city**

Answer

- Likert Scales have to do with extent of agreement with a statement. Hence:

City Park is a well-maintained park.

Strongly Agree	Somewhat Agree	Neutral	Somewhat Agree	Strongly Agree

Question

- **Develop a purchase intent scale for students eating at the university's cafeteria. How might the reliability and validity of this scale be measured? Why do you think purchase intent scales are so popular in commercial marketing research?**

Answer

How likely is it that you will buy a 19-meal card this semester?

Definitely Will, Probably Will, Might, Probably Will Not, Definitely Will Not

The reliability could be measured by a test-retest reliability check of the scale. Validity could be measured by considering the content, the predictability, and whether it looks like it is measuring what it is supposed to be measuring.

These scales are important for commercial researchers because it is imperative that clients be able to adequately predict the potential success of a product. This success would include the immediate purchase level of the product, repeat purchase behavior, brand loyalty, potential market share, and predicted sales volume.

Question

- **When might a researcher use a graphic rating scale rather than an itemized scale?**

Answer

- A researcher might use a graphic rating scale when dealing with anyone that cannot read the questions (a child or an individual who doesn’t read the language of the instrument). It might also be used when dealing with a sensitive subject or if the characteristics of the construct are difficult to discern.

Question

- **Explain the concept of scale equivalence.**

Answer

- Consider four common scales: 5-point, 7-point, 10-point, and 11-point. Often results are reported using a top-box approach and thus we can use this same approach to find overlap in the scales. For example, each scale point for a 5-point scale covers 20% of the scale (i.e., if responses were completely random, we'd expect 20% to respond 1, 20% to respond 2, etc.). Therefore a top-two-box in a 5-point scale would encompass 40% of the scale points. Similarly, for a 7-point scale, a single scale point accounts for 14%. A top-two-box would account for 28% and a top three box 42% of the scale points, which is approximately the same as our top-two box for the 5-point scale.

Question

- **Why is the net promoter score so popular yet controversial?**

Answer

- It is popular because it is one way to avoid the confusion of using scales with differing numbers of scale points. Acceptance of NPS meant no more surveys with lots of questions or mystifying models to understand. The key strategy is to maximize high scores and to eliminate or minimize low scores.
- Not everyone is a strong supporter of NPS. For example, Exhibit 11.13 shows three different scenarios with an NPS of 20 percent (promoters minus detractors). With Company A, there are no detractors, but 80 percent are passive. Company B has an equal amount of promoters and passives with 20 percent detractors. Company C has no passives, but a large number (40 percent) of detractors. Thus, even though the NPS is the same for all three firms, each requires a different marketing and customer relationship strategy.

Chapter Twelve Q & A

Questionnaire Design

LEARNING OBJECTIVES

1. Understand the role of the questionnaire in the data-collection process.
2. Become familiar with the criteria for a good questionnaire.
3. Learn the process for questionnaire design.
4. Understand how software, the Internet, and mobile devices are influencing questionnaire design.
5. Understand the impact of the questionnaire on data-collection costs.

Question

What's wrong with the following questions?

a.How do you like the flavor of this high-quality Maxwell House coffee?

b.b. What do you think of the taste and texture of this Sara Lee coffee cake?

c. We are conducting a study for Bulova watches. What do you think of the quality of Bulova watches?

Answer

a. How do you like the flavor of this high-quality Maxwell House coffee? bias - leading question

b. What do you think of the taste and texture of this Sara Lee coffee cake? Double-Barreled questions

c. We are conducting a study for Bulova watches. What do you think of the quality of Bulova watches? Client introduced - bias

Question

- **Give examples of poor questionnaire wording and explain what is wrong with each question.**

Answer

- “Have you recently tried and enjoyed the new Burger King Big King sandwich?” Double questions and is leading (biased).
- “Many people have recently watched the movie, Titanic. Have you seen it?” Leading to bias
- “How satisfied were you with the all new and improved Clean-O laundry detergent?” Introduced bias.
- “How many days do you sleep until 8:00 a.m.?” Vague.

Question

- **Design three open-ended and three closed-ended questions to measure consumers' attitudes toward BMW automobiles.**

Answer

Open-ended:

How comfortable is the driver’s seat in the BMW?

What is your opinion of the body style of the two-door coupe?

What did you think of the sound system in the BMW?

Closed-ended:

1.What exterior color do you like most of those offered by BMW?

Forest Green White Navy Burgundy Taupe

2.How would you judge the quality of the ride in the BMW?

Very smooth Somewhat smooth No Opinion Somewhat bumpy Very bumpy

Answer(Cont'd)

Closed-ended:

Please rank the following features (with 1 being the most important and 8 being the least important) in their importance to you in buying a new car.

Gas Mileage Automatic Transmission

Body style Special feature (power doors, windows, etc.)

Sound system Acceleration speed

Interior color Exterior color

Question

Which of the following would *not* be a good practice regarding question sequencing?

- general questions at the end
- general questions at the beginning
- sensitive questions at the end
- questions requiring work in the middle
- none of these

Answer

- Ans: A

Question

What type of question is the following?

Which of the following age categories best describes your age?

____0-18 ____19-24 ____25-34 ____35 and over

- dichotomous question
- open-ended question
- multiple choice question
- scaled question
- none of these

Answer

Ans: C

Chapter Thirteen

Basic Sampling Issues

LEARNING OBJECTIVES

1. Understand the concept of sampling.
2. Learn the steps in developing a sampling plan.
3. Understand the concepts of sampling error and nonsampling error.
4. Understand the differences between probability samples and nonprobability samples.
5. Understand sampling implications of surveying over the Internet.

Question

- **What are some situations in which a census would be better than a sample? Why are samples usually taken rather than censuses?**

Answer

- A census would be better than a sample when a business has only a small group of customers and does not expect to acquire many more. Samples are usually less expensive to administer and are easier to manage. Also, the findings of a sample are often just as statistically accurate as the findings of census would be, leading to the conclusion that you can get equivalent results for less time and money.

Question

- **Develop a sampling plan for examining undergraduate business students' attitudes toward Internet advertising.**

Answer

- Determine the population: All undergraduate students that attend the university.
- Determine the sampling frame: A list of all undergraduate students divided by rank or class level obtained from the registrar's office
- Determine data collection method: Telephone survey
- Determine sampling method: A quota sample based on gender and class standing
- Determine sample size: Depending upon statistical (level of error) requirements, a number will be chosen that is representative of the population of interest.

Answer(cont'd)

- Plan for Selecting Sample Elements Since a quota sample has been chosen, a proportional representation of the population of male and females, and freshmen, sophomores, juniors, seniors, and graduate students will be determined. From each subset, an adequate number of students will be chosen.
- Execution of Sampling Plan Telephone the chosen students and collect data using a questionnaire.

Question

- **Given an example of a perfect sample frame. Why is a telephone directory often not an acceptable sample frame?**

Answer

- A perfect sample frame would be a mailing list or telephone list that perfectly represents the population. For example, if you wished to interview all male individuals aged 25-45 who play golf twice a week, and you were able to obtain a mailing list that contained every individual who fits in that category that would be a perfect sample frame. A telephone book does not contain the names of everyone in a community. It doesn’t even contain the names of everyone that has a telephone. Private listings, unlisted numbers, and cell phone numbers are omitted.

Question

- **Distinguish between probability and nonprobability samples. What are the advantages and disadvantages of each? Why are nonprobability samples so popular in marketing research?**

Answer

- A probability sample ensures that each element within the population of interest has a known chance of being chosen. The advantages are: 1) representative cross-section, 2) sampling error can be computed, and 3) survey results are projectable to the total population. The disadvantages are: 1) expensive, 2) more complex design, and 3) it takes more time to execute.
- Non probability samples do not ensure that each unit will have a known chance of being chosen. Discretion is usually left up to the researcher. The advantages are: 1) cost less, 2) excellent in exploratory research, 3) execution is quick, and 4) it can be adequately representative. The disadvantages are 1) the sampling error cannot be computed, 2) it may not be representative, and 3) results cannot be projected to the total population. Nonprobability samples are popular because they can be quicker, cheaper, and easier to conduct. Sometimes nonprobability samples give quick answers that are "good enough."

Question

- **American National Bank has 1,000 customers. The manager wishes to draw a sample of 100 customers. How would this be done using systematic sampling? What impact would it have on the technique, if any, if the list were ordered by average size of deposit?**

Answer

- Using systematic sampling, a skip interval of 10 would be determined (1000/100). Every tenth person would be chosen from the list to be included in the sample. If the distribution of the banks depositors is skewed toward the wealthy or toward the very poor depositors, it would have an effect. However, since this would be representative of his customers, it might not be a problem.
- Another technique that would yield a more randomly selected sample would be to select every customer whose Social Security number ended in 7, or 4, or whatever. That would be a 10% sample. The last digit of a Social Security number is a random number.

Question

- **Do you see any problem with drawing a systematic sample from a telephone book, assuming that the telephone book is an acceptable sample from for the study in question?**

Answer

- If the book is an acceptable sample frame, then the sample would be representative. This might be the case if you are looking for populations of people who are listed in the phone book, have not moved within the last year, and no one has died.

Question

- **Describe snowball sampling. Given an example of a situation in which you might use this type of sample. Give an example of a situation in which you might use this type of sample. What are the dangers associated with this type of sample?**

Answer

- Snowball sampling procedures ask respondents to recommend other individuals who share the characteristic of interest. If you are looking for individuals who have been a victim of a particular crime, and you know there is a victim support network in the area, you might use this technique. There may be no other way to obtain the respondent's names. The danger associated with this type of sample is, of course, the bias that may occur because of the method. The sample may not be a good cross section, also respondents may be reluctant to give referrals.

Question

Identify the following sample designs:

a. The names of 200 patrons of a casino are drawn from a list of visitors for the last month and a questionnaire is administered to them.

b. A radio talk show host invites listeners to call in and vote yes or no on whether handguns should be banned.

c. A dog food manufacturer wants to test a new dog food. It decides to select 100 dog owners who feed their dog's canned food, 100 who feed their dog's dry food, and 100 who feed their dog's semi moist food.

d. A poll surveys men who play golf to predict the outcome of a presidential election.

Answer

a. Simple random sample
b. Convenience sample
c. Quota Sample
d. A faulty sample. Male golfers are not necessarily representative of the population of interest, registered voters.

Question

Under the right circumstances and all other things equal, __________ produces the most efficient samples and provides the most precise or reliable estimates for a given sample size.

a. Proportional stratified allocation
b. Disproportional stratified allocation
c. Optimal allocation
d. Disproportional Quota allocation
e. None of these

Answer

- Ans: B

Question

- A researcher invokes a pilot sample and finds that respondents from households with less than $50,000 annual income respond very differently than respondents from households with greater than $50,000 annual income, with regard to the key survey questions. In addition, the researcher's preliminary results show greater variance among respondents in the over $50,000 households. Given the preceding, which probability sampling method should the researcher invoke and why?

Answer

- When a key demographic factor is related directly to the key survey questions and objectives, and there is great variance among respondents across the demographic factors, a stratified random sample should be used. This is because stratified random samples are more statistically efficient than other types of probability sampling techniques; hence, sampling costs, which are usually linear, can be reduced.

Question

- Suppose a marketing researcher was doing a survey of snow skiers residing in South Louisiana, for the specific purpose of estimating the feasibility of offering discounted snow ski rental equipment. The idea was gauge the need, interest and price expectations of these snow skiers as they head to Colorado or some other snow skiing destination. What type of sample would be needed?

Answer

- It is plausible to assume that there will a low incidence of snow skiers in South Louisiana. Instead of surveying at random, the researcher should resort to a referral or snowball sampling technique.

Chapter Thirteen

Basic Sampling Issues

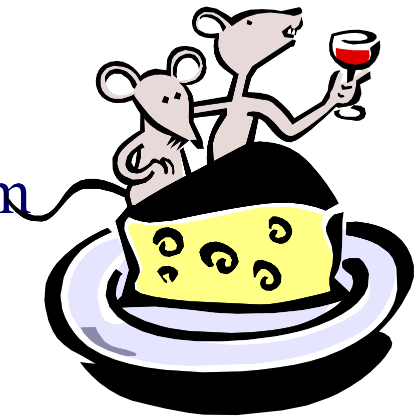
LEARNING OBJECTIVES

1. Understand the concept of sampling.
2. Learn the steps in developing a sampling plan.
3. Understand the concepts of sampling error and nonsampling error.
4. Understand the differences between probability samples and nonprobability samples.
5. Understand sampling implications of surveying over the Internet.

The Concept of Sampling

Population

The entire group of people about whom information is needed; also called the *universe* or *population of interest*.



Sampling

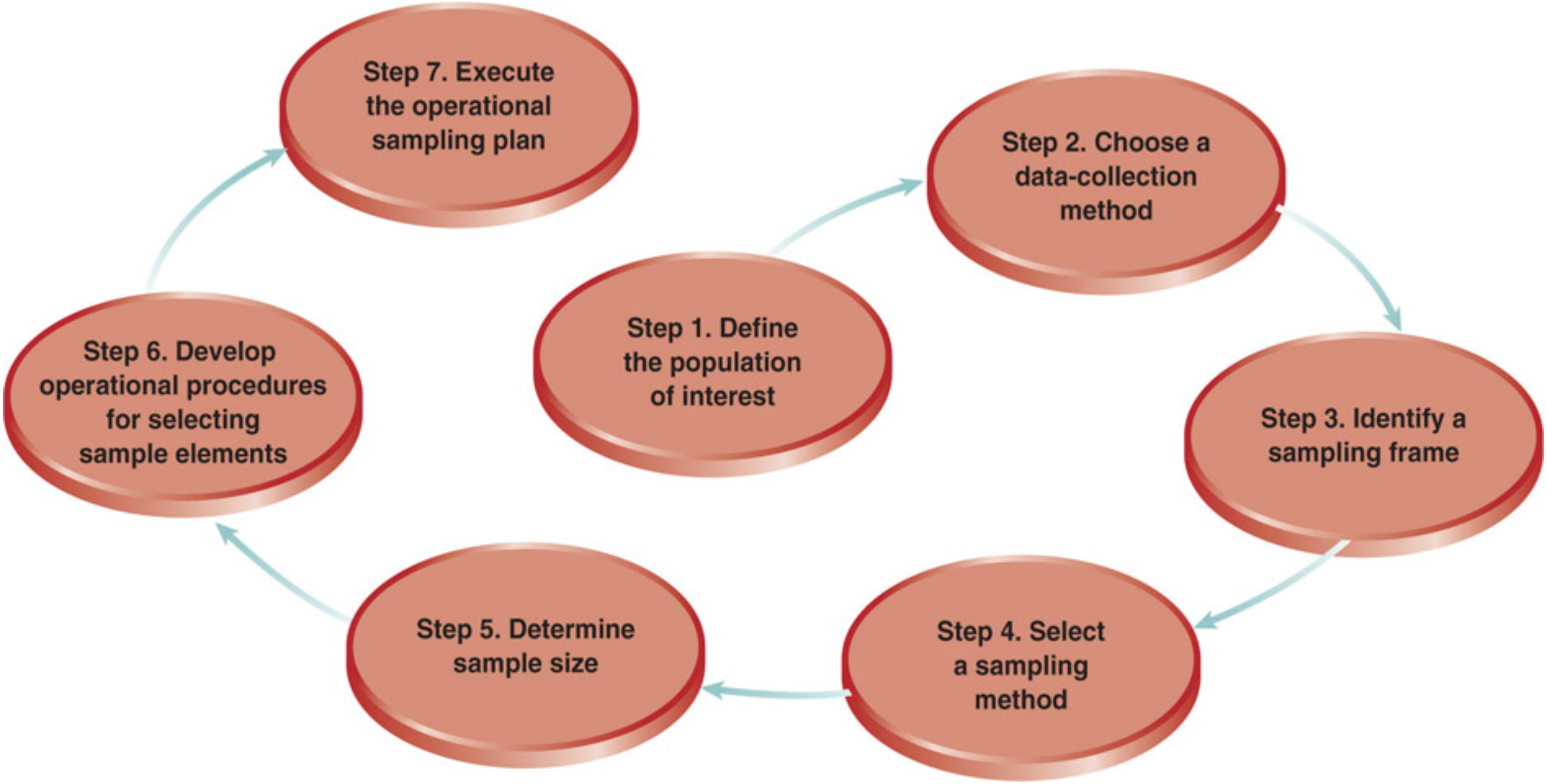
The process of obtaining information from a subset of a larger group.

Census vs. Sample

Census: Data collection from or about every member of the population of interest. Also called *canvassing* the population by asking *everyone* a set of questions.

Sample: A subset of all the members of a population of interest. Hopefully that subset is statistically representative of the general population.

Developing a Sampling Plan



Developing a Sampling Plan

1. Define the Target Population

Determine the characteristics of those you are interested in studying. Determine which group of people or entities about which you want to learn more.

2. Choose the Data Collection Method

Determine how you collect the sample - such as mail, Internet, telephone, mall intercept, etc.

3. Select the Sample Frame

A list of population elements from which units to be sampled can be selected.

Developing a Sampling Plan

4. Select the Sampling Method

Determine how you will get the sample list through probability or non-probability methods.

5. Determine the Sample Size

What is the level of accuracy you want to achieve; the time and money you have to do the survey, and the data collection method?

6. Determine Operational Procedures

This is the plan of how to go about actually choosing and interviewing the respondents.

7. Execute the Sampling Plan

Field workers must be trained to execute the sampling plan properly.

Example

Develop a sampling plan for examining undergraduate business students' attitudes toward Internet advertising.

1. Determine the population: All undergraduate students that attend the university.
2. Determine data collection method: Email or phone Survey
3. Determine the sampling frame: A list of all undergraduate students divided by rank or class level obtained from the registrar's office
4. Determine sampling method: A quota sample based on gender and class standing

Example (cont'd)

5. Determine sample size: Depending upon statistical (level of error) requirements, a number will be chosen that is representative of the population of interest.
6. Plan for Selecting Sample Elements Since a quota sample has been chosen, a proportional representation of the population of male and females, and freshmen, sophomores, juniors, seniors, and graduate students will be determined. From each subset, an adequate number of students will be chosen.
7. Execution of Sampling Plan Telephone the chosen students and collect data using a questionnaire.

1. Defining the Population of Interest

EXHIBIT 13.2	Some Bases for Defining the Population of Interest
Geographic Area	What geographic area is to be sampled? This is usually a question of the client's scope of operation. The area could be a city, a county, a metropolitan area, a state, a group of states, the entire United States, or a number of countries.
Demographics	Given the objectives of the research and the target market for the product, whose opinions, reactions, and so on are relevant? For example, does the sampling plan require information from women over 18, women 18–34, or women 18–34 with household incomes over $35,000 per year who work and who have preschool children?
Usage	In addition to geographic area and/or demographics, the population of interest frequently is defined in terms of some product or service use requirement. This is usually stated in terms of use versus nonuse or use of some quantity of the product or service over a specified period of time. The following examples of use screening questions illustrate the point: ■ Do you drink five or more cans, bottles, or glasses of diet soft drinks in a typical week? ■ Have you traveled to Europe for vacation or business purposes in the past two years? ■ Have you or has anyone in your immediate family been in a hospital for an overnight or extended stay in the past two years?
Awareness	The researcher may be interested in surveying those individuals who are aware of the company's advertising, to explore what the advertising communicated about the characteristics of the product or service.

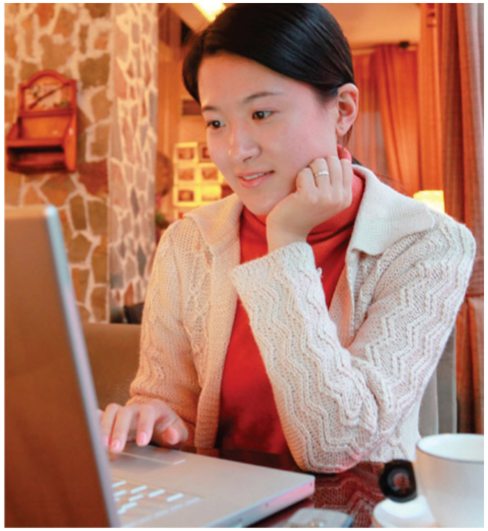
Key Terms & Definitions

2. Choose a Data Collection Method

This was discussed in the chapter on questionnaire design, also.

The sample plan will depend on the data collection method, too.

The main methods are:



- Personal, such as mall intercepts, etc.
- Telephone
- Mail or other self-administered
- Internet, blended samples

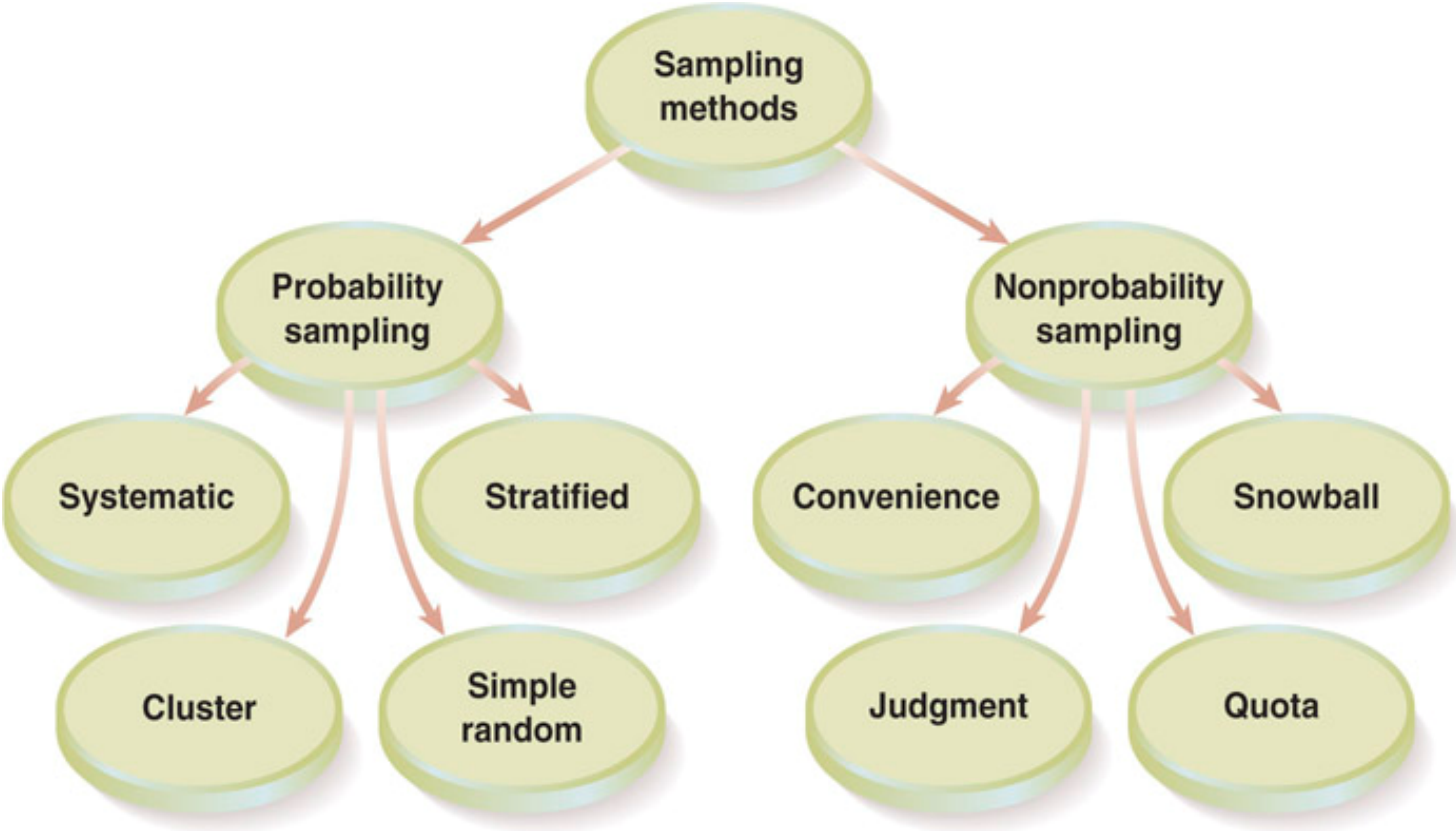
3. Identify the Sampling Frame

This is **a list of the members or elements of the population** from which units to be sampled are to be selected.

There is seldom a perfect correspondence between the sample frame and the population of interest.

Explain how a city's telephone book could be used as a sample frame of people in the city with telephones. What are the advantages and disadvantages of using that frame?

4. Sampling Methods



Probability Sampling

Simple Random

A sample selected by assigning a number to every element of the population and then using some method for randomly selecting elements to be in the sample such as random digit dialing.

$$\text{Probability of selection} = \frac{\text{Sample size}}{\text{Population size}}$$

Systematic

A sample in which the entire population is numbered and elements are selected using a skip interval – every "*nth*" name is selected.

$$\text{Skip interval} = \frac{\text{Population size}}{\text{Sample size}}$$

Simple Random

- Put 100 numbered bingo balls into a bowl (this is the population N).
- Select 10 balls from the bowl without looking(this is your sample n).

Simple random sample

The names of 200 patrons of a casino are drawn from a list of visitors for the last month and a questionnaire is administered to them.

Systematic Example

- **American National Bank has 1,000 customers. The manager wishes to draw a sample of 100 customers.**
- **How would this be done using systematic sampling?**

Example

- Using systematic sampling, a skip interval of 10 would be determined (1000/10). Every tenth person would be chosen from the list to be included in the sample.

- Another technique that would yield a more randomly selected sample would be to select every customer whose Social Security number ended in 7, or 4, or whatever. That would be a 10% sample. The last digit of a Social Security number is a random number.

Probability Sampling

Stratified

A sample that is forced to be more representative through simple random sampling of mutually exclusive and exhaustive subsets either proportionally or disproportionally. Good for data that are not normally distributed.

Stratified Sampling Allocations

Proportional Allocation:

Sampling in which the number of elements selected from a stratum is directly proportional to the size of the stratum relative to the size of the population.

Disproportional, or Optimal, Allocation:

Sampling in which the number of elements taken from a given stratum is proportional to the relative size of the stratum and the standard deviation of the characteristic under consideration.

stratified sample

- Purpose: determine the GPA of college students across the U.S.
- Population: 21 million college students.
- Sample: random sampling 4,000 students.
  - English major: 560
  - Science major: 1135
  - Computer science: 800
  - Engineering: 1090
  - Math: 415

Stratified sample

- Sample: random sampling 4,000 students.
  - English major: 560 (14%)
  - Science major: 1135 (28.4%)
  - Computer science: 800 (20%)
  - Engineering: 1090 (27.3%)
  - Math: 415 (10.4%)
- Population
  - English major: 12%
  - Science major: 28%
  - Computer science: 24%
  - Engineering: 21%
  - Math: 15%

Stratified Sample

- Population
  - English major: 12%
  - Science major: 28%
  - Computer science: 24%
  - Engineering: 21%
  - Math: 15%
- Resample
  - English major: 12% (480)
  - Science major: 28% (1120)
  - Computer science: 24% (960)
  - Engineering: 21% (840)
  - Math: 15% (600)

Stratified sample

- A researcher invokes a pilot sample and finds that respondents from households with less than $50,000 annual income respond very differently than respondents from households with greater than $50,000 annual income, with regard to the key survey questions.
- In addition, the researcher’s preliminary results show greater variance among respondents in the over $50,000 households.
- Given the preceding, which probability sampling method should the researcher invoke and why?

Stratified sample

- When a key demographic factor is related directly to the key survey questions and objectives, and there is great variance among respondents across the demographic factors, a stratified random sample should be used.
  - Two strata: <=$50000, and >$50,000
- Can use disproportionate stratified sampling:
  - More samples from household income>$50,000

Probability Sampling

Stratified

A sample that is forced to be more representative through simple random sampling of mutually exclusive and exhaustive subsets either proportionally or disproportionally. Good for data that are not normally distributed.

Cluster

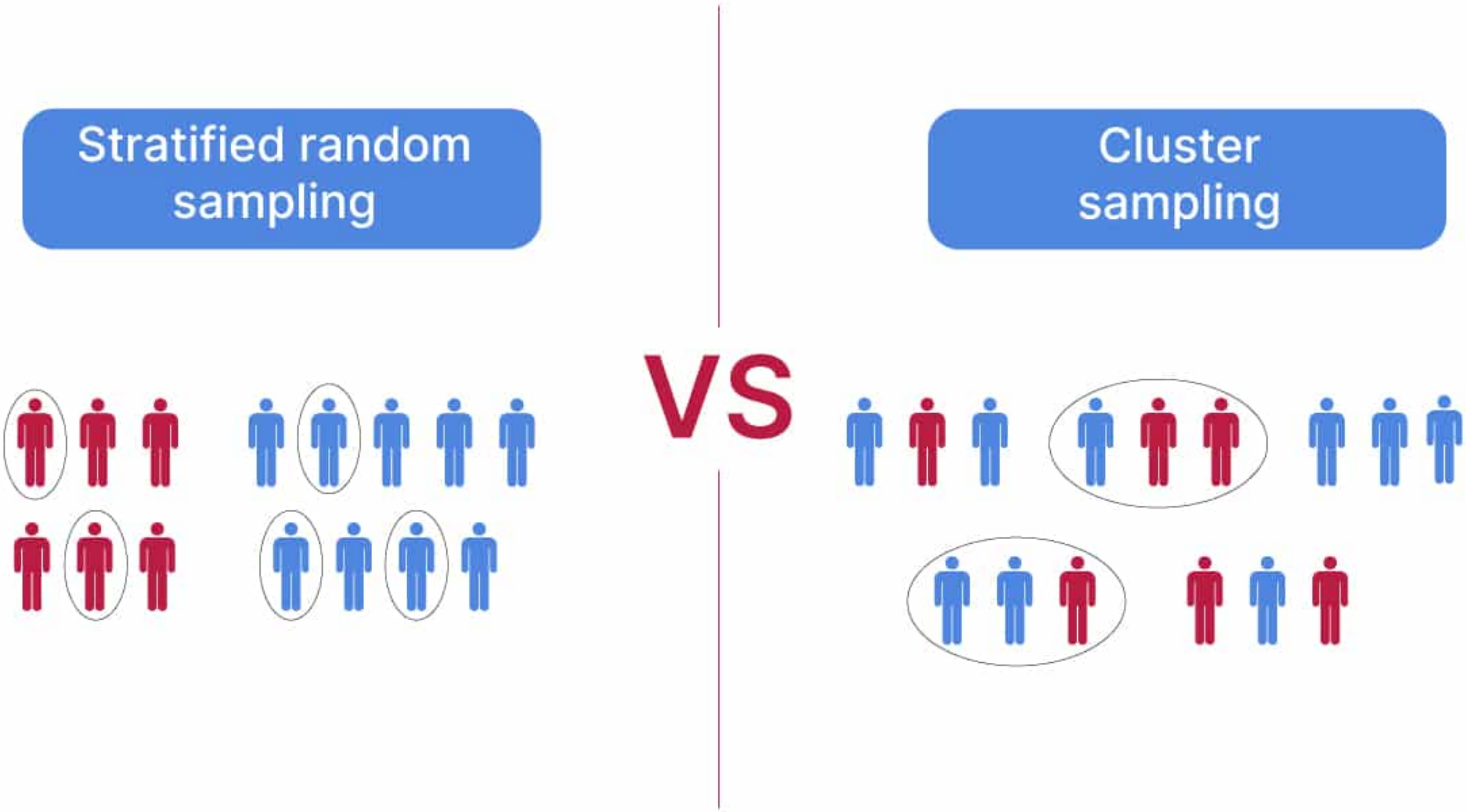
A sample in which the sampling units are selected from a number of small geographic areas to reduce data collection costs.

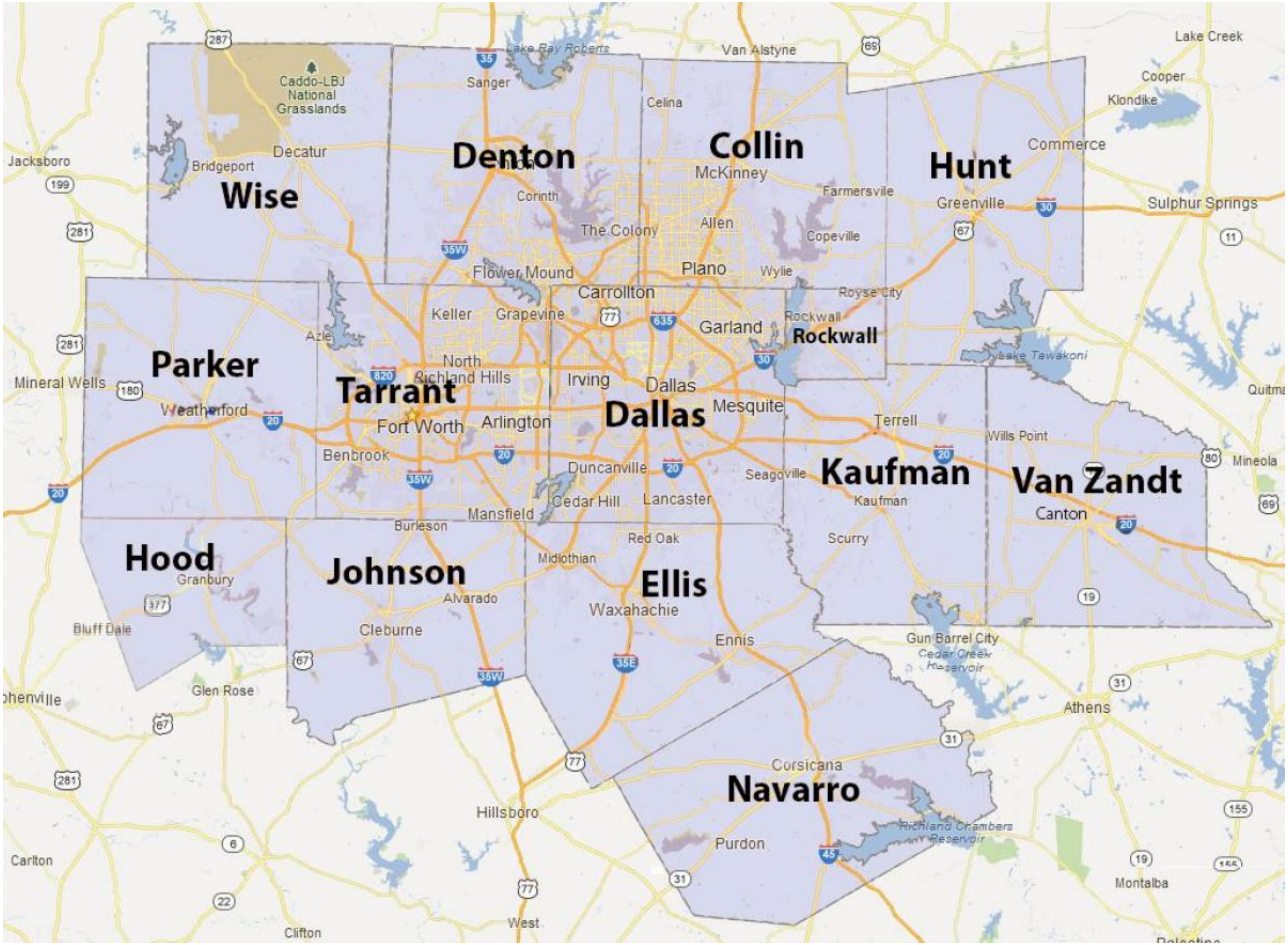
Stratified versus Cluster

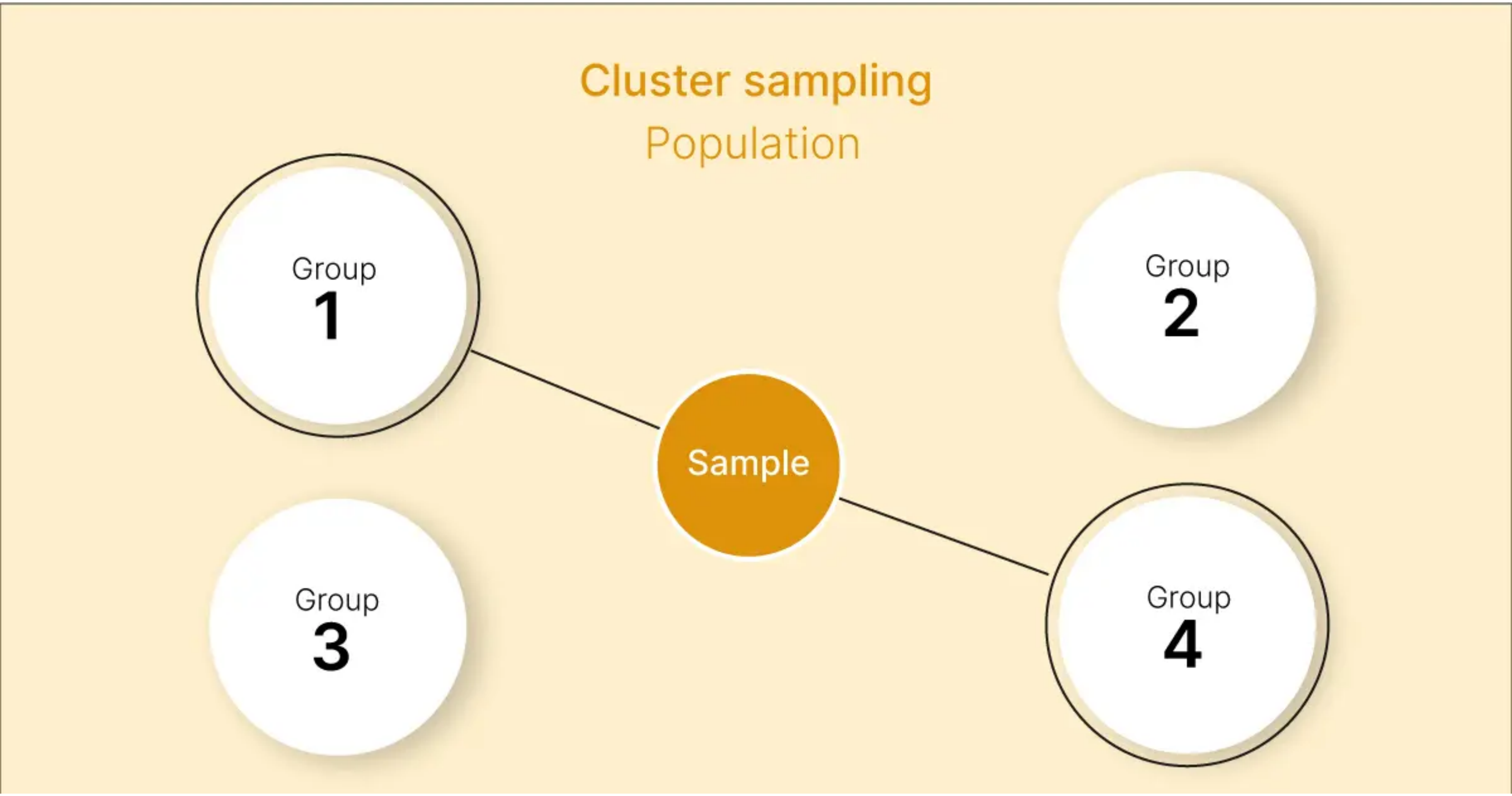
- For a stratified random sample, a population is divided into stratum, or sub-populations, before sampling.

- At first glance, the two techniques seem very similar. However, in cluster sampling the actual **cluster is the sampling unit.**

- in stratified sampling, analysis is done on **elements within each strata**.
- In cluster sampling, a researcher will only study selected clusters; with stratified sampling, a random sample is drawn from each strata.


Stratified random sampling
Cluster sampling
VS


Wise
Denton
Collin
Hunt
Parker
Tarrant
Dallas
Rockwall
Kaufman
Van Zandt
Hood
Johnson
Ellis
Navarro
Caddo-LBJ National Grasslands
Decatur
Bridgeport
Jacksboro
Sanger
Lake Ray Roberts
Van Alstyne
Celina
McKinney
Lake Creek
Cooper
Klondike
Commerce
Greenville
Sulphur Springs
Farmersville
Corinth
The Colony
Allen
Copeville
Plano
Wylie
Flower Mound
Carrollton
Royse City
Rockwall
Keller
Grapevine
Garland
Azle
North Richland Hills
Irving
Dallas
Mesquite
Lake Tawakoni
Mineral Wells
Weatherford
Fort Worth
Arlington
Terrell
Wills Point
Mineola
Benbrook
Duncanville
Seagoville
Kaufman
Cedar Hill
Lancaster
Canton
Mansfield
Burleson
Red Oak
Scurry
Midlothian
Granbury
Alvarado
Waxahachie
Bluff Dale
Cleburne
Ennis
Gun Barrel City
Cedar Creek Reservoir
Glen Rose
Athens
Corsicana
Hillsboro
Purdon
Richland Chambers Reservoir
Carlton
Montalba
Clifton
West


Cluster sampling
Population
Group 1
Group 2
Sample
Group 3
Group 4

Key Point Difference between Stratified Sampling and Cluster Sampling

Stratified Sampling

1. Elements within each stratum are sampled.
2. From each stratum, a random sample is selected.
3. Aim: to increase precision to reduce error.

Cluster Sampling

1. Only selected clusters are sampled.
2. Cluster/group is considered a sampling unit.
3. Aim: reduce cost and increase the efficiency of sampling.

Sampling and Nonsampling Error

Sampling Error

Error that occurs because the sample selected is not perfectly representative of the population.

Nonsampling Error

All error other than sampling error - also called "measurement error."

Nonprobability Sampling

Convenience

A sample based on using people who are easily accessible – such as mall intercepts or other high traffic locations.

Judgment

A sample in which the selection criteria are based on the researcher's personal judgment about the representativeness of the population under study. The researcher selects who should be in the study.

Nonprobability Sampling

Quota

A sample in which quotas, based on demographic or classification factors selected by the researcher, are established for population subgroups.

Snowball

A sample in which additional respondents are selected based on referrals from initial respondents.

Convenience Example

A radio talk show host invites listeners to call in and vote yes or no on whether handguns should be banned.

Judgement Sampling Example

- What it takes for American youths to graduate from high school by age 14, instead of the typical graduation age of 18 years old.

- A random sample? No
  - That includes a significant amount of youths that are on track to graduate at the traditional age of 18 years old.

- Focus only on the members of the population that fit the criteria.

- Judgment sampling is the only viable option.

Quota Example

A dog food manufacturer wants to test a new dog food.

It decides to select:

1. **100 dog owners who feed their dog’s canned food,**
2. **100 who feed their dog’s dry food,**
3. **and 100 who feed their dog’s semi moist food.**

Snowball Sampling

- Looking for individuals who have been a victim of a particular crime
- A victim support network in the area.
- There may be no other way to obtain the respondent’s names.
- The danger:
  - The sample may not be a good cross section
  - Respondents may be reluctant to give referrals.

Snowball Sampling

- Doing a survey of snow skiers residing in South Louisiana
- Purpose: estimating the feasibility of offering discounted snow ski rental equipment.
- The idea: gauge the need, interest and price expectations of these snow skiers as they head to Colorado or some other snow skiing destination.
- What type of sample would be needed?

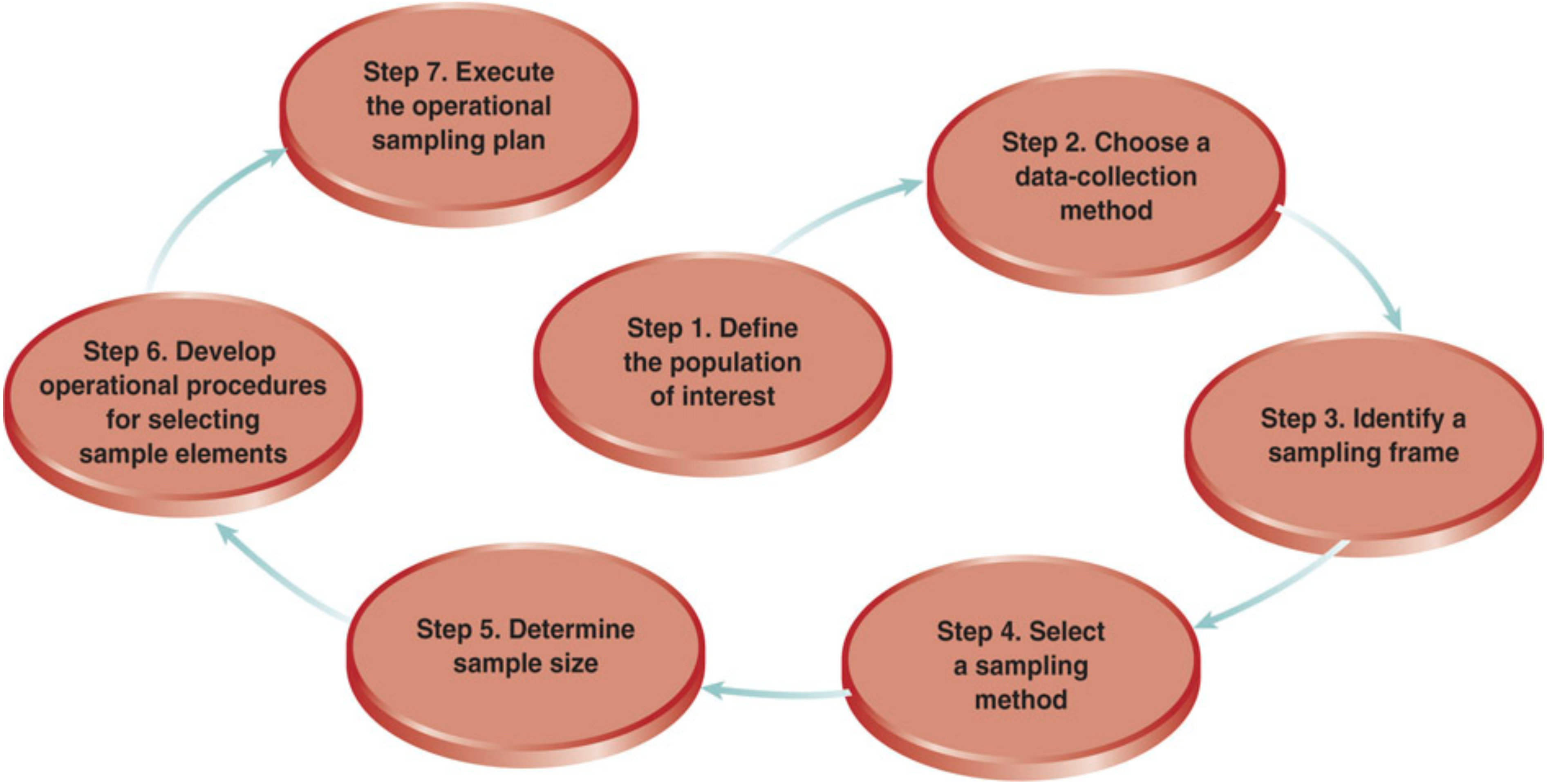
Snowball Sampling

- It is plausible to assume that there will a low incidence of snow skiers in South Louisiana. Instead of surveying at random, the researcher should resort to a referral or snowball sampling technique.

Systematic sample, cluster sample, and stratified sample

- A systematic sampling procedure uses **a skip interval** which is calculated by dividing the total population by the sample size.
- A cluster sampling method considers groups of people in a particular geographical region.
  - For example, a cluster sample could be used in retail trade analysis where a geographic area is clustered on a specific criterion (street boundaries). A specific number of clusters are randomly chosen. Then respondents are chosen randomly within each cluster either by a simple random scheme or a systematic sampling scheme.
- A stratified sampling procedure divides a population by specific strata (some demographic characteristic pertinent to the population of interest) then people are chosen randomly within each stratum, usually proportionate to the total number of people in each stratum.

Developing a Sampling Plan



5. Determine the Sample Size

Determine the Sample Size

Determining the sample size will be based on factors such as the level of accuracy you want to achieve, the time and money you have to do the survey, and on the sampling collection method.

The actual size could be determined by a formula or by some rule of thumb based on experience.

6. Develop Operational Procedures

Select Sample Units

Your operational plan to conduct the probability or non- probability sampling. Determine the phases of the sample selection process. Multi-stage sampling involves combining sampling methods.

For probability sampling, these instructions need to be detailed, clear, and unambiguous and should eliminate any interviewer discretion regarding the selection of specific sample elements.

7. Execute the Plan

Conduct Fieldwork

The execution phase of the research. Administering the questionnaire - sending the mailers, making the phone calls, conducting the mall intercepts, etc.

As mentioned in the last slide, if a probability sample is used, the instructions need to be followed to the letter. Good training and supervision of fieldwork personnel (if they are used) is of utmost importance.

Internet Sampling

Pros

- Target respondents can complete the survey at their convenience.
- Data collection is inexpensive.
- Survey software can facilitate the data collection process.
- The survey can be completed quickly.

Cons

- Sample might not be representative of the population.
- You cannot always be sure who is completing the survey.
- Maintaining respondent confidentially can be a challenge.
- Data security issues can be difficult to manage.

Chapter Fourteen

Sample Size Determination

LEARNING OBJECTIVES

1. Discover methods for determining sample size.
2. Gain an appreciation of a normal distribution.
3. Understand population, sample, and sampling distributions.
4. Understand how to compute the sampling distribution of the mean.
5. Learn how to determine sample size.
6. Understand how to determine statistical power.

Sample Size for Probability Sampling

Census:

- Population canvas - not really a “sample”
- Asking the entire population

Budget Available:

- how much can we afford?
- budget=$20, 000, each survey=$20

Rule of Thumb:

- Is there some convention we can apply?
- Experience based.

Sample Size for Probability Sampling

Number of Subgroups Analyzed:

- 50% of male and 50% of female
- Do we get enough size for each subgroup?

Traditional Statistical Methods:

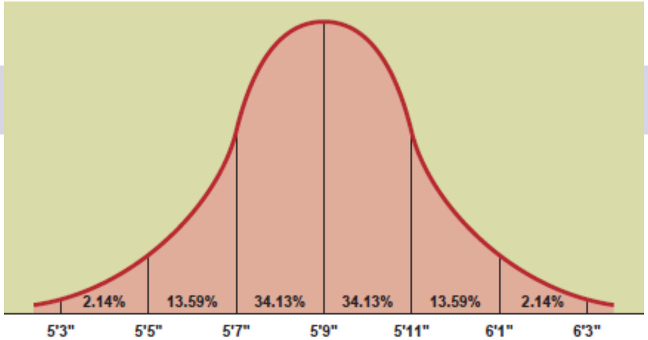
Variance, standard deviation, and confidence interval play a key role.

The Normal Distribution

Central Limit Theorem:

The idea that a distribution of a large number of sample means or sample proportions will approximate a normal distribution - regardless of the distribution of the population from which they were drawn.

Normal Distribution:

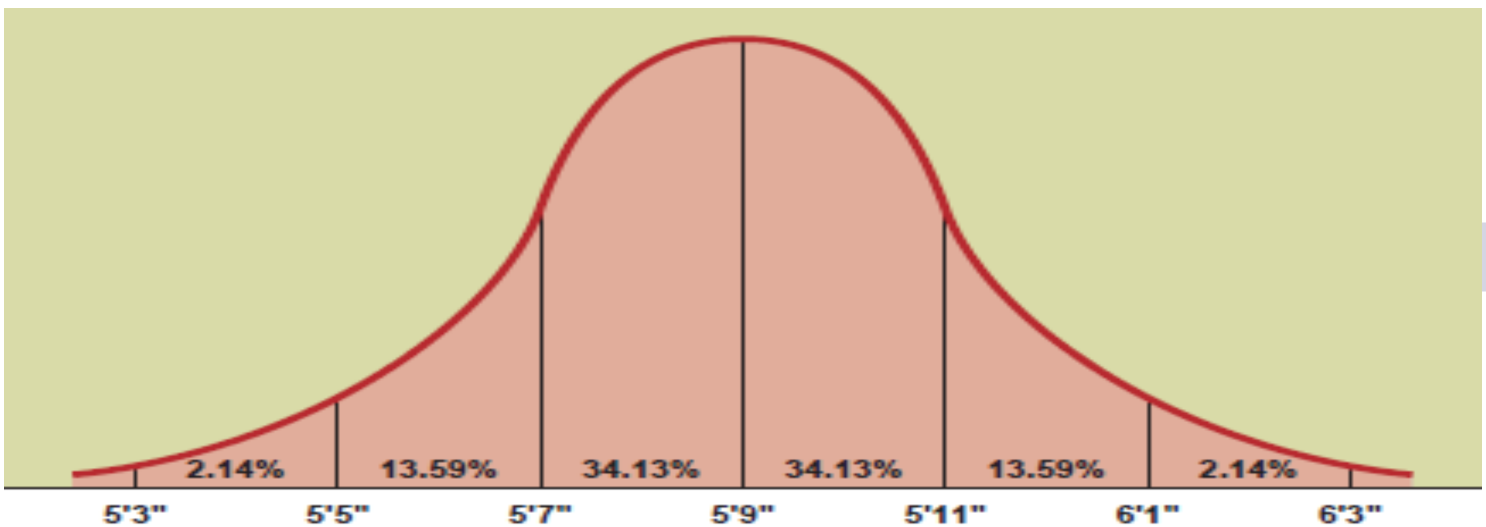


•Bell shaped
•Symmetrical about the mean.
•The mean, median, and mode are equal.
•Finally, about 68% of the observations are within one standard deviation plus/minus of the mean, 96% are within two standard deviations, and 99+% are within three standard deviations of the mean respectively.

The Normal Distribution

Proportionate Properties of the Normal Distribution:

A feature that the number of observations falling between the mean and a given number of standard deviations from the mean is the same for all normal distributions.



Question

- If we were making inferences from a single sample, we would expect that there would be a _____ percent probability that the sample mean or proportion generated from our sample results would be within two standard errors of the true population mean.

A. 68.26%
B. 99.74%
C. 97.5%
D. 95.44%
E. 98.00%

The Normal Distribution

Standard Deviation:

The measure of dispersion calculated by subtracting the mean of the series from each value in a series, squaring each result, summing the results, dividing the sum by the number of observations minus 1 and finally taking the square root of this value.

$$\text{Standard Deviation} = \sqrt{\frac{\text{sum } (X_1 - \bar{X})^2}{(N-1)}}$$

Population and Sampling Distribution

Population Distribution:

The frequency distribution of all the elements of a population.

μ σ

Sampling Distribution:

The frequency distribution of all the elements of an individual sample.

$\bar{X}$ S

Sampling Distribution of the Mean

Sampling Distribution of the Mean:

The theoretical frequency distribution of the means of all possible samples of a given size drawn from a particular population; it is normally distributed.

$$S_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

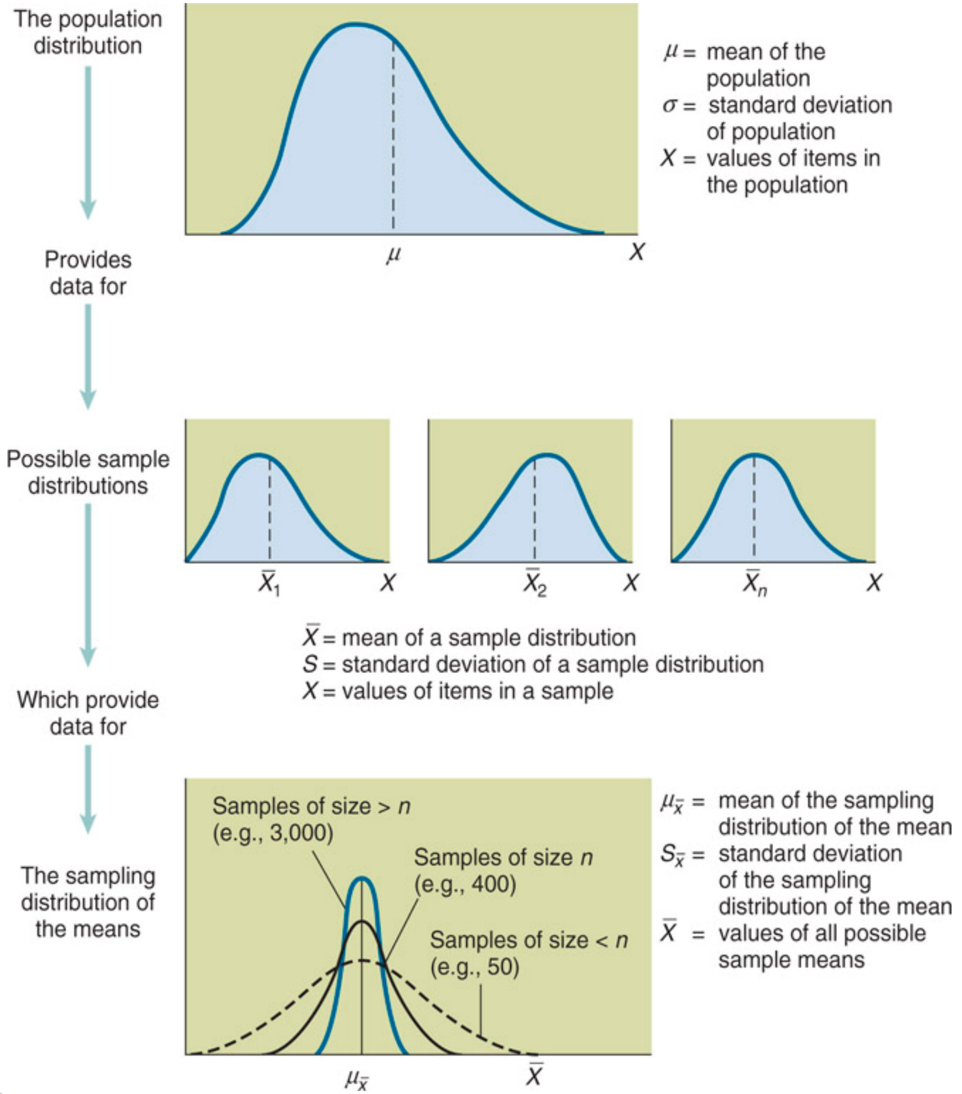
Standard Error of the Mean

Standard Error of the Mean:

Standard deviation of a distribution of sample means.

EXHIBIT 14.4	Notation for Means and Standard Deviations of Various Distributions	
Distribution	**Mean**	**Standard Deviation**
Population	μ	σ
Sample	$\bar{X}$	S
Sampling	$\mu_{\bar{X}} = \mu$	$S_{\bar{x}}$

Relationships of the Three Basic Types of Distribution



Standard Error of the Mean

- 1000 consumers:
  - number of time eating in a restaurant in last month
- Draw a size of 200 from the 1000 consumers. Draw 100 times.
- Each time, we get a mean number of a 200 customers, the mean is : $\bar{x}_1, \bar{x}_2, \bar{x}_3, \ldots, \bar{x}_{100}$
-
- The standard deviation of the above sample means:
  - standard error of the mean
  - Following a normal distribution

Example

Standard error of the mean is:

a. a measure of dispersion of a large population.

b. a measure of dispersion of large sample.

c. the standard deviation of a distribution of sample means.

d. the error in the computation of population standard deviation.

e. none of these

Sampling Distribution of the Proportion

Sampling Distribution of the Proportion:

The relative frequency distribution of the sample proportions of many random samples of a given size drawn from a particular population; it is normally distributed.

$$S_p = \sqrt{\frac{P(1-P)}{n}}$$

where S_p = standard error of sampling distribution of proportion

P = estimate of population proportion

n = sample size

Sampling Distribution of the Proportion

- Estimating the percentage of all adults who have accessed Twitter in the past 90 days.
- Select 1,000 random samples of size 200 from the population of all adults.
- Compute the proportion of all adults who have accessed Twitter in the past 90 days for all 1,000 samples.
- The mean proportion for all possible samples is equal to the

$$S_p = \sqrt{\frac{P(1-P)}{n}}$$

where S_p = standard error of sampling distribution of proportion

P = estimate of population proportion

n = sample size

Sampling Distribution of the Proportion

- Each sample of size 200 provides the proportion of all adults who have accessed Twitter in the past 90 days.

$$P_1, P_2, P_3, \ldots, P_{1000}$$

- The mean proportion for all possible samples is equal to the population proportion.
- $$Mean(P_1, P_2, P_3, \ldots, P_{1000}) = P$$

$$n = 200$$

$$S_p = \sqrt{\frac{P(1 - P)}{n}}$$

where S_p = standard error of sampling distribution of proportion
P = estimate of population proportion
n = sample size

Determining the Sampling Size

Problems Involving Mean:

$$n = \frac{Z^2\sigma^2}{E^2}$$

where Z = level of confidence expressed in standard errors
σ = population standard deviation
E = acceptable amount of sampling error

Three pieces of information are needed to compute the sample size required:

1. The acceptable or allowable level of sampling error E.
2. The acceptable level of confidence Z. In other words, how confident does the researcher want to be that the specified confidence interval includes the population mean?
3. An estimate of the population standard deviation σ.

Determining the Sampling Size

1. Allowable Sampling Error:

Amount of sampling error the researcher is willing to accept, E.

2. The Acceptable Level of Confidence:

How confident does the researcher want to be that an interval includes the population mean, *Z*.

3. Population Standard Deviation:

Standard deviation of a variable for the entire population, σ.

Example

- **You are in charge of planning a chili cook-off. You must make sure that there are plenty of samples for the patrons of the cook-off.**
- **The following standards have been set: a confidence level of 99 percent and an error of less than 2 ounces per cooking team. Last year's cook-off had a standard deviation in amount of chili cooked of 3 ounces. What is the necessary sample size?**

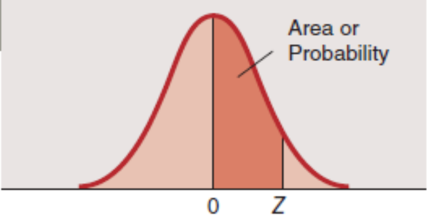
Answer

$$n = \frac{z^2\sigma^2}{E^2} = \frac{2.6^2 * 3^2}{2^2} = 15.21$$

- Z=2.6 for confidence level of 99 percent
  - i.e., 2.6 standard errors are required to take in 99% of the area under a normal curve. See appendix one in the end of text book-Exhibit 2.
- Thus, a sample of 16 is needed. A sample of 30 will allow more powerful analysis.
- .99/2=.495 $\longrightarrow$ z=2.6
- Z=2.6, area=.4953*2=.9906
- Z=2.59, area=.4952*2=.9904
- Z=2.61, area=.4955*2=.9910

EXHIBIT 2 Standard Normal Distribution: Z-values

Entries in the table give the area under the curve between the mean and Z standard deviations above the mean. For example, for $Z = 1.25$, the area under the curve between the mean and Z is .3944.



Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974

Determining the Sampling Size

Problems Involving Proportions:

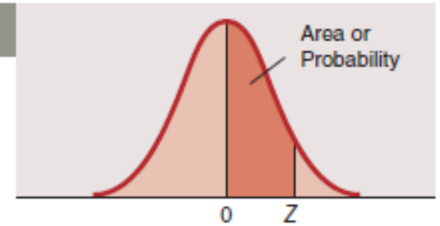
$$n = \frac{Z^2[p(1-p)]}{E^2}$$

Problems Involving Proportions

- A researcher wants to estimate the percentage of all adults that have used the Internet to seek pre-purchase information in the past 30 days, with a tolerable sampling error (E) of **0.03** and a confidence level of **97.5%**. If secondary data indicated that **25%** of all adults had used the Internet for such a purpose, what is the sample size?
- .975/2=.4875

EXHIBIT 2 Standard Normal Distribution: Z-values

Entries in the table give the area under the curve between the mean and Z standard deviations above the mean. For example, for $Z = 1.25$, the area under the curve between the mean and Z is .3944.



Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
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.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936

Determining the Sampling Size

$$z = 2.24,$$

$$0.4875 * 2 = .975$$

Determining the Sampling Size

$$n = \frac{Z^2[p(1-p)]}{E^2}$$

$$= \frac{2.24^2[.25*(1-.25)]}{0.03^2}$$

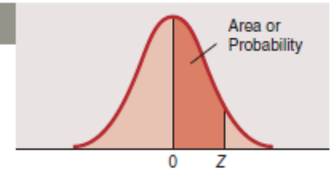
$$= 1046$$

Example

- **Assume that previous fast-food research has shown that 80 percent of the consumers like curly French fries. The researcher wishes to have an error of 6 percent or less and be 95 percent confident of an estimate to be made about curly French fry consumption from a survey. What sample size should be used for a simple random sample?**
- .95/2=.475

EXHIBIT 2 **Standard Normal Distribution: *Z*-values**

Entries in the table give the area under the curve between the mean and Z standard deviations above the mean. For example, for $Z = 1.25$, the area under the curve between the mean and Z is .3944.



Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4986	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Answer

$$n = \frac{z^2[p(1-p)]}{E^2} = \frac{1.96^2\left[.8(1-.8)\right]}{.06^2} = 170.7378$$

- Where z=1.96,p=.8, 1-p=1-.8, E=0.06
- Thus, a sample size of 171 subjects is needed.

How Many Contacts?

You need to contact more than n, since it's unlikely that everyone you contact will agree to answer the questionnaire. If you determine that you need 800 respondents and a typical response rate for your type of survey is 30%, then you would actually have to contact 2,667 people to get 800 completed surveys.

Number of Contacts = n/.30
Or
800/.3
Number of Contacts = 2,667

You must contact approximately 2,667 people (with 30% response rate), so you can expect 800 people to respond (the final sample size).

Example

- **A marketing researcher must determine how many telephone numbers she needs to order from a sample provider to complete a survey of ATM users.**
- **The goal is to complete 400 interviews with ATM users.**
- **From past experience, she estimates that 60 percent of the phone numbers provided will be working phone numbers. The estimated incidence rate (percentage of people contacted who are ATM users) is 43 percent. Finally, she estimates from previous surveys that 35 percent of the people contacted will agree to complete the survey. How many telephone numbers should she order?**

Answer

- $400 = (.6 * .43 * .35)*n$. Thus, $n = 4{,}430$ telephone numbers.

Sample Questions

Which of the following statements about sample size is false?

a)There is no direct relationship between population size and the size of the sample required to estimate population parameters.

b)The larger the sample variance, the larger the sample size that is required.

c)The higher the level of confidence, the larger the sample size that is required.

d)The larger the population, the larger the sample size that is required.

e)All of these statements are false.

Chapter Fourteen Q & A

Sample Size Determination

LEARNING OBJECTIVES

1. Discover methods for determining sample size.
2. Gain an appreciation of a normal distribution.
3. Understand population, sample, and sampling distributions.
4. Understand how to compute the sampling distribution of the mean.
5. Learn how to determine sample size.
6. Understand how to determine statistical power.

Question

- **Discuss and give examples of three methods that are used in marketing research for determining sample size.**

Answer

- The first method is the budget available. If the project has a total budget for data collection of $20,000 and each survey administered costs $20, then the sample size can be no larger than 1,000 people.
- The second method is the rule of thumb. This is the case where the sample size is some given number, usually determined by the research client. The client probably has chosen that number because of experience with a previous research project.
- The third method is the traditional statistical method where statistical formulas are used to determine the sample size under given variance, level of confidence, and desired error levels.

Question

- **A market researcher analyzing the fast-food industry noticed the following: The average amount spent at a fast-food restaurant in California was \$3.30, with a standard deviation was \$0.40. Yet in Georgia, the average amount spent at a fast-food restaurant was \$3.25 with a standard deviation of \$0.10. What do these statistics tell us about fast-food consumption expenditures in these two states?**

Answer

- Although the average spent at fast food restaurants in the two states was close, the dispersion was not. This means that the prices paid in California vary more than the prices paid in Georgia.

Question

- **Assume that previous fast food research has shown that 80 percent of the consumers like curly French fries. The researcher wishes to have an error of 6 percent or less and be 95 percent confident of an estimate to be made about curly French fry consumption from a survey. What sample size should be used for a simple random sample?**

Answer

$$n = \frac{z^2[p(1-p)]}{E^2} = \frac{2^2\left[.8(1-.8)\right]}{.06^2} = 177.8$$

- Where z=2,p=.8, 1-p=1-.8, E=0.06

- Thus, a sample size of 178 subjects is needed.

Question

- **You are in charge of planning a chili cook-off. You must make sure that there are plenty of samples for the patrons of the cook-off. The following standards have been set: a confidence level of 99 percent and an error of less than 4 ounces per cooking team. Last year's cook-off had a standard deviation in amount of chili cooked of 3 ounces. What is the necessary sample size?**

Answer

$$n = \frac{z^2\sigma^2}{E^2} = \frac{2.6^2 * 3^2}{4^2} = 15.21$$

- Z=2.6 for confidence level of 99 percent
  - i.e., 2.6 standard errors are required to take in 99% of the area under a normal curve. See appendix one in the end of text book-Exhibit 2.
- Thus, a sample of 16 is needed. A sample of 30 will allow more powerful analysis.

Question

- **Based on a client's requirements of a confidence interval of 99.74 percent and acceptable sampling error of 2 percent, a sample size of 500 was calculated. The cost to the client is estimated at $20,000. The client replies that the budget for this project is $17,000. What are the alternatives?**

Answer

- The sample size will have to be reduced to fit the budget, and the client will have to accept a lower confidence interval. Or, the sample size will remain the same, and the client will have to increase the budget by $3,000.

Question

- **A marketing researcher must determine how many telephone numbers she needs to order from a sample provider to complete a survey of ATM users. The goal is to complete 400 interviews with ATM users. From past experience, she estimates that 60 percent of the phone numbers provided will be working phone numbers. The estimated incidence rate (percentage of people contacted who are ATM users) is 43 percent. Finally, she estimates from previous surveys that 35 percent of the people contacted will agree to complete the survey. How many telephone numbers should she order?**

Answer

- $400 = (.6 * .43 * .35)X$. Thus, $X = 4{,}430$ telephone numbers.

Question

If we were making inferences from a single sample, we would expect that there would be a ____ percent probability that the sample mean or proportion generated from our sample results would be within two standard errors of the true population mean.

a) 68.26%

b) 99.74%

c)97.5%

d)95.44%

e)98.00%

Answer

- Ans: D

Question

When a research company routinely uses samples of 300 for their studies, they are using which type of plan to determine sample size?

a) the 50% rule

b) budget available

c) rule of thumb

d) number of subgroups to be analyzed

Answer

- Ans: C

Question

As the level of tolerable error increases in the sample means formula, the sample size required to represent a particular population is:

a) smaller

b) larger

c) about the same

d) none of these

Answer

- Ans: A

Question

____________ sampling error is the amount of sampling error the researcher is willing to accept.

a. Given
b. Projected
c. Accepted
d. Allowable
e. Tolerable

Answer

- Ans: E

Question

Statistical power is the probability of not making which of the following types of error?

a) Type I
b) Type II
c) Type III
d) Type A
e) Type B

Answer

- Ans: B

Question

- A researcher wants to estimate a population mean. The level of tolerable sampling error is **0.2** of a purchase occasion, with a confidence level of **95.44%.** If the estimated population variance is **5** for the most important question in the study, what is the desired sample size?

Answer

Ans: 1) at 95.44% confidence, Z = 2

2) sample means formula is appropriate

3) Variance = 5

4) Tolerable Error = .2

5) Computed Sample size of 500

n=(4*5/0.2^2)=500

Chapter Fifteen

Data Processing And Fundamental Data Analysis

LEARNING OBJECTIVES

1. Get an overview of the data analysis procedure.
2. Understand validation and editing.
3. Learn how to code questions in surveys.
4. Understand the process of data entry so that information can be read by a computer.
5. Understand the importance of cleaning questionnaires so that they are free of errors.
6. Be familiar with tabulation and statistical analysis.
7. Gain insight into the graphic representations of data.
8. Comprehend descriptive statistics.

Overview of the Data Analysis Procedure

The Key Steps:

1	2	3	4	5
Validation & Editing	Coding	Data Entry	Logical Cleaning of Data	Tabulation & Statistical Analysis

Overview of the Data Analysis Procedure

Step One:

- ***Validation:*** Process of ascertaining that interviews actually were conducted as specified.
- ***Editing:*** Process of ascertaining that questionnaires were filled out properly and completely.
- ***Skip Pattern:*** Sequence in which later questions are asked, based on a respondent's answer to an earlier question or questions.

Step Two:

- ***Coding:*** Process of grouping and assigning numeric codes to the various responses to a question.

Step Three:

- ***Data Entry:*** Process of converting information to an electronic format.
- ***Intelligent Data Entry:*** Form of data entry in which the information being entered into the data entry device is checked for internal logic.
- ***Scanning:*** Form of data entry in which responses on questionnaires are read in automatically by the data entry device.

Skip Pattern

- "If MALE, go to question 3; if FEMALE, go to Question 4."

Question

An interviewer, completed 50 questionnaires.

Further validation: Ten of the questionnaires.

A) Claimed age category was 30-40,

Marked category was 20-30.

B) "What is the most important problem facing our city government?"

1. **"The city council is too eager to raise taxes." (interviewer wrote)**
2. **In validation, "The city tax rate was too high." (response from the respondent)**

•As a valuator would you assume that these were honest mistakes and accept the entire lot of 50 interviews as valid? If not, what would you do?

Answer

- The error on the first questionnaire may have simply been a missed stroke of the pencil or computer.
- The second mistake, which is a completely different answer with similar content, gives cause for more concern.
- Check another ten questionnaires to see if more mistakes crop up. It may be that all the questionnaires should be validated.

Overview of the Data Analysis Procedure

Step Four:

- ***Clean the Data:*** Check for data entry errors or data entry inconsistencies.
- ***Logical or Machine Cleaning:*** Final computerized error check of data.
- ***Error Check Routines:*** Computer programs that accept instructions from the user to check for logical errors in the data.
- ***Marginal Report:*** Computer-generated table of the frequencies of the responses to each question, used to monitor entry of valid codes and correct use of skip patterns.

Step Five:

- ***Data Analysis –*** *e.g. One Way Frequency Tables:* Table showing the number of respondents choosing each answer to a survey question.
- ***Cross Tabulation Tables -*** Examination of the responses to one question relative to the responses to one or more other questions.

EXHIBIT 15.3 Sample of Responses to Open-Ended Question

Question: Why do you drink that brand of beer? (BRAND MENTIONED IN ANSWER TO PREVIOUS QUESTION)

Sample responses:

1. Because it tastes better.
2. It has the best taste.
3. I like the way it tastes.
4. I don't like the heavy taste of other beers.
5. It is the cheapest.
6. I buy whatever beer is on sale. It is on sale most of the time.
7. It doesn't upset my stomach the way other brands do.
8. Other brands give me headaches. This one doesn't.
9. It has always been my brand.
10. I have been drinking it for over 20 years.
11. It is the brand that most of the guys at work drink.
12. All my friends drink it.
13. It is the brand my wife buys at the grocery store.
14. It is my wife's/husband's favorite brand.
15. I have no idea.
16. Don't know.
17. No particular reason.

The Coding Process

EXHIBIT 15.4 Consolidated Response Categories and Codes for Open-Ended Responses from Beer Study

Response Category Descriptor	Response Items from Exhibit 14.1 Included	Assigned Numeric Code
Tastes better/like taste/tastes better than others	1, 2, 3, 4	1
Low/lower price	5, 6	2
Does not cause headache, stomach problems	7, 8	3
Long-term use, habit	9, 10	4
Friends drink it/influence of friends	11, 12	5
Wife/husband drinks/buys it	13, 14	6

QUESTION: How do you think the taste of Pepsi compares with Coca Cola?

Responses: The taste of Pepsi was

1) Better
2) Sweeter
3) Too sweet
4) Not as refreshing
5) More refreshing
6) Sweeter is better
7) Bolder taste
8) They taste about the same
9) I don’t know
10) I don’t have any idea
11) I don’t drink soft drinks
12) Soft drinks are not good for you
13) Not a refreshing as Coca Cola
14) Coca Cola has always been my favorite brand

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12) Soft drinks are not good for you
13) Not as refreshing as Coca Cola
14) Coca Cola has always been my favorite brand

One Way Frequency Tables

EXHIBIT 15.8 **One-Way Frequency Table Using Three Different Bases for Calculating Percentages**

Q.35 Why would you not consider going to Saint Paul for hospitalization?

	Total* Respondents	Total Asked	Total Answering
Total	300	64	56
	100%	100 %	100%
They aren't good/service poor			
	18	18	18
Saint Paul doesn't have the services/equipment that Minneapolis does	6%	28 %	32%
	17	17	17
Saint Paul is too small	6%	27 %	30%
	6	6	6
Bad publicity	2%	9 %	11%
	4	4	4
Other	1%	6 %	7%
	11	11	11
Don't know/no response	4%	17 %	20%
	8	8	
	3%	13 %	

*A total of 300 respondents were surveyed. Only 64 were asked this question because in the previous question those respondents said they would not consider going to Saint Paul for hospitalization. Only 56 respondents gave an answer other than "Don't know."

Key Terms & Definitions

Cross Tabulations Examples

EXHIBIT 15.10 Sample Cross Tabulation

Q.30 If you or a member of your family were to require hospitalization in the future, and the procedure could be performed in Minneapolis or Saint Paul, where would you choose to go?

	Age				
	Total	18–34	35–54	55–64	65 or Over
Total	300 100%	65 100%	83 100%	51 100%	100 100%
To a hospital in Saint Paul	144 48.0	21 32.3%	40 48.2%	25 49.0%	57 57.0%
To a hospital in Minneapolis	146 48.7%	43 66.2%	40 48.2%	23 45.1%	40 40.0%
Don't know/no response	10 3.3%	1 1.5%	3 3.6%	3 5.9%	3 3.0%

Key Terms & Definitions

Cross Tabulations Examples

EXHIBIT 15.11 Cross-tabulation Table with Column, Row, and Total Percentages*

Q.34 To which of the following towns and cities would you consider going for hospitalization?

	Total	Male	Female
Total	300	67	233
	100.0%	100.0%	100.0%
	100.0%	22.3%	77.7%
	100.0%	22.3%	77.7%
Saint Paul	265	63	202
	88.3%	94.0%	86.7%
	100.0%	23.6%	76.2%
	88.3%	21.0%	67.3%
Minneapolis	240	53	187
	80.0%	79.1%	80.3%
	100.0%	22.1%	77.9%
	80.0%	17.7%	62.3%
Bloomington	112	22	90
	37.3%	32.8%	38.6%
	100.0%	19.6%	80.4%
	37.3%	7.3%	30.0%

*Percentages listed are column, row, and total percentages, respectively.

Cross Tabulations Examples

EXHIBIT 15.11 Cross-tabulation Table with Column, Row, and Total Percentages*

Q.34 To which of the following towns and cities would you consider going for hospitalization?

	Total	Male	Female
Total	300	67	233
	100.0%	100.0%	100.0%
	100.0%	22.3%	77.7%
	100.0%	22.3%	77.7%
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	88.3%	94.0%	86.7%
	100.0%	23.6%	76.2%
	88.3%	21.0%	67.3%
Minneapolis	240	53	187
	80.0%	79.1%	80.3%
	100.0%	22.1%	77.9%
	80.0%	17.7%	62.3%
Bloomington	112	22	90
	37.3%	32.8%	38.6%
	100.0%	19.6%	80.4%
	37.3%	7.3%	30.0%

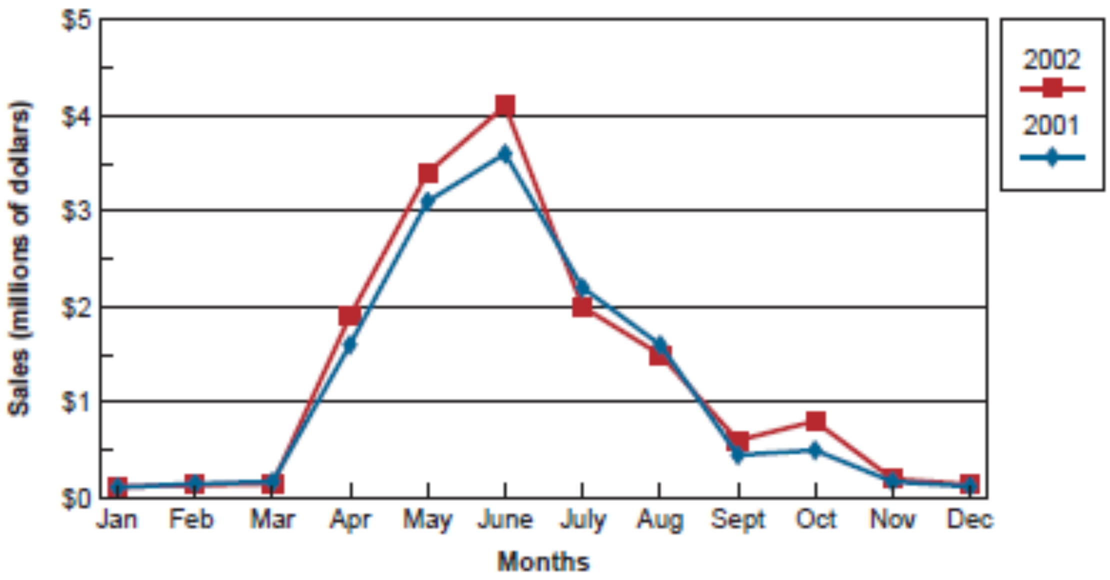
*Percentages listed are column, row, and total percentages, respectively.

- Among all male respondents, 94%-Saint Paul, 79.1%-Minneapolis, 32.8% - Bloomington
- Among all female respondents, 86.7%-Saint Paul, 80.3%-Minneapolis, 38.6% - Bloomington

Graphic Representations of Data

Line Charts:

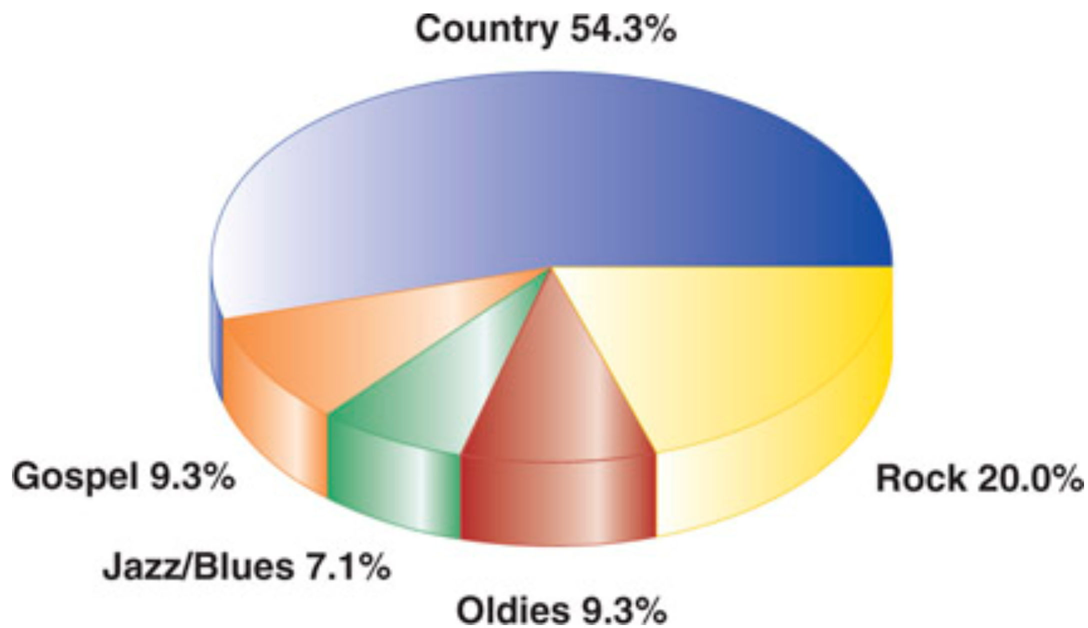
• Good for demonstrating linear relationships
• Particularly useful for presenting
a given measurement taken at several points over time



Graphic Representations of Data

Pie Charts:

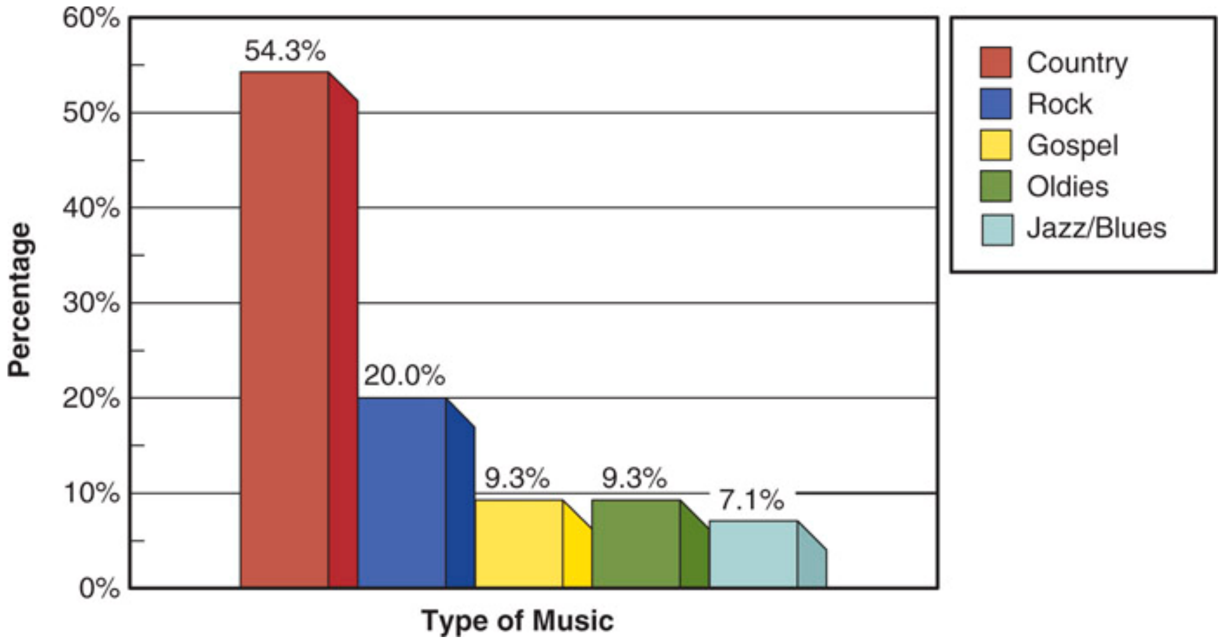
- Good for special relationships among data points
- Should total to 100%



Graphic Representations of Data

Bar Charts:

- Good for side by side relationships / comparisons
- Most flexible of the graphs



Descriptive Statistics

Measures of Central Tendency

Mean:

- The sum of the values for all observations of a variable divided by the number of observations.

Median:

- Value below which 50 percent of the observations fall.

Mode:

- The value that occurs most frequently.

Measures of Dispersion

These measures indicate how spread out the data are:

Variance:

- The sums of the squared deviations from the mean divided by the number of observations minus one.
- The same formula as standard deviation with the squaring.

Range:

- The maximum value for a variable minus the minimum value for that variable.

Standard Deviation:

- Measure of dispersion calculated by subtracting the mean of the series from each value in a series, squaring each result, summing the results, dividing the sum by the number of items minus 1, and taking the square root of this value.

Descriptive Statistics

Descriptive statistics are the most efficient means of summarizing the characteristics of large sets of data. In a statistical analysis, the analyst calculates one number or a few numbers that reveal something about the characteristics of large sets of data.

Significant discrepancies in "Mean" and Median" should cause you to look further into this data.

Years in Business	
Mean	22.4
Standard Error	2.6
Median	15.0
Mode	5.0
Standard Deviation	23.1
Sample Variance	534.5
Kurtosis	3.8
Skewness	2.1
Range	98.0
Minimum	2.0
Maximum	100.0
Sum	1770.5
Count	79.0

Chapter Fifteen Q & A

Data Processing And Fundamental Data Analysis

LEARNING OBJECTIVES

1. Get an overview of the data analysis procedure.
2. Understand validation and editing.
3. Learn how to code questions in surveys.
4. Understand the process of data entry so that information can be read by a computer.
5. Understand the importance of cleaning questionnaires so that they are free of errors.
6. Be familiar with tabulation and statistical analysis.
7. Gain insight into the graphic representations of data.
8. Comprehend descriptive statistics.

Question

- **Assume that Sally Smith, an interviewer, completed 50 questionnaires. Ten of the questionnaires were validated by calling the respondents and asking them one opinion question and two demographic questions over again. One respondent claimed that his age category was 30-40, when the age category marked on the questionnaire was 20-30. On another questionnaire, in response to the question, “What is the most important problem facing our city government?” the interviewer had written, “The city council is too eager to raise taxes.” When the interview was validated, the respondent said, “The city tax rate was too high.” As a valuator would you assume that these were honest mistakes and accept the entire lot of 50 interviews as valid? If not, what would you do?**

Answer

- The error on the first questionnaire may have been a judgment call on the part of the interviewer or it may have simply been a missed stroke of the pencil or computer. The second mistake, which is a completely different answer with similar content, gives cause for more concern. Check another ten questionnaires to see if more mistakes crop up. It may be that all the questionnaires should be validated. Sally may need more training.

Question

- **Give an example of a skip pattern on a questionnaire. Why is it important to always follow the skip patterns correctly?**

Answer

1. Have you eaten at a fast food restaurant in the last two weeks? *Yes* *No*

If *yes*, skip to question 2. If *no*, skip to question 9.

If the skip pattern is not followed correctly, then unnecessary and inappropriate questions may be asked and error may be introduced in interpreting the respondents' answers.

Question

- **It has been said that, to some degree, coding of open-ended questions is an art. Would you agree or disagree? Why? Suppose that after coding a large number of questionnaires, the researcher notices that many responses end up in the "Other" category, what might this imply? What might this imply? What could be done to correct it?**

Answer

- Coding open-ended questions is part science and part art. When there are clear themes in the data, similarly well-trained coders will produce consistent (reliable) sets of codes. If a lot of responses ended up in the “Other” category, it is possible that the coding categories were not properly selected or explained to the coders or that the categories are not complete. In this case, new coding categories should be created.

Question

- **It has been said that a cross-tabulation of two variables offers the researcher more insightful information than does a one-way frequency table. Why might this true? Give an example.**

Answer

- A cross-tabulation between two variables provides the researcher with data that looks at the relationship between two categorical variables. Two one-way frequency tables are interesting, but do not provide the same kind of data.
- A one-way table would show that all consumers have about a 50% purchase rate (150 Yeses/300 responses). Cross-tabulation reveals that females have a much higher propensity to purchase than males (90/150 versus 60/150, respectively).

Question

- **Calculate the mean, median, mode, and standard deviation from the following data set (p 388, Q11)**

Answer

	Whitehill Mall	Northpark Mall	Sampson Mall
Mean	8.0	7.9	8.6
Median	7	7	8
Mode	4	3	1
Standard deviation	5.3	6.6	6.9

Question

- Page 388, Q 12
- **Enter the following data into an Excel spreadsheet. Include the column headings (Q1, Q2, and Q3), as well as the numeric values. The definitions of the numeric values are provided at the bottom of the table. Use the Pivot Table feature in Excel (found under the Data option) to cross-tabulate the likelihood of purchase (row) by gender (column) and income level (column). What conclusions can you draw about the relationship between gender and likelihood of purchase and that between income and likelihood of purchase?**

Question

- Student version of SPSS works much better (easier, more intuitive) for this sort of analysis, Enter the data, select *Analyze, Descriptive Statistics, and Crosstabs*. Click Q1 to the column field and Q2, Q3 to the row field. Click on *Finished*.

Question

- This analytical procedure shows the responses to one question relative to the responses of another question.
- a. one-way frequencies
- b. cross tabulation
- c. t-test
- d. z-test
- e. none of these

Answer

- Ans: B

Question

Which of the following is the most flexible type of graph?

a. line chart

b. bar chart

c. pie chart

d. scatter plot graph

e. All are equally flexible.

Answer

- Ans: B

Question

If we conclude that the average weekly amount of soft drink consumption by males and females is about the same, but that the standard deviation among males is greater than that for females, what would this mean?

a. Males and females pretty much agree as to how many soft drinks they consume per week.

b. Males consume more soft drinks per week than females.

c. Even though males and females consume, on average, about the same number of soft drinks, there is more diversity of consumption among males.

d. Females are more health conscious than males.

Answer

- Ans: C

Question

If an interviewer did not properly follow skip patterns specified in a questionnaire, the _______________ step in data analysis would reveal the problem.

a. validation
b. editing
c. coding
d. analyzing
e. data cleaning

Answer

Ans: A

Chapter Sixteen

Statistical Testing Of Differences And Relationships

LEARNING OBJECTIVES

1. Learn how to evaluate differences and changes.
2. Understand the concept of hypothesis development and how to test hypotheses.
3. Be familiar with several of the more common statistical tests of goodness of fit, hypotheses about one mean, hypotheses about two means, and hypotheses about proportions.
4. Learn the hypotheses about one mean.
5. Learn the hypotheses about two means.
6. Learn the hypotheses about proportions.
7. Learn about analysis of variance.
8. Understand the *P* values and significance testing.

Statistical Significance

- Exam Score

  Female=120

  Male=110

  Female higher than male?

Statistical Significance

Mathematical Differences:

By definition, if numbers are not exactly the same, they are different. This does not, however, mean that the difference is either important or statistically significant.

Statistical Significance:

A difference that is large enough that it is not likely to have occurred because of **chance or sampling error**.

Statistical Significance

Important Differences for Managers:

One must be able to distinguish between mathematical differences and statistically significant differences in using the data analysis in managerial decision making.

Hypothesis:

Assumption or theory that a researcher or manager makes about some characteristic of the population under study.

Goodness of Fit

Chi-Square Test:

Test of the goodness of fit between the OBSERVED distribution and the EXPECTED distribution of a variable.

Marketing researchers often need to determine whether there is any association between two or more variables.

Types of Hypothesis Tests

About One Mean:

Z Test:

Hypothesis test used for a single mean if the sample is large enough and drawn at random. Usually for samples of about 30 and above.

t Test:

Hypothesis test used for a single mean if the sample is too small to use the Z test. Usually for samples below 30.

About Two Means:

Hypothesis testing that tests the differences *between* groups of data.

Z Test - Example

Z Test

One of the most common goals of marketing research studies is to make some inference about the population mean. If the sample size is large enough ($n \geq 30$), the appropriate test statistic for testing a hypothesis about a single mean is the ***Z* test**. For small samples ($n < 30$) the t test with $n - 1$ degrees of freedom (where n = sample size) should be used.

Video Connection, a Dallas video store chain, recently completed a survey of 200 consumers in its market area. One of the questions was "Compared to other video stores in the area, would you say Video Connection is much better than average, somewhat better than average, average, somewhat worse than average, or much worse than average?" Responses were coded as follows:

Response	Code
Much better	5
Somewhat better	4
Average	3
Somewhat worse	2
Much worse	1

The mean rating of Video Connection is 3.4. The sample standard deviation is 1.9. How can the management of Video Connection be confident that its video stores' mean rating is significantly higher than 3 (average in the rating scale)? The Z test for hypotheses about one mean is the appropriate test in this situation. The steps in the procedure follow.

Z Test – Example

Continued

1. Specify the null and alternative hypotheses.
   - Null hypothesis $H_0: M \leq 3$ (M = response on rating scale)
   - Alternative hypothesis $H_a: M > 3$
2. Specify the level of sampling error (α) allowed. For $\alpha = .05$ the table value of Z(critical) $= 1.64$. (See Exhibit 3 in Appendix 2 for d.f. $= \infty$, .05 significance, one-tail. The table for t is used because $t = Z$ for samples greater than 30.) Management's need to be very confident that the mean rating is significantly higher than 3 is interpreted to mean that the chance of being wrong because of sampling error should be no more than .05 (an $\alpha = .05$).
3. Determine the sample standard deviation (S), which is given as $S = 1.90$.
4. Calculate the estimated standard error of the mean, using the formula

$$S_{\overline{X}} = \frac{S}{\sqrt{n}}$$

where $S_{\overline{X}}$ = estimated standard error of the mean

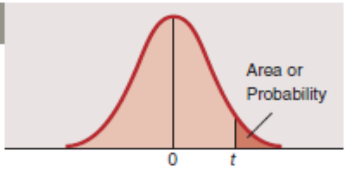
In this case,

$$S_{\overline{X}} = \frac{1.9}{\sqrt{200}} = 0.13$$

Key Terms & Definitions

EXHIBIT 3 *t*-Distribution

Entries in the table give *t*-values for an area or probability in the upper tail of the *t*-distribution. For example, with 10 degrees of freedom and a .05 area in the upper tail, $t_{.05} = 1.812$.



	Area in Upper Tail				
Degrees of Freedom	.10	.05	.025	.01	.005
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.358	2.617
∞	1.282	1.645	1.960	2.326	2.576

Z Test – Example

Continued

5. Calculate the test statistic:

$$Z = \frac{(\text{Sample mean}) - \begin{pmatrix}\text{Population mean specified} \\ \text{under the null hypothesis}\end{pmatrix}}{\text{Estimated standard error of the mean}}$$

$$= \frac{3.4 - 3}{0.13} = 3.07$$

6. State the result. *The null hypothesis can be rejected* because the calculated Z value (3.07) is larger than the critical Z value (1.64). Management of Video Connection can infer with 95 percent confidence that its video stores' mean rating is significantly higher than 3. Further discussion of Z test application is provided in the feature above.

Hypothesis About Two Means

Continued

- Marketers are frequently interested in testing differences between groups. In the following example of testing the differences between two means, the samples are independent.
- The management of a convenience store chain is interested in **differences between the store visit rates of men and women**.

➢ Mean for Male=11.49

➢ Mean for Female=8.51

- Believing that men visit convenience stores more often than women, management collected data on convenience store visits from 1,000 randomly selected consumers. Testing this hypothesis involves the following steps:

Hypothesis About Two Means

Continued

EXHIBIT 16.4 Data for 32 Test of Two Independent Samples

Visits to Convenience Store by Males				Visits to Convenience Stores by Females			
Number X_m	Frequency f_m	Percent	Cumulative Percent	Number X_f	Frequency f_f	Percent	Cumulative Percent
2	2	4.4	4.4	2	5	7.0	7.0
3	5	11.1	15.6	3	4	5.6	12.7
5	7	15.6	31.1	4	7	9.9	22.5
6	2	4.4	35.6	5	10	14.1	36.6
7	1	2.2	37.8	6	6	8.5	45.1
8	2	4.4	42.2	7	3	4.2	49.3
9	1	2.2	44.4	8	6	8.5	57.7
10	7	15.6	60.0	9	2	2.8	60.6
12	3	6.7	66.7	10	13	18.3	78.9
15	5	11.1	77.8	12	4	5.6	84.5
20	6	13.3	91.1	15	3	4.2	88.7
23	1	2.2	93.3	16	2	2.8	91.5
25	1	2.2	95.6	20	4	5.6	97.2
30	1	2.2	97.8	21	1	1.4	98.6
40	1	2.2	100.0	25	1	1.4	100.0

$n_m = 45$ $n_f = 71$

Mean number of visits by males, $\overline{X}_m = \dfrac{\sum X_m f_m}{45} = 11.5$

Mean number of visits by females, $\overline{X}_f = \dfrac{\sum X_f f_f}{71} = 8.5$

Hypothesis About Two Means - Example

1. Specify the null and alternative hypotheses.
   - Null hypothesis H_0: $M_m - M_f \leq 0$; the mean visit rate of men (M_m) is the same as or less than the mean visit rate of women (M_f).
   - Alternative hypothesis H_a: $M_m - M_f > 0$; the mean visit rate of men (M_m) is higher than the mean visit rate of women (M_f).

   The observed difference in the two means (Exhibit 16.4) is 11.49 – 8.51 = 2.98.
2. Set the level of sampling error (α). The managers decided that the acceptable level of sampling error for this test is $\alpha = .05$. For $\alpha = .05$ the table value of Z(critical) = 1.64. (See Exhibit 3 in Appendix 3 for d.f. = ∞, .05 significance, one-tail. The table for t is used because $t = Z$ for samples greater than 30.)
3. Calculate the estimated standard error of the differences between the two means as follows:

$$S_{X_{m-f}} = \sqrt{\frac{S_m^2}{n_m} + \frac{S_f^2}{n_f}}$$

where

S_m = estimated standard deviation of population m (men)

S_f = estimated standard deviation of population f (women)

n_m = sample size for sample m

n_f = sample size for sample f

Hypothesis About Two Means

Continued

Therefore,

$$S_{X_{m-f}} = \sqrt{\frac{(8.16)^2}{45} + \frac{(5.23)^2}{71}} = 1.37$$

Note that this formula is for those cases in which the two samples have unequal variances. A separate formula is used when the two samples have equal variances. When this test is run in SAS and many other statistical packages, two *t* values are provided—one for each variance assumption.

4. Calculate the test statistic *Z* as follows:

$$Z = \frac{\begin{pmatrix}\text{Difference between means}\\ \text{of first and second sample}\end{pmatrix} - \begin{pmatrix}\text{Difference between means}\\ \text{under the null hypothesis}\end{pmatrix}}{\text{Standard error of the differences between the two means}}$$

$$= \frac{(11.49 - 8.51) - 0}{1.37} = 2.18$$

5. State the result. The calculated value of *Z* (2.18) is larger than the critical value (1.64), so *the null hypothesis is rejected*. Management can conclude with 95 percent confidence ($1 - \alpha = .95$) that, on average, men visit convenience stores more often than do women.

Hypothesis About Two Means

Continued

A child psychologist observed 8-year-old children behind a one-way mirror to determine how long they would play with a toy medical kit. The company that designed the toy was attempting to determine whether to give the kit a masculine or feminine orientation. The length of time (in minutes) the children played with the kits are shown below. Calculate the value of *Z* and recommend to management whether the kit should have a male or female orientation.

Sex	Time played with toy medical kit											
Boys	31	12	41	34	63	7	67	67	25	73	36	41	15
Girls	26	38	20	32	16	45	9	9	16	26	81	20	5

Hypothesis About Two Means

Continued

STEP 1: Hypotheses

Ho: The difference in the mean length of time is equal to zero.

Ha: The difference in the mean length of time is non-zero.

Hypothesis About Two Means

Continued

STEP 2: Decide on Significance Level and Look up Appropriate Table Value

Assume an alpha of 0.05.

Since the sample size is less than 30, it is appropriate to use a t-test.

This is also a two tailed test, hence, the value from the t table for n=12 and alpha = 0.05 is 2.179

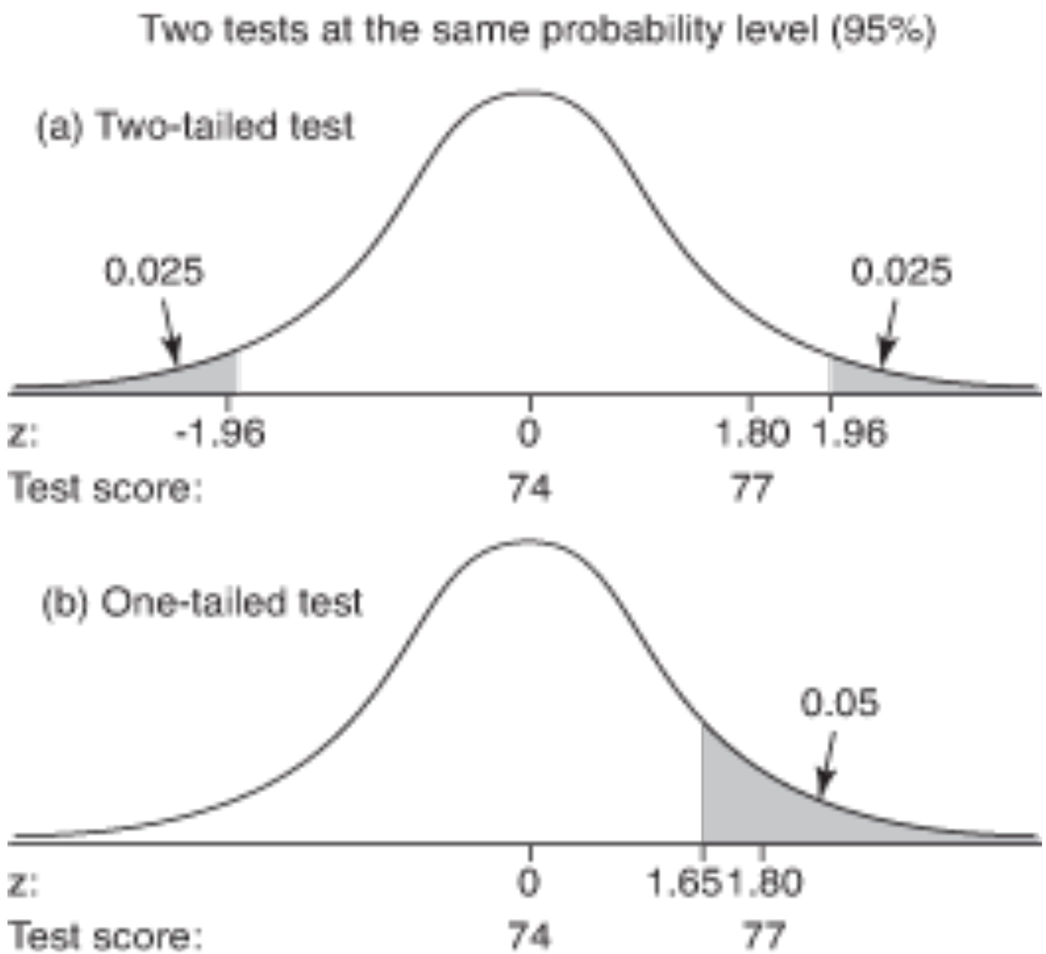
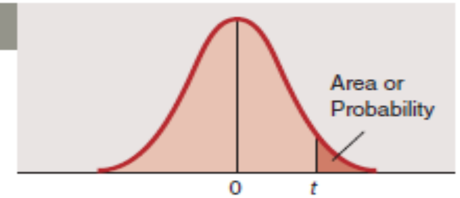

Two tests at the same probability level (95%)
(a) Two-tailed test
0.025
0.025
z:
-1.96
0
1.80
1.96
Test score:
74
77
(b) One-tailed test
0.05
z:
0
1.65
1.80
Test score:
74
77

EXHIBIT 3 *t*-Distribution

Entries in the table give t-values for an area or probability in the upper tail of the t-distribution. For example, with 10 degrees of freedom and a .05 area in the upper tail, $t_{.05} = 1.812$.



Degrees of Freedom	Area in Upper Tail .10	.05	.025	.01	.005
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
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7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
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24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.358	2.617
∞	1.282	1.645	1.960	2.326	2.576

Hypothesis About Two Means

Continued

STEP 3: Calculate the Pooled Standard Error for the two samples

The mean of the boys is 39.38. The mean of the girls is 26.83. The variance for the boys was 494.09 and the variance for the girls was 404.59. Therefore, the pooled standard error is 8.31 (square root of 494.09/13 + 404.59/13).

Sex	Time played with toy medical kit												
Boys	31	12	41	34	63	7	67	67	25	73	36	41	15
Girls	26	38	20	32	16	45	9	9	16	26	81	20	5
Observ.	1	2	3	4	5	6	7	8	9	10	11	12	13

Avg.	S	S^2	S^2/n
39.38	22.23	494.09	38.01
26.38	20.11	404.59	31.12

$$S_{x_{b-g}} = \sqrt{\frac{S_b^2}{n_b} + \frac{S_g^2}{n_g}} = \sqrt{\frac{494.09}{13} + \frac{404.59}{13}} = 8.31$$

Hypothesis About Two Means

Continued

STEP 4: Calculate the test statistic

The observed difference in the means is 13. Therefore the t-calculated is equal to 13/8.31 or 1.56

STEP 5: Compare Results and State Conclusion

Since the t calculated value of 1.56 is less than the t-table value of 2.179, we fail to reject the null hypothesis. No significant difference in the attention span of boys and girls was found. No recommendation can be made to management, except to perhaps take a larger sample.

Analysis of Variance (ANOVA)

ANOVA:

Test for the differences among the means of two or more independent samples.

When the goal is to test the differences among the means of two or more independent samples, analysis of variance (ANOVA) is an appropriate statistical tool. Although it can be used to test differences between two means, ANOVA is more commonly used for hypothesis tests regarding the differences among the means of several (C) independent groups (where C > or = 3). It is a statistical technique that permits the researcher to determine whether the variability among or across the C sample means is greater than expected because of sampling error.

F Test

F Test:

Test of the probability that a particular calculated value could have been due to chance.

$$\text{MSA} = \frac{\text{Sum of squares among groups (SSA)}}{\text{Degrees of freedom (d.f.)}}$$

where Degrees of freedom = number of groups (C) − 1

$$F = \frac{\text{MSA}}{\text{MSE}} = \frac{860}{232.14} = 3.70$$

$$\text{MSE} = \frac{\text{Sum of squares within groups (SSE)}}{\text{Degrees of freedom (d.f.)}}$$

p Values and Significance Testing

_p_ Value:

Exact probability of getting a computed test statistic that is due to chance. The smaller the *p* value, the smaller the probability that the observed result occurred by chance.

Chi-square Goodness of Fit test for Frequencies

- A statistical test to determine whether some observed pattern of frequencies corresponds to an expected pattern.

One way table—Test of one factor

Two way table---Test of two factors

Chi Square Example – Test of the effectiveness of three special deals

- A retail electronics chain needs to test the effectiveness of three special deals
- Each deal offered for a month
- Measure the effect of each deal on the number of customers visiting a test store during the time deal is on

Chi-square Goodness of Fit test for Frequencies

- <u>Question</u>: Is there a significant difference between the number of customers visiting the store under each deal?
  - Ho: number of customers equal across deals
  - Ha: significant difference in the no of customers visiting the store under various deals
- Level of significance = .05

Deal	Month	Customers per Month	Expected
1	April	11,700	11,860
2	May	12,100	11,860
3	June	11,780	11,860
Total		**35,580**	**35,580**

Chi-Square Goodness-of-Fit Test for Frequencies

- A statistical test to determine whether some observed pattern of frequencies corresponds to an expected pattern

$$\chi^2 = \sum_{i=1}^{k} \frac{[O_i - E_i]^2}{E_i}$$

- O_i is the observed number of cases falling in the ith category,
- E_i is the expected number of cases falling in the ith category, and
- k is the number of categories

Calculate Chi-Square value

$$= \frac{(11{,}700 - 11{,}860)^2}{11860} + \frac{(12{,}100 - 11{,}860)^2}{11860} + \frac{(11{,}780 - 11{,}860)^2}{11860}$$

$= 7.6$

$$\chi^2 = \sum_{i=1}^{k} \frac{[O_i - E_i]^2}{E_i}$$

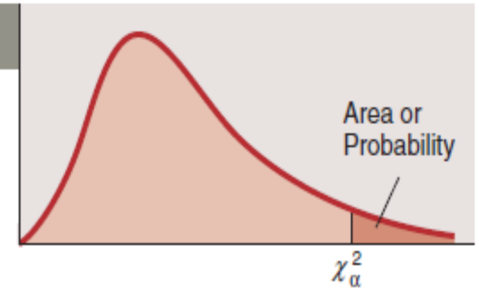
- df = k-1=3-1=2,
- Significance level= 0.05 , table value= 5.99.
- Conclusion: Because observed value is higher than the table value

(7.6 > 5.99), we reject the null.

Deal	Month	Customers per Month	Expected
1	April	11,700	11,860
2	May	12,100	11,860
3	June	11,780	11,860
Total		**35,580**	**35,580**

EXHIBIT 4 Chi-Square Distribution

Entries in the table give χ^2_α values, where α is the area or probability in the upper tail of the chi-square distribution. For example, with 10 degrees of freedom and a .01 area in the upper tail, χ^2_α 23.2093.



Degrees of Freedom	Area in Upper Tail									
	.995	.99	.975	.95	.90	.10	.05	.025	.01	.005
1	.0000393	.000157	.000982	.000393	.015709	2.70554	3.84146	5.02389	6.63490	7.87944
2	.0100251	.0201007	.0506356	.102587	.210720	4.60517	5.99147	7.37776	9.21034	10.5966
3	.0717212	.114832	2.15795	.351846	.584375	6.25139	7.81473	9.34840	11.3449	12.8381
4	.206990	.297110	.484419	.710721	1.063623	7.77944	9.48773	11.1433	13.2767	14.8602
5	.411740	.554300	.831211	1.145476	1.61031	9.23635	11.0705	12.8325	15.0863	16.7496
6	.675727	.872085	1.237347	1.63539	2.20413	10.6446	12.5916	14.4494	16.8119	18.5476
7	.989265	1.239043	1.68987	2.16735	2.83311	12.0170	14.0671	16.0128	18.4753	20.2777
8	1.344419	1.646482	2.17973	2.73264	3.48954	13.3616	15.5073	17.5346	20.0902	21.9550
9	1.734926	2.087912	2.70039	3.32511	4.16816	14.6837	16.9190	19.0228	21.6660	23.5893
10	2.15585	2.55821	3.24697	3.94030	4.86518	15.9871	18.3070	20.4831	23.2093	25.1882
11	2.60321	3.05347	3.81575	4.57481	5.57779	17.2750	19.6751	21.9200	24.7250	26.7569
12	3.07382	3.57056	4.40379	5.22603	6.30380	18.5494	21.0261	23.3367	26.2170	28.2995

Univariate versus Multivariate Analysis

- The ***chi-square test*** provides a method for testing the association between the row and column variables in a two-way table.
- H_0 assumes that there is no association between the variables (in other words, one variable does not vary according to the other variable),
- H_a claims that some association does exist.
  - The alternative hypothesis does not specify the *type* of association, so close attention to the data is required to interpret the information provided by the test.

Analyses Involving Categorical Measures

- Two-Way Cross Tabulations
  - A multivariate technique used for studying the relationship between two or more categorical variables (i.e., nominal- or ordinal-level)
  - Cross tabs consider the joint distribution of sample elements across variables
  - It is the most used multivariate data analysis technique

Example

- **Your university library is concerned about student desires for library hours on Sunday morning (9:00 a.m. – 12:00 p.m.).**
- **It has undertaken a random sample of 1,600 undergraduate students (one-half men, one half women) in each of four status levels (i.e. 400 freshmen, 400 sophomores, 400 juniors, 400 seniors.)**
- **If the percentage of students preferring Sunday morning hours are those shown below, what conclusions can the library reach?**

Observed Results

	Sen	Jun	Soph	Fresh	TOTAL
Women	70	53	39	26	188
Men	30	48	31	27	136
TOTAL	100	101	70	53	324

Step 1: Hypotheses

- Ho: There is no relationship between gender and class year.
- Ha: There is a significant relationship between gender and class year.
- Note again:
  - The null hypothesis H_0 assumes that there is no association between the variables while the alternative hypothesis H_a claims that some association does exist.

Step 2: Determine Expected Results

	Sen	Jun	Soph	Fresh	TOTAL
Women	70	53	39	26	188
Men	30	48	31	27	136
TOTAL	100	101	70	53	324

	Sen	Jun	Soph	Fresh	TOTAL
Women	58.02	58.60	40.62	30.75	188
Men	41.98	42.40	29.38	22.25	136
TOTAL	100	101	70	53	324

**Cell values calculated by multiplying each row margin total by each column margin total and dividing by the grand total, e.g., cell 1(woman x sen)=58.02=188*100/324=58.02.*

STEP 3: Calculate Chi-Square Value

	Sen	Jun	Soph	Fresh	TOTAL
Women	2.47	0.54	0.06	0.73	
Men	3.42	0.74	0.09	1.02	
TOTAL	$\chi^2 = 2.47 + 0.54 + 0.06 + 0.73 + 3.42 + ... + 1.02 = 9.07$				

Cell values calculated by taking the squared difference between the expected and observed and dividing expected, e.g. cell 1(woman x sen)=(70-58.02)^2/58.02=2.47

$$\chi^2 = \sum_{i=1}^{k} \frac{[O_i - E_i]^2}{E_i}$$

STEP 4: Find Chi Square Table Value based on Significance Level and Degrees of Freedom

- Degrees of freedom = (r-1) * (k-1) = (2-1) * (4-1) = 3
- The tabulated chi square, 3 df, .05 alpha = 7.814

STEP 5: Compare Results and State Conclusion

- The calculated chi square = 9.06
- Conclusion: Calculated chi-square > Table chi-square
- We can state that, of those who prefer Sunday morning hours, gender and class year are statistically dependent. That is, there is a significant difference in how gender and class status will affect the use of the library on Sunday mornings. We can expect more Senior women than any other group.

CHAPTER 16

3. HYPOTHESIS TESTING

I. **Hypothesis**

A. **Hypothesis Defined**–assumption or guess that a researcher or manager makes about some characteristic of the population being investigated

1. In hypothesis testing, a researcher determines whether a hypothesis concerning some characteristic of the population is likely to be true, given the evidence.
2. A statistical hypothesis test allows us to calculate the probability of observing a particular result IF the stated hypothesis is true.

B. Two Basic **Explanations of Observed Differences**

1. **Hypothesis** is **true** and the observed difference is likely due to sampling error
2. **Hypothesis** is **false** and the true value is some other value

II. **Steps in Hypothesis Testing**

A. **Step One: Stating the Hypothesis**

1. Hypotheses are stated using two basic forms:
    a. **Ho**–the null hypothesis (sometimes called the *hypothesis of the status quo*) that is tested against its complement
    b. **Ha**–the alternative hypothesis (sometimes called the *research hypothesis of interest*) that is the complement of Ho
2. The null and the alternative hypothesis must be stated in a way that both cannot be true at the same time.

B. **Step Two: Choosing the Appropriate Test Statistic**

1. **Exhibit 16.1 Statistical Tests and Their Uses**–provides a guide to selecting the appropriate test for various situations

C. **Step Three: Developing a Decision Rule**

1. As discussed in an earlier chapter, we know it's very unlikely for our sample estimate to exactly equal our population parameter. The issue is whether or not the difference between the sample value and its expected value (based on the hypothesis) could have occurred by chance if the hypothesized value is true.

2. A decision rule, or standard, is needed to determine whether we should accept or reject the null hypothesis.

3. A Significance level (a) that will determine whether to reject or fail to reject the null hypothesis

a. the level of significance—0.01, 0.05, or 0.10—is the probability that is too low to justify acceptance of the null hypothesis.

b. In other words, we reject the null hypothesis if the probability of occurrence of the observed sample value is low if we assume the null value to be true.

D. **Step Four: Calculating the Value of the Test Statistic**

1. Use the appropriate formula to calculate the value of the statistic for the test chosen

2. Compare the value just calculated to the critical value of the statistic (from the appropriate table), based on the decision rule chosen

3. Based on the comparison, determine to either reject or fail to reject the null hypothesis Ho

E. **Step Five: Stating The Conclusion**–the conclusion summarizes the results of the test. It should be stated from the perspective of the original research question

III. **Types of Errors in Hypothesis Testing**

A. **Two General Types of Errors in Hypothesis Testing**

1. **Type I Error** involves situations in which the researcher rejects the null hypothesis when it is, in fact, true. The probability of committing a **type I error** is referred to as the *alpha level*. Conversely, 1 – *alpha* is the probability of making a correct decision by not rejecting the null hypothesis when, in fact, it is true

2. **Type II Error** involves situations in which the researcher fails to reject the null hypothesis when the null hypothesis actually is false. A type II error is referred to as a ***beta error***. The value 1 – *beta* reflects the probability of making a correct decision in rejecting the null hypothesis when, in fact, it is false.

3. The value of *beta* is never set in advance–*alpha* becomes larger when *beta* is made smaller–to minimize type II error, then you choose a larger value for *alpha* in order to make *beta* smaller.

See Exhibit 16.2 Type I and Type II Errors

4. The decision to reject or fail to reject is never 100% certain. There is a probability of being correct and a probability of being incorrect.

5. Hence, Type I Error is set by the researcher after consulting with the client, considering the limitations of the study (e.g., sample size), and considering the implications of a Type I versus Type II error.

6. Note: Type I and Type II errors are NOT complements of each other.

7. Thus in a hypothesis test, there are three critical elements: *alpha*, *beta*, and the sample size, *n*. Unfortunately, the researcher can only control 2 of the 3 elements. The third element is always determined by the other two.

8. When setting either *alpha* or *beta*, it is critical to understand the implications.

a. Let's assume we are testing for a disease using the following hypothesis:

H_o: Test indicated that you do not have the disease

H_a: Test indicates you do have the disease

b. In this case, *a* = the probability of rejecting H_o when it is true, or the test indicates you have the disease when you do not; and *b*= the probability of accepting Ho when it is false, or the test indicates you do not have the disease when you do.

c. If the treatment for the disease is harmless with no risk to someone without the disease but cures you 100% if you do have the disease, which of the two errors is more costly? Clearly Type I error.

9. Typically, we do not set Type II error, b, in advance. For a fixed sample size, when a is made smaller, b becomes larger; and when a is made larger, b becomes smaller.

10. The most commonly accepted range for a is between .01 to .10.

11. In the above example where Type II error is more serious than Type I, one would set *alpha* = .1. If the situation is that Type I error is more serious, than one would set *alpha* = .01. If there is no real difference between Type I and Type II error, than traditionally researchers set *alpha* = .05.

IV. **Decision to Reject or Fail to Reject**

A. **Accepting Ho or Failing to Reject (FTR) Ho**–whether there is enough evidence in the data to conclude that H_a is correct. There is either sufficient evidence to support Ha (reject H_o) or there is not (fail to reject H_o).

1. The real question is whether there is enough evidence in the data to conclude that Ha is correct

2. Failing to reject Ho is saying that the data do to provide sufficient support of the claim made in Ha–not that the statement made in Ho is acceptable

V. **One-Tailed versus Two-Tailed Test**

A. Tests are either one-tailed or two tailed. This decision depends on the nature of the situation and what you are trying to demonstrate.

B. When the researcher is concerned whether there is a difference in a specific direction only (either higher only or lower only), a one-tail test is sufficient. For example, if we're concerned only whether fat content in a product is higher than a preferred level but we're not concerned if it is lower.

C. If the researcher is concerned whether there is pure difference in either direction, a two-tailed test is appropriate. For example, measuring the temperature that trips a fuse or causes a break.

4. COMMONLY USED STATISTICAL HYPOTHESIS TESTS

I. **Independent versus Related Samples**

A. **Independent Samples**–involve situations in which measurement of the variable of interest in one sample has no effect on (i.e., independent) the measurement of the variable in the other sample (e.g., brand awareness of a product for men vs. women).

B. **Related Samples**–are those in which the measurement of the variable of interest in one sample may influence the measurement of the variable of interest in another sample (e.g., brand awareness on a sample group before a new campaign and brand awareness of the same sample group after the new campaign).

II. **Degrees of Freedom**

A. Many statistical tests refer to degrees of freedom.

B. **Degrees of Freedom (D.F.)**–the number of observations in a statistical problem that are not restricted and or are free to vary.

C. **The Number of Degrees of Freedom**–equal to the number of observations minus the number of assumptions or constraints necessary to calculate a statistic.

5. GOODNESS OF FIT

I. **Chi-Square Test**

A. **Chi-square**

1. **Chi-square defined**–chi-square test enables the research analyst to determine whether an observed pattern of frequencies corresponds to or fits an “expected” pattern.

a. **"goodness of fit"**–test the observed distribution to the expected distribution

6. HYPOTHESES ABOUT ONE MEAN

One of the most common goals in marketing research is to make an inference for a single population mean.

I. **Z Test**

A. **Z Test Defined**–When the sample size is large enough (n≥30), the most common test statistic used for these types of hypotheses is the Z Test.

1. Example of how to apply this test page 538

B. **Steps Involved in the Z Test**

1. Specify the null and alternative hypotheses
2. Specify the level of sampling error allowed
3. Determine the sample standard deviation (S)
4. Calculate the estimated standard error of the mean
5. Calculate the test statistic
6. State the result

II. ***t*-Test**

A. ***t*-Test Defined**– When the sample size is relatively small (n<30), the Student *t*-test is more appropriate than the Z Test for hypothesis testing.

1. The *t*-test with n – 1 degrees of freedom is appropriate for making statistical inferences in this case.
2. The *t* distribution is theoretically correct for large samples (n≥30), however when the sample size is large, the t-distribution and the z-distribution become indistinguishable.
3. Although the z-distribution can be used, most statistical computer packages provide the t-test in their results.

B. **Steps Involved in the *t-Test***

1. Specify the null and alternative hypotheses

2. Specify the level of sampling error allowed

3. Determine the sample standard deviation (S)

4. Calculate the estimated standard error of the mean

5. Calculate the *t*-test statistic

6. State the result

See SPSS Jump Start for *t*-Test

7. HYPOTHESES ABOUT TWO MEANS

I. Testing Differences between Groups

A. Marketers are frequently interested in testing differences between groups.

II. Differences Between Groups

A. **Steps for Testing the Differences between Groups**

1. Specify the null and alternative hypotheses

2. Specify the level of sampling error

3. Calculate the estimated standard error of the differences between the two means

4. Calculate the test statistic Z

5. State the result.

8. HYPOTHESES ABOUT PROPORTIONS

I. **Proportion in One Sample**

A. **Hypothesis Test of Proportions Defined**–test to determine whether the difference between proportions is greater than would be expected because of sampling error

1. Example of how to apply this test pages 546-547

B. **The Procedure for the Hypothesis Test of Proportions**

1. Specify the null and alternative hypotheses

2. Specify the level of sampling error allowed

3. Calculate the estimated Standard error, using the value of *P* specified in the null hypothesis

4. Calculate the test statistic

5. State the results

II. **Two Proportions in Independent Samples**

A. **Difference between the Proportions in Two Different Groups**–such as the proportions of people in two different groups who engage in certain activity or have a certain characteristic

1. Specifications Required and the Procedure for Testing this Hypothesis:

a. Specify the null and alternative hypotheses

b. Set the level of sampling error (management decision)

c. Calculate the estimated standard error of the differences between the two proportions

d. Calculate the test statistic

e. State the result

9. ANALYSIS OF VARIANCE (ANOVA)

I. **Analysis of Variance (ANOVA)**

A. **ANOVA Defined**–test for the differences among the means of two or more independent samples

1. It is more commonly used for tests regarding the differences among the means of several (C) independent groups where (C≥3).

2. It is a statistical technique that permits the researcher to determine whether the variability among or across the C sample means is greater than expected because of sampling error.

3. The Z and *t* tests described earlier normally are used to test the null hypothesis when only two sample means are involved. However, it is inefficient (and statistically unwise) to make multiple, two-at-a-time comparisons.

4. Steps involved in an ANOVA

a. Specify the null and alternative hypotheses

b. Sum the squared differences between each subsample mean ($\overline{X}$j) and the overall sample mean ($\overline{X}$), weighted by sample size (*n j*). This is call the *sum of squares among groups* or among group variation (SSA)

c. Calculate the variation among group means as measured by the *mean sum of squares among groups* (MSA)

d. Sum the squared differences between each observation (Xjj) and its associated sample mean ($\overline{X}$j), accumulated over all C levels (groups). Also called the *sum of squares within groups* or *within group variation*, it is generally referred to as the *sum of squared error* (SSE)

e. Calculate the variation within the sample groups as measured by the mean sum of squares within groups.

Referred to as *mean square error* (MSE), it represents an estimate of the random error in the data.

f. Calculate the *F* statistic

g. State the results

10. p VALUES AND SIGNIFICANCE TESTING

I. ***p* Values and Significance Testing**

A. ***p* Value Defined**–exact probability of getting a computed test statistic assuming the null hypothesis is true.

1. The smaller the ***p* value**, the smaller the probability that the observed result occurred by chance

2. The ***p* value** is the most demanding level of statistical (not managerial) significance that can be met, based on the calculated value of the statistic.

3. An example is provided on page 553 using Exhibit 16.5.

Exhibit 16.5 Sample *t*-Test Output (example of a *p* value calculation)

QUESTIONS FOR REVIEW AND CRITICAL THINKING

1. Explain the notions of mathematical differences, managerially important differences, and statistical significance. Can results be statistically significant and yet lack managerial importance. Explain your answer.

Mathematical differences occur when two measures are not exactly the same. This does not mean that the difference is necessarily statistically significant nor managerially important. Statistical significance is a difference that is large enough to be unlikely to have occurred because of chance. Managerial importance is the concept that the difference is large enough to have meaning in the decision the manager makes.
Yes, results can be statistically significant and yet lack managerial importance. A .05% increase in sales resulting from a 20% increase in advertising may be statistically significant, but the increase may have cost the company an additional $1 million in advertising expense. For this amount, the dollar amount of the increase in profits would have to be greater than $1 million for the manager to think it had any practical meaning.

2. Describe the steps in the procedure for testing hypotheses. Discuss the difference between a null hypothesis and an alternative hypothesis.

In hypothesis testing, the first step is the state the hypothesis. The convention is to state the generally accepted condition, or status quo, as the null hypothesis. Then the alternative hypothesis is stated. The second step involves choosing the appropriate test statistic. Consideration must be given to the situation and the data to determine the correct test statistic. The third step involves developing a decision rule. This is based on the understanding that the sample will not be exactly like the population, and determining what level of difference or error, is acceptable. The acceptable standard is then stated as the rule of when to reject or fail to reject the null hypothesis. In the fourth step, the value of the test statistics is calculated and compared to the critical value stated in the decision rule. Finally, the conclusion from the test is stated.

3. Distinguish between a Type I error and Type II error. What is the relationship between the two?

Type I error, or alpha level, is the probability that the researcher will reject the null hypothesis when it is actually true. Type II error, or beta error, is the probability that the researcher will fail to reject the null hypothesis when it should have been rejected. Type I error plus Type II error does not equal 1 unless the Type I error is 0. That is not a realistic case. The alpha level is set by the researcher, within the constraints of the project. Beta error is not determined by the researcher.

4. What is meant by the terms *independent samples* and *related samples?* Why is it important for a researcher to determine whether an ample is independent?

An independent sample is a sample in which measuring a variable in one population has no effect on measuring that variable in another population. An example would be determining the percentage of voters who are women in Arkansas and the percentage of voters who are women in Texas. A related sample is a sample in which the measurement of a variable in one population may influence the measurement of the variable in the other. For example, if you survey a group about their movie-going experiences and then three months later repeat the survey, the samples are not independent of each other.

5. Your university library is concerned about student desires for library hours on Sunday morning (9:00 a.m. – 12:00 p.m.). It has undertaken a random sample of 1,600 undergraduate students (one-half men, one half women) in each of four status levels (i.e. 400 freshmen, 400 sophomores, 400 juniors, 400 seniors.) If the percentage of students preferring Sunday morning hours are those shown below, what conclusions can the library reach?

Observed Results

	Sen	Jun	Soph	Fresh	**TOTAL**
Women	70	53	39	26	**188**
Men	30	48	31	27	**136**
TOTAL	**100**	**101**	**70**	**53**	**324**

STEP 1: Hypotheses

Ho: There is no relationship between gender and class year.

Ha: There is a significant relationship between gender and class year.

STEP 2: Determine Expected Results

Expected Results if the variables are independent*

	Sen	Jun	Soph	Fresh	**TOTAL**
Women	58.02	58.60	40.62	30.75	**188**
Men	41.98	42.40	29.38	22.25	**136**
TOTAL	**100**	**101**	**70**	**53**	**324**

**Cell values calculated by multiplying each row margin total by each column margin total and dividing by the grand total, e.g., cell 1(woman x sen)=58.02=188*100/324=58.02.*

STEP 3: Calculate Chi-Square Value

Chi-square Calculations*

	Sen	Jun	Soph	Fresh	TOTAL
Women	2.47	0.54	0.06	0.73	
Men	3.42	0.74	0.09	1.02	
TOTAL				$c^2=$	**9.07**

** Cell values calculated by taking the squared difference between the expected and observed and dividing expected, e.g. cell 1(woman x sen)=(70-58.02)^2/58.02=2.47*

STEP 4: Find Chi Square Table Value based on Significance Level and Degrees of Freedom

Degrees of freedom = (r-1) * (k-1) = (2-1) * (4-1) = 3

The tabulated chi square, 3 df, .05 alpha = 7.814

STEP 5: Compare Results and State Conclusion

The calculated chi square = 9.06

Conclusion: Calculated chi-square > Table chi-square

We can state that, of those who prefer Sunday morning hours, gender and class year are statistically dependent. That is, there is a significant difference in how gender and class status will affect the use of the library on Sunday mornings. We can expect more Senior women than any other group.

6. A consultant has a random sample of 400 usable responses in a database. Included are the following questions:

Household Income Category:
(1) $0 to $24,999 (2) $25,000 to $49,999 (3) $50,000 to $99,999
(4) $100,000 and over

Average Weekly Soft Drink Consumption: ______________________

The consultant wants to determine if there are any statistically significant differences in average weekly soft drink consumption by income category. What statistical test should be applied to give the consultant the information he needs?

Ans: Since the problem will involve comparing more than two means (ratio scale data) for statistically significant differences, 1-Way ANOVA should be used.

7. A market researcher has completed a study of pain relievers. The following table depicts the brand purchased most often broken down by men versus women. Perform a Chi-square test on the data and determine what can be said regarding the crosstabulation.

Pain Reliever Men Women

Pain Reliever	**Men**	**Women**
Anacin	40	55
Bayer	60	28
Bufferin	70	97
Cope	14	21
Empirin	82	107
Excedrin	72	84
Excedrin PM	15	11
Vanquish	20	26

STEP 1: Hypotheses

Ho: There is no relationship between gender and the type of brand purchased.

Ha: There is a significant relationship between gender and the type of brand purchased.

STEP 2: Determine Expected Results

The total number of males is 373.

The total number of females is 429

Expected Results If the Variables Are Independent

Pain Reliever	Men	Women	Total
Anacin	44.18	50.82	95
Bayer	40.93	47.07	88
Bufferin	77.67	89.33	167
Cope	16.28	18.72	35
Empirin	87.90	101.10	189
Excedrin	72.55	83.45	156
Excedrin PM	12.09	13.91	26
Vanquish	21.39	24.61	46
Total:	373	429	802

STEP 3: Calculate Chi-Square Value

Pain Reliever	Men	Women
Anacin	0.40	0.34
Bayer	8.89	7.73
Bufferin	0.76	0.66
Cope	0.32	0.28
Empirin	0.40	0.34
Excedrin	0.00	0.00
Excedrin PM	0.70	0.61
Vanquish	0.09	0.08

Chi-square = 21.59

STEP 4: Find Chi Square Table Value based on Significance Level and Degrees of Freedom

Degrees of freedom = (r-1) * (k-1) = (8-1) * (2-1) = 7

The tabulated chi square, 7 df, .05 alpha = 14.067

STEP 5: Compare Results and State Conclusion

The calculated Chi square = 21.59

Conclusion: Calculated chi-square > Table chi-square

The tabular chi square at the .05 level of significance and 7 degrees of freedom is 14.07. The calculated value is higher than the tabular value, so we reject the null hypothesis. We can say with a 95% confidence that there is a significant relationship between sex and the brand purchased.

8. A consultant has collected 700 usable responses via a probability sample concerning political opinions. After analyzing each respondent's political ideology, he/she divides the respondents into two groups, moderate liberals and moderate conservatives. Further, the consultant asks respondents the following:

How likely are you to vote for increasing property taxes in the next election?
(1) very unlikely (2) somewhat unlikely (3) undecided
(4) somewhat likely (5) very likely

The consultant wants to determine if the moderate conservatives differ significantly from moderate liberals concerning how they'll vote on the property tax issue in the next election. How should the data be analyzed?

Ans: The problem involves comparing just two means, and the variable concerning property tax is metric (interval scale), the appropriate method of analysis would be a t-test.

9. American Airlines is trying to determine which baggage handling system it will put in its new hub terminal at San Juan, Puerto Rico. One system is made by Jano Systems and a second baggage handling system is manufactured by Dynamic Enterprises. American has installed a small Jano system and a small Dynamic Enterprises system in two of its low-volume terminals. Both terminals handle approximately the same quantity of baggage each month. American has decided to select the system that will provide the minimum number of instances in which passengers disembarking must wait 20 minutes or longer for baggage. Analyze the data that follow and determine whether there is a significant difference at the .95 level of confidence between the two systems. If there is a difference, which one should American select?

Minutes of Waiting	Jano Systems (Frequency)	Dynamic Enterprise (Frequency)

10-11	4	10
12-13	10	8
14-15	14	14
16-17	4	20
18-19	2	12
20-21	4	6
22-23	2	12
24-25	14	4
26-27	6	13
28-29	10	8
30-31	12	6
32-33	2	8
34-35	2	8
36 or more	2	2

STEP 1: Hypotheses and determine sample proportions

Ho: The difference in the proportions is less than or equal to zero; the proportion of those who waited 20 minutes or more for the Jano system is the same as those who waited 20 or minutes for the Dynamic System.

Ha: The difference in the proportions is greater than zero; the proportion of those who waited 20 minutes or more for the Jano system is the same as those who waited 20 or minutes for the Dynamic System.

	Jano Systems (Frequency)	Dynamic Enterprise (Frequency)
Total Number of people who waited for luggage	88	131
Number of People who waited 20 minutes or more	54	67
Proportion of People who waited 20 minutes or more	61.4%	51.2%

STEP 2: Decide on Significance Level and Look up Appropriate Table Value

Management wants a 95% confidence level, hence an alpha of 0.05. This is a two tailed test, hence, the value from the Z table for alpha = 0.05 is +/-1.96.

STEP 3: Calculate the Pooled Standard Error for the two proportions

$$p = \sqrt{\frac{p_1 n_1 + p_2 n_2}{n_1 + n_2}} \quad = \quad \sqrt{\frac{(.614)88 + (.512)131}{88 + 131}} \quad = \quad .55$$

$$SEp = \sqrt{p(1-p) * \left(\frac{1}{n_1} + \frac{1}{n_2}\right)} \quad = \quad \sqrt{.55(.45) * \left(\frac{1}{88} + \frac{1}{131}\right)} \quad = \quad .069$$

Hence, the pooled standard error of the proportions equals .069

STEP 4: Calculate the test statistic

The test statistic equals (.614 - .512)/.069, or 1.49

STEP 5: Compare Results and State Conclusion

Since Zcalc =1.49 < Ztable=1.96, we conclude there is no statistical difference between the proportions.

As a side observation, if instead of comparing those who waited 20 minutes or more you compared those who waited less than 20 minutes, For Jano the proportion is 39% compared to Dynamic's 53%. The resulting zcalc would be -2.15, which is greater than -1.96. In other words, the proportion of people who waited between 10-19 minutes is significantly different for the two systems with Jano system having a lower proportion.

10. Menu space is always limited in fast food restaurants. However, McDonald's has decided that it needs to add one more salad dressing to its menu for its garden salad and check salad. It has decided to test market four flavors: Caesar, Ranch-style, Green Goddess, and Russian. Fifty restaurants were selected in the North-Central region to sell *each* new dressing. Thus, a total of 200 stores were used in the research project. The study was conducted for two weeks and the units of each dressing sold are shown below. As a researcher, you want to know if the differences among the average daily sales of the dressings are larger than can be reasonably expected due to chance. If so, which dressing would you recommend be added to the inventory throughout the United States?

Day	Caesar	Ranch-Style	Green Goddess	Russian	
1	155	143	149	135	
2	157	146	152	136	
3	151	141	146	131	
4	146	136	141	126	
5	181	180	173	115	
6	160	152	170	150	
7	168	157	174	147	
8	157	167	141	130	
9	139	159	129	119	
10	144	154	167	134	
11	158	169	145	144	
13	184	195	178	177	
14	161	177	201	151	Grand Avg.
AVG	158.54	159.69	158.92	138.08	153.81

STEP 1: Hypotheses

H0: M1=M2=M3= M4; mean request for the four salad dressings are equal.

Ha: The variability in group means is greater than would be expected because of sampling error.

STEP 2: Determine Mean Sum of Square Differences BETWEEN Columns

$$SSA = \sum_{j=1}^{C} n_j \left(\overline{X}_j - \overline{X}_t\right)^2 = 13\left[(158.5-153.8)^2 + (159.7-153.8)^2 + (158.9-153.8)^2 + (138.1-153.8)^2\right]$$

SSA= 4298.23

Degrees of Freedom for SSA = C-1 = 4-1 = 3

MSA = SSA / Df = 4298.23 / 3 = 1432.7

STEP 3: Determine Mean Sum of Square Differences WITHIN Columns

$$SSE = \sum_{j=1}^{C} \sum_{i=1}^{n_j} \left(X_{ij} - \overline{X}_j \right)^2$$

SSE=2075.2 +3574.8+4792.9+3126.9 = 13569.8

Degrees of Freedom for SSE= (n1+n2+n3+n4) - C = 52-4 = 48

MSE = SSE / Df = 13569.8 / 48 = 282.7

STEP 4: Calculate the F statistic

F calc = MSA / MSE = 1432.7 / 282.7 = 5.07

F Table Value at alpha = .05 with 3, 35 degrees of freedom = 2.80

STEP 5: Compare Results and State Conclusion

Fcalc > Ftable. Hence, there is at least one mean that is statistically different from the rest. Looking at the results, it would appear that Russian Dressing has the least appeal whereas the other three have almost the same average. Computing confidence intervals for each column mean or other types of direct comparison tests (e.g., Tukey's Test, etc.) would provide more reliable comparisons.

CHAPTER 17

Bivariate Correlation and Regression

1. BIVARIATE ANALYSIS OF ASSOCIATION

I. **Degrees of Association between Variables**

A. **Statistical Techniques**

1. **Bivariate Techniques**–Statistical methods of analyzing the relationship between two variables
2. **Multivariate Techniques**–when more than two variables are involved, discussed in Chapter 18
3. **Independent Variable (Predictor)**–the symbol or concept that the researcher has some control over or can manipulate to some extent and that is hypothesized to cause or influence the dependent variable
4. **Dependent Variable**–a symbol or concept expected to be explained or caused by the independent variable

B. **Procedures for Metric and Ordinal Data**

1. Metric Data
   a. Bivariate Regression
   b. Pearson's Product Moment Correlation
2. Other Statistical Procedures (Chapter 16)
   a. Two-group *t* Test
   b. Chi-square Analysis of Crosstabs or Contingency Tables
   c. ANOVA (Analysis of Variance) for Two Groups

2. BIVARIATE REGRESSION

I. **Bivariate Regression Analysis**

A. **Bivariate Regression Analysis Defined**–a statistical procedure which analyzes the strength of the linear relationship between two variables when one is considered the independent variable and the other the dependent variable

B. **Nature of the Relationship**

1. **Scatter Diagram**–one way to study the nature of the relationship between the dependent and the independent variable is to plot the data in a scatter diagram

a. **Dependent Variable Y**–plotted on the vertical axis

b. **Independent Variable X**–plotted on the horizontal axis

c. **Linear Relationship**–apply linear regression to the data

d. **Nonlinear Relationship**–apply curve-fitting nonlinear regression techniques

See Exhibit 17.1 Types of Relationships Found in Scatter Diagrams (p 515)

PRACTICING MARKETING RESEARCH

Questions

1. **What did regression analysis show about the impact of "Teen Mom" on teen pregnancy?**

   That there was a 5.7% reduction in pregnancies attributable to the show.

2. **What, if anything, did regression tell us about the reasons for the decline in teen pregnancies?**

   Regression only showed that viewership was associated with a lower likelihood of getting pregnant. Other qualitative research efforts would show the specific reasons.

C. **Example of Bivariate Regression**

1. 20 stores were identified.

2. Goal is to develop a model that can be used to evaluate potential sites for store locations.

3. Daily traffic counts for each site were taken over a 30 day period.

4. A scatter plot of the resulting data was drawn.

1. Least Squares Estimation Procedure

a. The least squares procedure is a simple mathematical technique that can be used to fit a line to data for X and Y that best represents the relationship between the two variables.

b. No straight line will perfectly represent every observation in the scatterplot. This is reflected in discrepancies between the actual values (dots on the scatter diagram) and predicted values (values indicated by the line). Any straight line fitted to the data in a scatterplot is subject to error

c. The least squares procedure results in a straight line that fits the actual observations (dots) better than any other line that could be fitted to the observations.

d. The general equation is **Y = a + bX + e** and the estimating equation is $Y = \hat{a} + \hat{b}X + e$, where:

Y = dependent variable

$\hat{a}$ = estimated ***Y*** intercept of regression line

$\hat{b}$ = estimated slope of regression line, regression coefficient

X = independent variable

e = error, difference between actual value and value predicted by regression line

2. **Regression Line**–Predicted values for ***Y***, based on calculated values for $\hat{a}$ and $\hat{b}$ (Exhibit 17.5). In addition, errors for each observation $(Y - \hat{Y})$ are shown. The regression line resulting from the $\hat{Y}$ values is plotted in Exhibit 17.6.

3. **Strength of Association –** the estimated regression function describes the *nature* of the relationship between the variables ***X*** and ***Y***.

a. **Coefficient of determination**– denoted R^2, measures *strength* of the linear relationship between ***X*** and ***Y***.

1) Indicates the percentage of the total variation in ***Y*** that is "explained" by the variation in ***X***.

b. The R^2 statistic ranges from 0 to 1, where 1 = a perfect linear relationship and 0 = no relationship at all.

4. **Statistical Significance of Regression Results**

a. **Total variation (Total Sum of Squares or SST)** = explained variation + unexplained variation

1) **Sum of squares due to regression (SSR)**–variation explained by the regression

2) **Error sum of squares (ESS)**–variation not explained by the regression

5. **Hypotheses Concerning Overall Regression**

The interest is in the hypotheses regarding the computed R^2 value for the problem. Is the amount of variance explained in the result significantly greater than should be expected due to chance? Analysis of variance (an *F* test) is used to test the significance of the results

a. **The null hypothesis H_0**–there is no linear relationship between ***X*** (average daily vehicular traffic) and ***Y*** (annual sales).

b. **Alternative hypothesis H_a**–there is a linear relationship between ***X*** and ***Y***.

c. Must decide on a standard level of significance: $\alpha = .05$ (i.e., 5 percent chance of incorrectly rejecting the null hypothesis)

d. **F =MSR/MSE**

e. Compare the calculated *F*-value to the table value of *F*.

f. Because the calculated *F*-value is > than the table value of *F*, reject the null hypothesis.

6. **Hypotheses about the Regression Coefficient *b***

a. ***b*** is the estimate of the effect of a one-unit change in X on Y. The hypotheses are as follows

1) Null hypothesis H_0: $b = 0$

2) Alternative hypothesis H_a: $\boldsymbol{b} \neq 0$

b. The appropriate test is a *t* test–last line of Exhibit 17.9– the computer program calculates the *t* value and the *p* value

PRACTICING MARKETING RESEARCH

Using Regression Analysis for Key Driver Analysis

1. **Is there one, or more than one, dependent variable?**

   Regression models call for one dependent variable.

2. **Is the relationship being modeled linear or non-linear?**

   This would require the observation of a scatterplot of the data.

Single dependent variable

Questions

1. **What is key driver analysis? What role does regression analysis play in this type of analysis?**

   Key Drive analysis always involves at least one dependent or criterion variable and one or typically multiple independent or predictor variables, who effect on the dependent variable needs to be understood.

2. **How can you use the results from key driver to improve, say, customer satisfaction? Explain.**

   Once the predictor variables have been identified, a regression analysis will jointly associate the values associated with the independent variables with the dependent variable. Examination of the strength and direction of the beta coefficients can tell the research which of the independent variables is the best predictor of the dependent variable.

3. CORRELATION ANALYSIS

I. **Correlation for Metric Data: Pearson's Product Moment Correlation**

A. **Analysis between Two Variables**

1. **Correlation Defined**–degree to which changes in one variable (the dependent variable) are associated with the changes in another

    a. **Correlation Analysis Defined**–analysis of the degree to which changes in one variable are associated with changes in another

    b. **Pearson's Product Moment Correlation**–correlation analysis technique for use with metric data

2. **Coefficient of Correlation**–***R***, is a measure of the degree of association between ***X*** and ***Y***. It is the square root of the coefficient of determination. It can range from –1(perfect negative correlation) to +1(perfect positive correlation).

$$R = \pm\sqrt{R^2}$$

PRACTICING MARKETING RESEARCH:

Do Your "BESD" When Explaining Correlation Results

Questions

1. **What are two traditional ways to explain correlation results to a client? Describe each.**

    Given a significant correlation between two variables, the two traditional ways are: first, the strength of the relationship (what is the probability of insignificance or confidence) and two, what is the direction of the relationship.

2. **What is the BESD approach? Does it make results easier to digest by clients? Why/ why not?**

    The BESD approach is a flexible technique because it can be used with any kind of data. Responses will vary to the second part of the technique.

QUESTIONS FOR REVIEW AND CRITICAL THINKING

2. A sales manager of a life insurance firm administered a standard multiple-item job satisfaction scale to all the members of the firm's sales force. The manager then correlated (Pearson's product-moment correlation) job satisfaction score with years of school completed for each salesperson. The resulting correlation was .11. On the basis of this evidence, the sales manager concluded: "A salesperson's level of education has little to do with his or her job satisfaction." Would you agree or disagree with this conclusion? Explain the basis for your answer.

A correlation coefficient of .11 is low and the conclusion may be correct. This conclusion should be tested with a significance test on the correlation coefficient to provide greater certainty. Hence, what is the probability that a significant relationship does indeed exist. The student should note that statistical analysis cannot lead the decision maker, but the decision maker uses statistical analysis to assist in making recommendations.

3. What purpose does a scatter diagram serve?

A scatter diagram is used to plot data observations to determine if the relationship appears to be linear, curvilinear, or non existent. This allows the researcher to determine whether using linear measures of association (e.g. Pearson's product-moment correlation) would be appropriate.

4. Explain the meaning of the coefficient of determination. What does this coefficient tell the researcher about the nature of the relationship between the dependent and independent variables?

The coefficient of determination tells the marketing researcher how much variation in the dependent variable can be explained by variation in the independent variable. It is a measure of the strength of the relationship. If the coefficient of determination is low, the independent variable does not have significant explanatory power in predicting changes in the dependent variable.

5. It has been observed in the past that when an AFC team wins the Super Bowl, the stock market rises in the first quarter of the year in almost every case. When an NFC team wins the Super Bowl, the stock market falls in the first quarter in most cases. Does this mean that the direction of movement of the stock market is caused by which conference wins the Super Bowl? What does this example illustrate?

It is pretty hard to imagine a cause and effect relationship. This example is almost certainly an example of a spurious relationship.

6. The following table gives the data collected for a convenience store chain for 20 of its stores.

Column 1 - ID number for each store

Column 2 - Annual sales for the store for the previous year in thousands of dollars.

Column 3 - Average number of vehicles that pass the store each day, based on actual traffic counts for one month.

Column 4 - Total population that lives within a 2-mile radius of the store, based on 1990 census data.

Column 5 - Median family income for households within a 2-mile radius of the store based on 2000 census data. See text for data.

Answer the following:

a. Which of the other three variables is the best predictor of sales? Compute correlation coefficients to answer the question.

- For the correlation between sales and traffic, $r = .769$
- For the correlation between sales and population, $r = .418$
- For the correlation between sales and average income, $r = -.418$
- Of the three variables, traffic is the most predictive of sales.

b. Do the following regressions.

1. Sales as a function of average daily traffic.

Sales = 305 +.013*(Traffic), $R^2 = .591$ (note: sales measured in thousands of dollars)

2. Sales as a function of population in two-mile radius.

Sales = 539 + .015*(Population), $R^2 = .175$ (note: sales measured in thousands of dollars)

c. Interpret the results of the two regressions.

Traffic and population have direct positive relationships with sales. As each one increases, sales increases. The R^2 value indicates that the variance in traffic explains more of the variance in sales than does the variation in population.

7. Interpret the following:

a. $Y = .11 + .009X$, where Y is the likelihood of sending children to college and X is family income in thousands of dollars. Remember, it is family income in *thousands*.

1. According to our model how likely is a family with an income of $100,000 to send their children to college?

Y = 0.11 + .009(100) = 1.01 according to the model, but probability cannot be greater than 1.00

2. What is the likelihood for a family with an income of $50,000?

Y = 0.11 + .009(50) = .56

3. What is the likelihood for a family with an income of $17,500?

Y = 0.11 + .009(17.5) = .268

4. Is there some logic to the estimates? Explain.

Yes, those families with higher income would be more likely to be able to afford college for their children.

b. $Y = .25 - .039X$, where Y is the likelihood of going to a skateboard park and X is age.

1. According to our model, how likely is a 10 year old to go to a skateboard park?

Y = .25 - .0039(10) = .211

2. What is the likelihood for a 60 year old?

Y = .25 - .0039(60) = .016

3. What is the likelihood for a 40 year old?

Y = .25 - .0039(40) = .094

4. Is there some logic to the estimates? Explain.

Yes, it is logical that as you get older you are less likely to go to a skateboard park. Children tend to skateboard more than older adults.

8. The following ANOVA summary data are the result of a regression with sales per year (dependent variable) as a function of promotion expenditures per year (independent variable) for a toy company.

$$F = \frac{MSR}{MSE} = \frac{34{,}276}{4{,}721}$$

The degrees of freedom are 1 for the numerator and 19 for the denominator. Is the relationship statistically significant at $\alpha = .05$? Comment.

With this summary data, we can compute an *F*-value of 7.26. With one and 19 degrees of freedom at $\alpha = .05$, the tabulated or critical *F*-value is 4.38. Thus the null hypothesis is rejected, and we can conclude that there seems to be a relationship between sales and promotion expenditures.

REAL-LIFE RESEARCH

Case 17.1 – Axcis Athletic Shoes

Key Points:

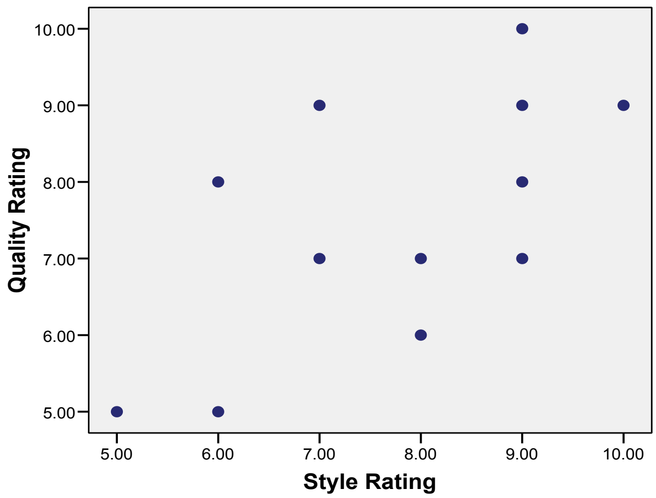
- Axcis' management wants to know whether there is a relationship between consumers' perceptions of style in an athletic shoe and their perception of quality.

Questions

1. Which of the statistical procedures covered in this chapter is appropriate for addressing Fred's theory? Why would you choose that technique over the others?

Pearson's product-moment correlation would be appropriate, as it is designed to quantify the nature and strength of association between variables measured on metric scales. We could also run bivariate regression if a predictive model is desired.

As a check, we should examine a scatter diagram to ensure that a measure of *linear* association such as Pearson's correlation is appropriate. The plot reveals no obvious non-linear relation and thus Pearson's correlation would be appropriate.



2. Use the technique that you choose to determine whether Fred's theory is supported by the statistical evidence. State the appropriate null and alternative hypothesis. Is Fred's theory supported by the statistical evidence? Why or why not?

Fred's theory is represented by the alternative hypothesis in an inference test for the correlation.

H_0: There is not a positive association between perceptions of style and perceptions of quality.

H_a: There is a positive association between perceptions of style and perceptions of quality.

The computed correlation is .634, with a *p*-value of .027. Thus, Fred's theory (Ha) is supported by this data at the $\alpha = .05$ level.

Chapter Seventeen

Bivariate Correlation And Regression

	LEARNING OBJECTIVES
	1. Learn the bivariate analysis of association.
	2. Understand bivariate regression analysis.
	3. Define the correlation analysis.

Bivariate Analysis of Association

Bivariate Techniques:

• Statistical methods of analyzing the relationship between two variables.

Independent Variable:

• Variable believed to affect the value of the dependent variable.

Bivariate Analysis of Association

Dependent Variable:

• Variable expected to be explained or caused by the independent variable.

Bivariate Regression Analysis:

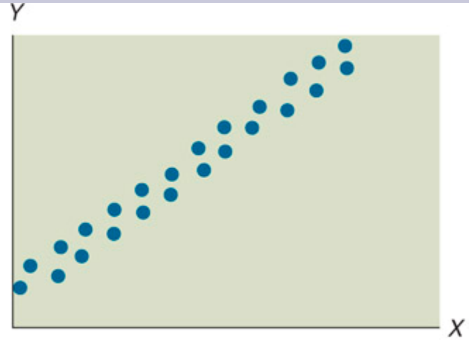
• The analysis of the strength of the linear relationship between variables when one is considered the independent variable and the other is the dependent variable.

Scatter Diagram

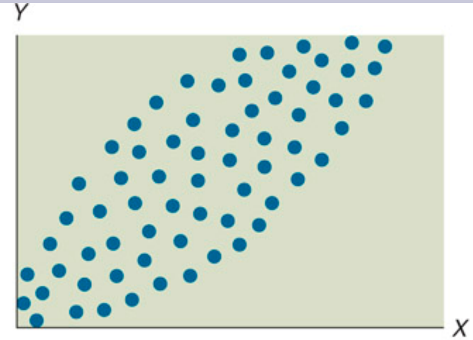
Scatter Diagram:

Graphic plot of the data with dependent variable on the Y (vertical) axis and the independent variable on the X (horizontal) axis. Shows the nature of the relationship between the two variables, linear or nonlinear.

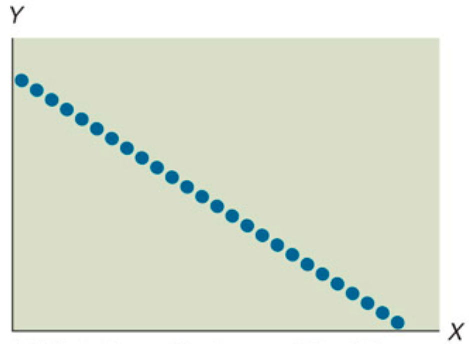
Types of Relationships Found in Scatter Diagrams



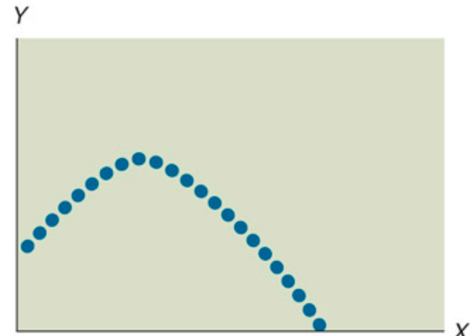
(a) Strong positive linear relationship



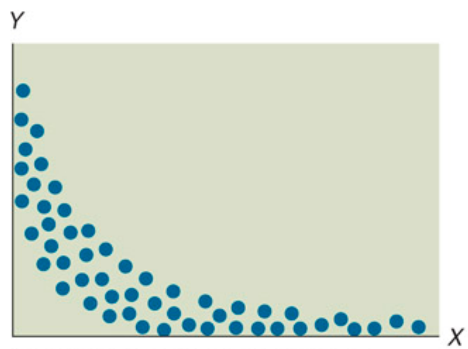
(b) Positive linear relationship



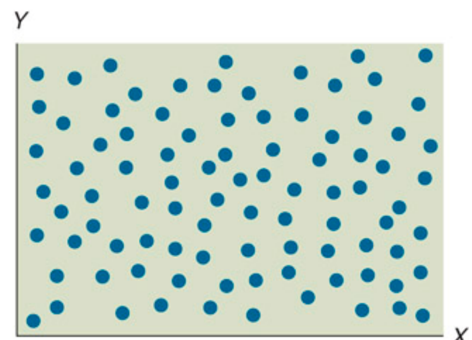
(c) Perfect negative linear relationship



(d) Perfect parabolic relationship

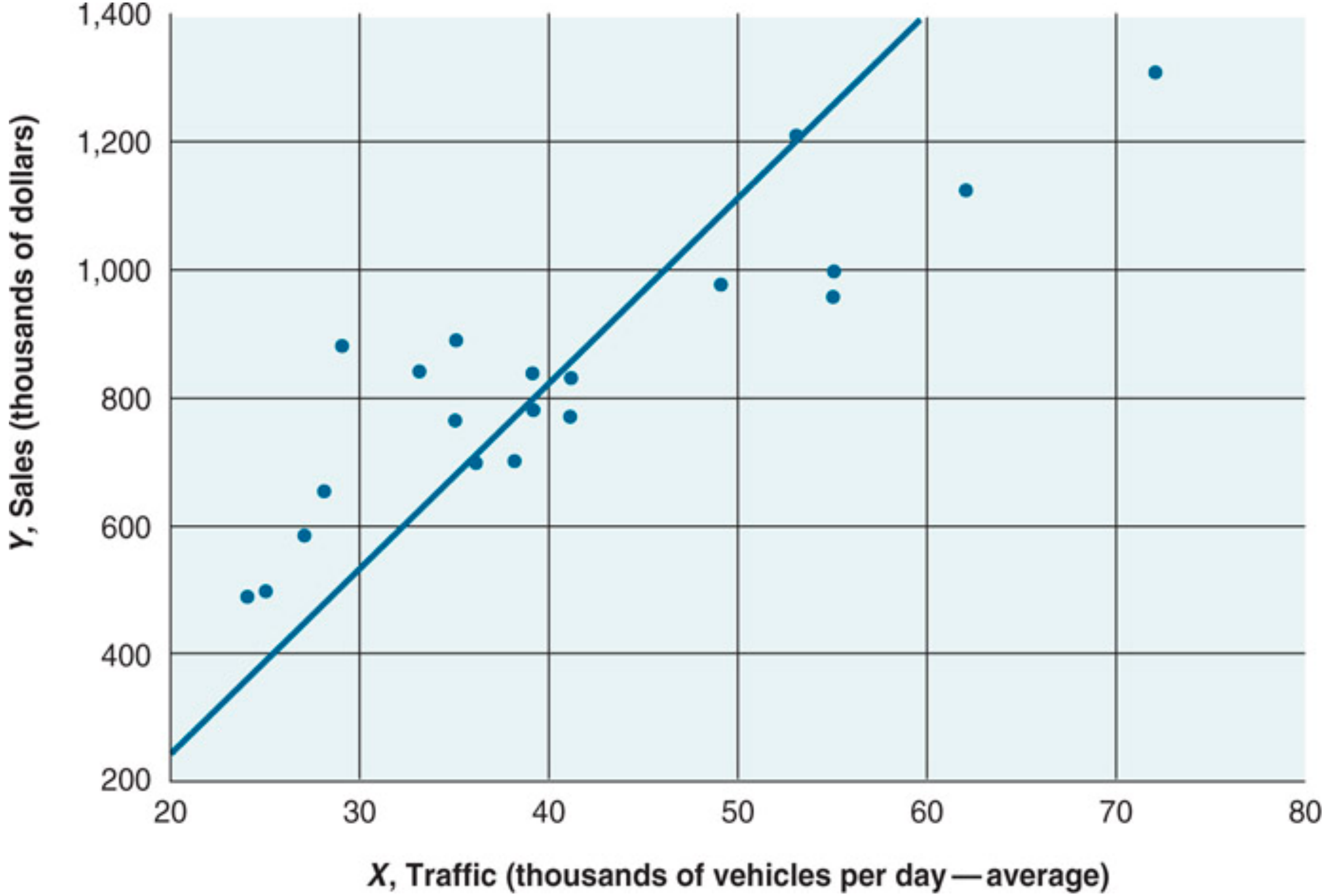


(e) Negative curvilinear relationship



(f) No relationship between X and Y

Types of Relationships Found in Scatter Diagrams



Least-Squares Estimation Procedure

Estimating the best line of fit:

$$Y = \hat{a} + \hat{b}X + e$$

Where:

Y = dependent variable

$\hat{a}$ = estimated Y intercept

$\hat{b}$ = estimated slope of the regression line

X = independent variable

e = error

Values for "a" and "b" can be calculated as follows:

$$\hat{b} = \frac{\Sigma X_i Y_i - n\bar{X}\bar{Y}}{\Sigma X_i^2 - n(\bar{X})^2}$$

$$\hat{a} = \bar{Y} - \hat{b}\bar{X}$$

Where:

$\bar{\mathbf{X}}$ = mean of value X

$\bar{\mathbf{Y}}$ = mean of value y

n = sample size

Least-Squares Estimation Procedure

The least-squares procedure is a fairly simple mathematical technique that can be used to fit data for X and Y to a line that best represents the relationship between the two variables.

$$Y = \hat{a} + \hat{b}X + e$$

where Y = dependent variable, annual sales in thousands of dollars

$\hat{a}$ = estimated Y intercept for regression line

$\hat{b}$ = estimated slope of regression line, regression coefficient

X = independent variable, average daily vehicular traffic in thousands of vehicles

e = error, difference between actual value and value predicted by regression line

Values for $\hat{a}$ and $\hat{b}$ can be calculated from the following equations:

$$\hat{b} = \frac{\sum X_i Y_i - n\overline{X}\,\overline{Y}}{\sum X_i^2 - n(\overline{X})^2}$$

$$\hat{a} = \overline{Y} - \hat{b}\overline{X}$$

where $\overline{X}$ = mean value of X

$\overline{Y}$ = mean value of Y

n = sample size (number of units in the sample)

Least-Squares Estimation Procedure

The least-squares procedure is a fairly simple mathematical technique that can be used to fit data for X and Y to a line that best represents the relationship between the two variables.

With the data from Exhibit 17.4, $\hat{b}$ is calculated as follows:

$$\hat{b} = \frac{734{,}083 - 20(40.8)(841.3)}{36{,}526 - 20(40.8)^2} = 14.7$$

The value of $\hat{a}$ is calculated as follows:

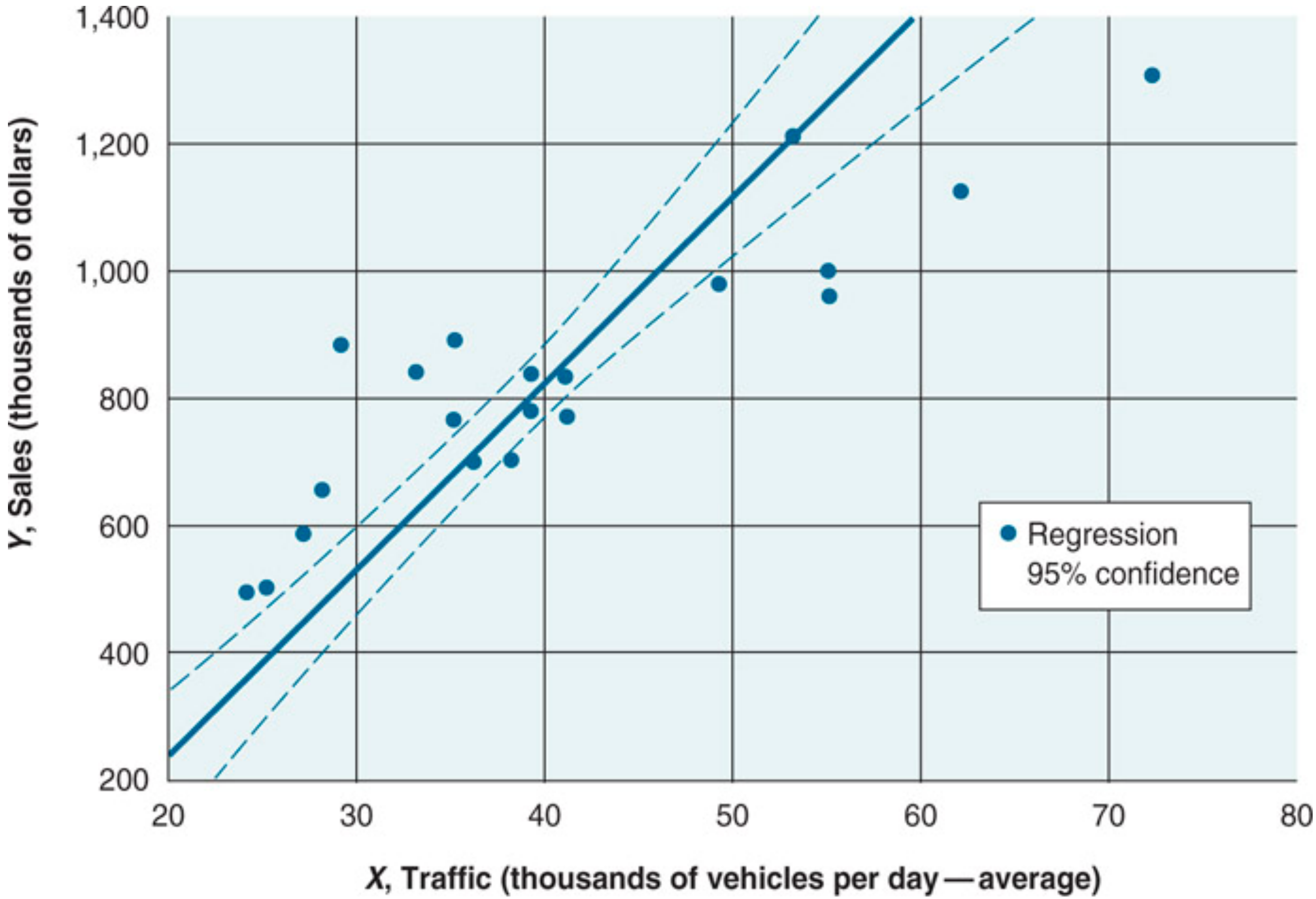
$$\begin{aligned} \hat{a} &= \overline{Y} - \hat{b}\overline{X} \\ &= 841.3 - 14.72(40.8) = 240.9 \end{aligned}$$

Thus, the estimated regression function is given by

$$\begin{aligned} \hat{Y} &= \hat{a} + \hat{b}X \\ &= 240.9 + 14.7(X) \end{aligned}$$

where $\hat{Y}$ (Y-hat) is the value of the estimated regression function for a given value of X.

Coefficient of Determination



Coefficient of Determination

The **coefficient of determination**, denoted by R^2, is the measure of the strength of the linear relationship between X and Y. The coefficient of determination measures the percentage of the total variation in Y that is "explained" by the variation in X. The R^2 statistic ranges from 0 to 1. If there is a perfect linear relationship between X and Y (all the variation in Y is explained by the variation in X), then R^2 equals 1. At the other extreme, if there is no relationship between X and Y, then none of the variation in Y is explained by the variation in X, and R^2 equals 0.

$$R^2 = \frac{\text{Explained variation}}{\text{Total variation}}$$

where

Explained variation = Total variation − Unexplained variation

The coefficient of determination for the Stop 'N Go data example is computed as follows. [See Exhibit 17.5 for calculation of $(Y - \hat{Y})^2$ and $(Y - Y)^2$.]

Chapter Eighteen

Multivariate Data Analysis

LEARNING OBJECTIVES

1. Define multivariate data analysis.
2. Gain insights into multivariate software.
3. Describe Multiple Discriminant Analysis.
4. Understand cluster analysis.
5. Understand factor analysis.

Multivariate Analysis

A general term for statistical procedures that simultaneously analyze multiple measurements on each individual or object under study.

Multivariate Regression Analysis

Multiple Discriminant Analysis

Cluster Analysis

Factor Analysis

Conjoint Analysis

Multivariate Analysis

EXHIBIT 18.1	Brief Descriptions of Multivariate Analysis Procedures
Multiple regression analysis	Enables the researcher to predict the level of magnitude of a dependent variable based on the levels of more than one independent variable.
Multiple discriminant analysis	Enables the researcher to predict group membership on the basis of two or more independent variables.
Cluster analysis	Is a procedure for identifying subgroups of individuals or items that are homogeneous within subgroups and different from other subgroups.
Factor analysis	Permits the analyst to reduce a set of variables to a smaller set of factors or composite variables by identifying underlying dimensions in the data.
Conjoint analysis	Provides a basis for estimating the utility that consumers associate with different product features or attributes.

Multiple Regression

Key Concepts

A procedure for predicting the level or magnitude of a (metric) dependent variable based on the levels of multiple independent variables.

Coefficient of Determination:

- Measured changes in the dependent and independent variables.

Regression Coefficients:

- Effect of the independent variable on the dependent variable.

Dummy Variables:

- They're nominally scaled variables included in regression analysis.

Multiple Regression

Key Concepts

A procedure for predicting the level or magnitude of a (metric) dependent variable based on the levels of multiple independent variables.

Dummy Variables:

- They're nominally scaled variables included in regression analysis.
- An example of a dummy variable for a measure of location of birth would be
- 0 = born in the United States, 1 = born outside the United States

Multiple Regression Analysis

The general equation for multiple regression is as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \cdots + b_nX_n$$

where Y = dependent or criterion variable

a = estimated constant

b_1–b_n = coefficients associated with the predictor variables so that a change of one unit in X will cause a change of b_1 units in Y; values for the coefficients are estimated from the regression analysis

X_1–X_n = predictor (independent) variables that influence the dependent variable

Multiple Regression Analysis

For example, consider the following regression equation (in which values for a, b_1, and b_2 have been estimated by means of regression analysis):

$$\hat{Y} = 200 + 17X_1 + 22X_2$$

where $\hat{Y}$ = estimated sales in units
X_1 = advertising expenditures
X_2 = number of salespersons

This equation indicates that sales increase by 17 units for every $1 increase in advertising and 22 units for every one-unit increase in number of salespersons.

Examples

Suppose a marketer was trying to predict the sales (Y) of a product for a given level of advertising (X_1) and sales person performance (X_2). The resulting output was as follows:

$$Y = 2{,}300 + 34(X_1) + 15.5(X_2) \text{ with a } R^2 = .12$$

Given the above results, what would you suggest to the marketer?

Examples

the sales (Y) of a product for a given level of advertising (X_1) and sales person performance (X_2).

$$Y = 2{,}300 + 34(X_1) + 15.5(X_2) \text{ with a } R^2 = .12$$

Answer: The resulting regression equation depicts a positive relationship between Sales and both Advertising and Salesperson Performance, which means greater inputs of advertising and higher salesperson performance result in higher sales.

However, the R^2 is only .12, meaning that only 12% of the variation in the dependent variable Sales (Y) is explained jointly by Advertising (X_1) and Salesperson Performance (X_2).

There must be other performance variables that would explain more of the variation in Sales. The consultant should suggest additional analysis of the company database to find additional variables that would explain more of the variation in Sales.

Coefficient of Determination

The **coefficient of determination**, denoted by R^2, is the measure of the strength of the linear relationship between X and Y. The coefficient of determination measures the percentage of the total variation in Y that is "explained" by the variation in X. The R^2 statistic ranges from 0 to 1. If there is a perfect linear relationship between X and Y (all the variation in Y is explained by the variation in X), then R^2 equals 1. At the other extreme, if there is no relationship between X and Y, then none of the variation in Y is explained by the variation in X, and R^2 equals 0.

$$R^2 = \frac{\text{Explained variation}}{\text{Total variation}}$$

where

$$\text{Explained variation} = \text{Total variation} - \text{Unexplained variation}$$

The coefficient of determination for the Stop 'N Go data example is computed as follows. [See Exhibit 17.5 for calculation of $(Y - \hat{Y})^2$ and $(Y - Y)^2$.]

Examples

- An advertising agency has been doing work for a client selling widgets.
- The three-month campaign has produced a low correlation between advertising expenditures and sales for its client.
  - Hence, the client is considering firing the ad agency.
- The ad agency counters that consumer sales: not a fair assessment of the effectiveness of the ad campaign after only three months.
- An analysis of advertising expenditures in relation to
  - number of requests for information about the widgets;
  - number of distributors stocking widgets;
  - number of retailers requesting shipments of widgets.

Examples

- What kind of analysis would best assist the ad agency in making their case for the effectiveness of their ad campaign?

- A multiple regression analysis.
  - requests for information about widgets,
  - number of distributors stocking widgets,
  - number of retailers requesting shipments of widgets.

  - AD Exp. = $B_0 + B_1(X_1) + B_2(X_2)+B_3\ (X_3)$

Multiple Discriminant Analysis

Multiple Discriminant Analysis:

Procedure for predicting group membership for a (**nominal or categorical**) dependent variable on the basis of two or more independent variables.

Metric Scale:

A type of quantitative that provides the most precise measurement.

Nominal or Categorical:

A type of non-metric qualitative data scale that only uses numbers to indicate membership in a group (e.g., 1=male, 2=female). Most mathematical and statistical procedures cannot be applied to nominal data.

Multiple Discriminant Analysis

Discriminant Score:

Score that is the basis for predicting to which group a particular object or individual belongs; also called Z score.

Discriminant Coefficient:

Estimate of the discriminatory power of a particular independent variable; also called discriminant weight.

Classification Matrix:

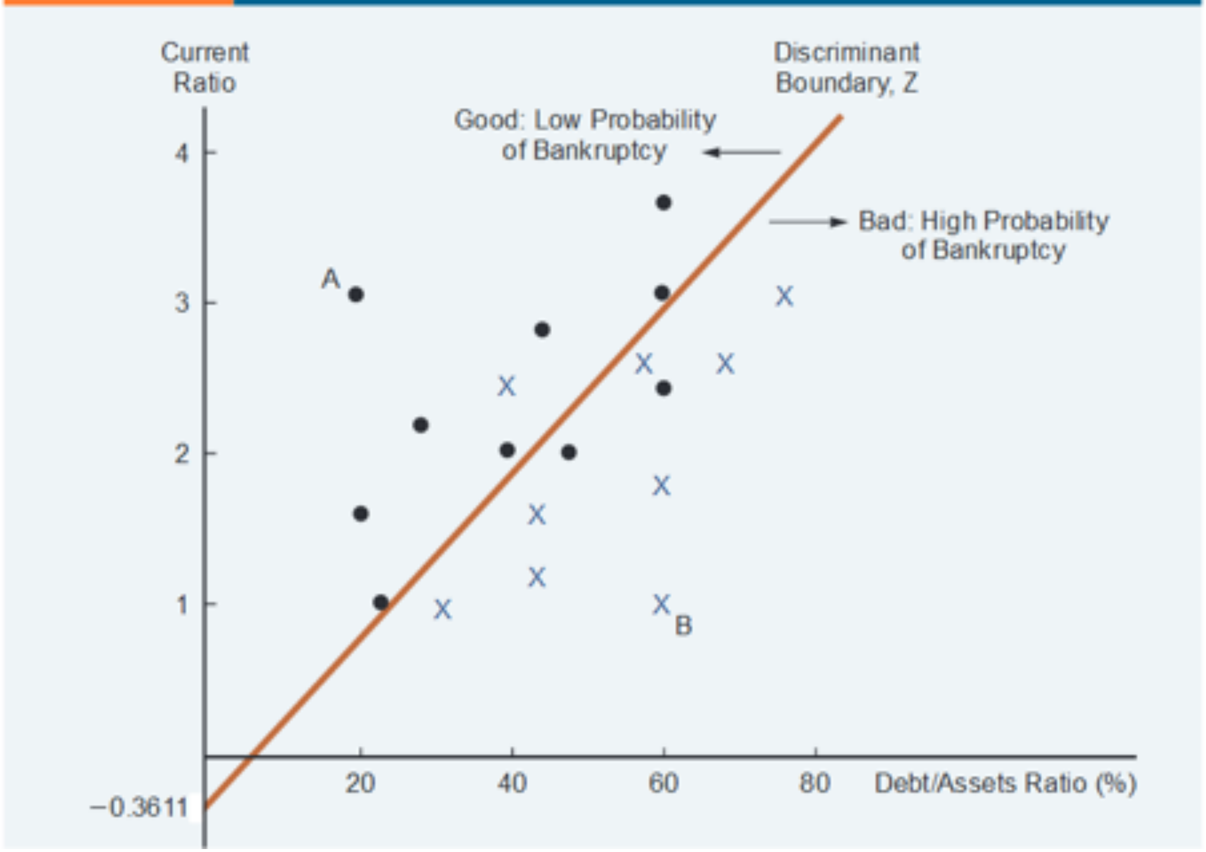
A matrix or table that shows the percentages of people or things correctly and incorrectly classified by the discriminant model.

Multiple Discriminant Analysis

- Z=a+b1* (current ratio)+b2(Debt ratio)
- Fit a discrimination function using historic data.
- Plot the equation in the figure.
- Companies lie to the left of the line(Z<0) are unlikely to go to bankrupt,
- Companies lie to the right (Z>0) are likely to go bankrupt.

Multiple Discriminant Analysis

FIGURE 25B-1 Discriminant Boundary between Bankrupt and Solvent Firms



Key difference

- In the case of multiple regression analysis, the dependent variable must be **metric**;
- In multiple discriminant analysis, the dependent variable is **nominal or categorical** in nature.

Example

A client has a data set that would be appropriate for a linear model. He wants the resulting model to predict whether or not a person would buy a particular product.
The client has been advised that a multiple regression analysis would be the best approach. What would you suggest?

Example

A client has a data set that would be appropriate for a linear model. He wants the resulting model to predict whether or not a person would buy a particular product. The client has been advised that a multiple regression analysis would be the best approach. What would you suggest?

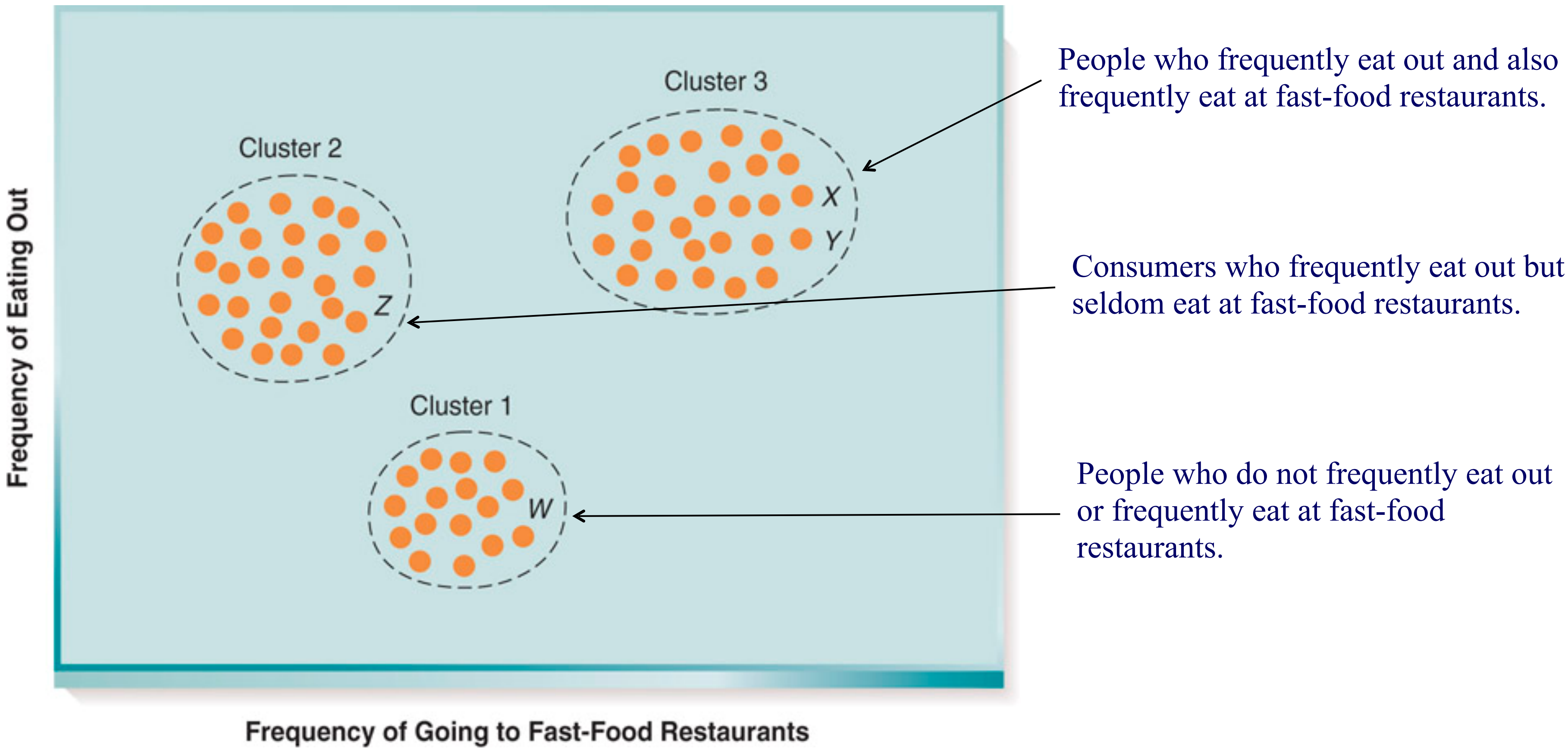
Ans: Multiple regression analysis would be appropriate if the goal is to predict what sales would be given a set of predictor variables.
However, if the goal was to simply predict whether or not a particular type of purchase behavior would occur, then the proper method would be multiple discriminant analysis.

Cluster Analysis

- Cluster analysis
  - A multivariate approach for grouping observations based on similarity among measured variables.
    - Cluster analysis is an important tool **for identifying market segments**.
    - Cluster analysis classifies individuals or objects into a small number of mutually exclusive and exhaustive groups.
    - Objects or individuals are assigned to groups so that there is great similarity within groups and much less similarity between groups.
    - The cluster should have high internal (within-cluster) homogeneity and external (between-cluster) heterogeneity.

Cluster Analysis

The general term for statistical procedures that classify objects, or people, into some number of mutually exclusive and exhaustive groups on the basis of two or more classification variables.



Examples

- An analyst is trying to group together persons who attend theatre performances and who prefer a dinner to accompany the theatre performance. Hence, the two pieces of information are 1) frequency of attending theatre performances and 2) preference for a dinner-theatre format.

- What type of analysis should be undertaken to determine if those persons preferring the dinner-theatre format are those who attend theatre performances more frequently?

Examples

- An analyst is trying to group together persons who attend theatre performances and who prefer a dinner to accompany the theatre performance.
- Hence, the two pieces of information are
  - 1) frequency of attending theatre performances
  - 2) preference for a dinner-theatre format.
- What type of analysis should be undertaken to determine if those persons preferring the dinner-theatre format are those who attend theatre performances more frequently?

Examples

- This problem would be best solved using cluster analysis, which would simultaneously group persons preferring the dinner-theatre format with how frequently they attend theatre performances

Techniques of Cluster Analysis

- Which of the following is not an example of a cluster technique?

K-means

Nearest neighbor

Decision trees

BIRCH

All of these are examples

Factor Analysis

Factor: A linear combination of variables that are correlated with each other.

A procedure for simplifying data by reducing a large set of variables to a smaller set of factors of composite variables by identifying dimensions of the data.

Factor Analysis

- Data Reduction Technique
  - Overlapping information among p variables
- For a set of p variables we want to extract a smaller set of n factors that adequately describes the key measures of differentiation
  - Uncover the salient underlying dimensions
- The correlation matrix
- If x1 and x2 are highly correlated the two variables may reflect the same latent construct

Questionnaire to obtain responses regarding the celebrity for a Jewelry Brand

- How do you rate the celebrity " Katrina Kaif " on the following factors:

Dependable	1	2	3	4	5
Classy	1	2	3	4	5
Beautiful	1	2	3	4	5
Elegant	1	2	3	4	5
Attractive	1	2	3	4	5
…….	1	2	3	4	5

COMPONENT MATRIX OBTAINED FROM SPSS

Rotated Component Matrix[a]

	Component		
	1	2	3
Dependable	-.047	.767	-.030
Honesty	.409	.582	.041
Reliable	.007	.899	.012
Trustworthy	.369	.569	-.309
Sincere	-.211	.620	.148
Attractive	.896	.022	.177
Classy	.936	.085	.124
Beautiful	.897	.027	.189
Elegant	.896	.026	.245
Sexy	.875	-.023	.240
Knowledgeable	.106	.005	.853
Qualified	.328	.039	.659

WHAT SHALL THESE COMPONENTS BE CALLED?

Dependable	Attractiveness	Knowledgeable
Honest	Classy	Qualified
Reliable	Beautiful	
Trustworthy	Elegant	
Sincere	Sexy	

THESE COMPONENTS MAY BE CALLED AS

TRUSTWORTHINESS	ATTRACTIVENESS	EXPERTISE
Dependable	Attractiveness	Knowledgeable
Honest	Classy	Qualified
Reliable	Beautiful	
Trustworthy	Elegant	
Sincere	Sexy	

Examples

- A client wanted to know which preventive health care information (PHC) sources were related to each other. The following table has factor loadings for 10 types of preventive health care information using a Varimax rotation. Based on the table of results below, what would you tell your client?

Sources of PHC information	Factor 1	Factor 2	Factor 3
Web MD	.88	.15	.23
Nutritional labels	.11	.67	.14
Health fairs	.25	.32	.88
Health magazines	.22	.74	.30
Health books	.43	.64	.31
Hospital seminars	.03	.21	.85
Television	.70	.31	.34
Wellness center newsletters	.27	.70	.20
Medical Encyclopedias	.33	.76	.31
Hospital websites	.72	.42	.19

Examples

a) Analysis of the factor loadings coupled with the number of factors developed during the principal components step, there are 3 distinct factors or groups of PHC information that co-vary together.

b)The next step for the analyst would be to examine the factor loadings and assign the individual factors (sources of PHC info) to the composite factor group they are related to.

c)
Factor 1: Electronic and video media
Factor 2: Print Media
Factor 3: Institutional related health events

Question

- Independent variables are important components in multiple regression analysis and ___________________.
  a. multiple discriminant analysis
  b. factor analysis
  c. conjoint analysis
  d. cluster analysis

Question

Cluster analysis is particularly valuable for what type of marketing strategy?

a. product differentiation

b. positioning

c. segmentation

d. cost leadership

CHAPTER 18

Multivariate Data Analysis

CHAPTER SUMMARY

1. MULTIVARIATE ANALYSIS PROCEDURE

I. **Multivariate Analysis**

A. **Multivariate Analysis Defined**

1. General term for statistical procedures that simultaneously analyze multiple measurements on each individual or object under study

B. **Five Techniques for Multivariate Analysis**

1. Multiple regression analysis
2. Multiple discriminant analysis
3. Cluster analysis
4. Factor analysis
5. Conjoint analysis

2. MULTIVARIATE SOFTWARE

1. Running the various types of analyses presented in this text requires appropriate software. Personal computers of today have the power to handle most problems that a marketing researcher might encounter.
2. There is a wide variety of outstanding Window software available for multivariate analysis. SPSS for Windows is one of the best and the most widely used by professional marketing researchers.

3. MULTIPLE REGRESSION ANALYSIS

I. **Multiple Regression Analysis**

A. **Multiple Regression Analysis Defined**

1. Procedure for predicting the level or magnitude of a (metric) dependent variable based on the levels of multiple independent variables

2. **General Equation for Multiple Regression**:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \ldots b_nX_n$$

where

Y = dependent or criterion variable

a = estimated constant

X_1 – X_n = predictor (independent) variables that influence the dependent variable

b_1 – b_n = coefficients associated with the predictor variables so that a change of one unit in X_n is associated with a change of b_n units in Y; values for the coefficients are estimated from the regression analysis

B. **Applications of Multiple Regression Analysis**

1. Estimating the effects that various marketing mix variables have on sales or market share.
2. Estimating the relationship between various demographic or psychographic factors and frequency of visiting fast food restaurants or other service businesses.
3. Determine the relative influence of individual satisfaction elements on overall satisfaction.
4. Quantifying the relationship between various classification variables, such as age and income, and overall attitude toward a product or service.
5. Determining which variables are predictive of sales of a particular product or service.

C. **Purposes of Multiple Regression Analysis**

1. Predicting the level of the dependent variable, based on given levels of the independent variables
2. Understanding the relationship between the independent variables and the dependent variable

D. **Multiple Regression Analysis Measures**

1. **Coefficient of Determination**, R^2–measure of the percentage of the variation in the dependent variable explained by variations in the independent variables

a. This statistic can assume values from 0 to 1

b. ***b* Values or Regression Coefficients**–estimates of the effect of the individual independent variables on the dependent variable.

1) We determine the likelihood that each individual b value is the result of chance (H_0: $b_n = 0$)

c. Adjusted R^2-- As models get larger, it is wise to look at a variation of the R^2 statistic called **adjusted R^2**, as the measure of fit for a regression model. The standard R^2 value tends to increase with every predictor variable that is added to the model, regardless whether that variable truly adds to the explanatory power of the model. The adjusted R^2 corrects the coefficient of determination based on the relationship between the number of predictor variables and the overall sample size, producing a more rational estimate of model fit when several independent variables are included.

E. **Dummy Variables**

1. **Dummy Variables**–nominally scaled independent variables

2. **Dichotomous Nominally Scaled Independent Variables--**can be transformed into dummy variables by coding one value (for example, female) as 0 and the other (for example, male) as 1.

3. **Nominally Scaled Independent Variables**–can assume more than two values, a slightly different approach is required.

a. Example: A question regarding racial group with three categories: African American, Hispanic, or Caucasian. Binary or dummy variable coding of responses requires the use of two dummy variables. For example, X_1 (1 for African American, 0 otherwise) and X_2 (1 for Hispanic, 0 otherwise). Then, $X_1 = 0$ and $X_2 = 0$ corresponds to the “left out” or reference category (in this case, Caucasian).

If there are K categories, K – 1 dummy variables are needed to uniquely identify every category (including K categories would over identify the model since the last category is represented by “0’s” on the previous K – 1 variables)

	X_1	X_2
If person is African American	1	0
If person is Hispanic	0	1
If person is Caucasian	0	0

F. **Potential Use and Interpretation Problems**

1. **Collinearity** – A key assumption when interpreting multiple regression results is that the independent variables are not correlated (collinear) with each other.

a. If they are correlated, then estimated *b* values (regression coefficients) will be less precise (larger standard errors).

b. Check for collinearity by examining the matrix showing the correlations between each variable. If a correlation of .30 or greater exists, check for distortions of *b* values.

c. **Strategies for dealing with collinearity**

1) If two variables are heavily correlated, one variable can be dropped

2) The correlated variables can be combined in some fashion to form a new composite independent variable (create an index or use factor analysis).

2. **Causation**–Regression analysis can show that variables are correlated, but it cannot prove causation.

3. **Scaling of Coefficients**

a. Magnitudes of regression coefficients can be compared directly only if they are scaled in the same units or if the data have been standardized

b. Standardization–achieved by taking each number in a series, subtracting the mean of the series from the number, and dividing the result by the standard deviation of the series. This process converts any set of numbers to a new set with a mean of 0 and a standard deviation of 1.

4. **Sample Size**

a. The value of $\boldsymbol{R^2}$ is influenced by the number of predictor variables relative to sample size.

b. Rules of thumb suggest that the number of observations should be equal to at least 10 to 15 times the number of predictor variables.

4. MULTIPLE DISCRIMINANT ANALYSIS

I. Multiple Discriminant Analysis

A. **Multiple Discriminant Analysis Defined**–a procedure for predicting group membership for a (nominal or categorical) dependent variable on the basis of two or more independent variables

1. In multiple discriminant analysis, the dependent variable must be metric; in multiple discriminant analysis, the dependent variable is nominal or categorical in nature.

2. **Goals of Multiple Discriminant Analysis**

a. To determine if there are statistically significant differences between the average discriminant score profiles of the two or more groups.

b. To establish a model for classifying individuals or objects into groups on the basis of their values on the independent variables.

c. To determine how much of the difference in the average score profiles of the two or more groups is accounted for by each independent variable.

3. **General Discriminant Analysis Equation**

$\boldsymbol{Z} = b_1\boldsymbol{X_1} + b_2\boldsymbol{X_2} + \ldots + b_n\boldsymbol{X_n}$

where

$\boldsymbol{Z}$ = discriminant score

$b_1 - b_2$ = discriminant weights

$\boldsymbol{X_1} - \boldsymbol{X_n}$ = independent variables

a. Independent variables with large discriminatory power (large differences between groups) will have large weights, and those with little discriminatory power will have small weights.

b. The goal of discriminant analysis is the prediction of a categorical variable.

c. The problem is finding a linear combination of independent variables that shows large differences in group means.

4. **Discriminant Score**–a score that is the basis for predicting to which group a particular object or individual belongs; also called ***Z-score***

5. **Discriminant Coefficient**–estimate of the discriminatory power of a particular independent variable; also called ***discriminatory weight***

B. **Applications of Discriminant Analysis**

1. **Questions Answered by Discriminant Analysis**

a. How are consumers who purchase various brands different from those who do not purchase those brands?

b. How do we target likely buyers for a new product from our database of existing customers in order to conduct the most effective prelaunch marketing campaign?

c. How do consumers who frequent one fast food restaurant differ in demographic and lifestyle characteristics from consumers who frequent another fast food restaurant?

d. How do consumers who have chosen either indemnity insurance, HMO coverage, or PPO coverage differ from one another in regard to health care use, perceptions, and attitudes?

C. **Example of Multiple Discriminant Analysis**

United Wireless's marketing director wants to predict whether or not the five importance ratings used in the regression analysis predict whether or not an individual currently has a wireless telephone. Dummy variables are used for that variable. The results show that the ability to place and receive calls when away from home is the most important variable, while range of coverage is the least important variable in discriminating between those that currently have and do not have wireless telephone service. The model correctly predicted 73% of all respondents as wireless users or nonusers.

5. CLUSTER ANALYSIS

I. **Cluster Analysis**

A. **Cluster Analysis Defined**–the term cluster analysis is used to refer to a group of techniques used to identify objects or people that are similar in regard to certain variables or measurements.

1. **Purpose**–to classify objects or people into some number of mutually exclusive and exhaustive groups, so that those within a group are as similar as possible to one another.

B. **Procedures for Clustering**

1. **Different Procedures**–but all are similar in their general approach, which involves measuring the similarity between people or objects in regard to their values on the variables used for clustering. Some examples include k-means, two-stage, nearest neighbor, decision trees, ensemble analysis, random forest, BIRCH, and self-organizing neural networks.

2. **Scatter Plots**– in the case of two clustering variables, the dots indicate the positions of consumers with respect to the variables. The distance between any pair of dots is negatively related to how similar the corresponding individuals are (the smaller the distance between two dots, the more similar the individuals).

3. **Computer algorithms**–the basic idea behind most of the algorithms is to start with some arbitrary cluster boundaries and modify the boundaries until a point is reached where the average inter-point distances within clusters are as small as possible relative to average distances between clusters.

6. FACTOR ANALYSIS

I. Factor Analysis

A. **Factor Analysis Defined**

1. Procedure for simplifying data by reducing a large set of variables to a smaller set of factors or composite variables by identifying underlying dimensions of the data

    a. **Objective**–to summarize the information contained in a large number of measures into a smaller number of summary measures called *factors*

    b. No dependent variable

    c. If after the data has been analyzed there are several measures of a concept, they can be used to form an average score on the concept.

B. **Factor Scores**

1. **Factor**–technical definition "a linear combination of variables"–weighted summary score of a set of related variables.

2. **Factor Analysis**–each measure is first weighted according to how much it contributes to the variation of each factor

3. **Factor Score**–calculated on each subject in the data set.

4. **Relative Sizes**–of the scoring coefficients are used in determining relative importance of each variable.

C. **Factor Loadings**

1. Correlation between each factor score and each of the original variables

    a. Because the loadings are correlation coefficients, values near +1 or –1 indicate a close positive or negative association

2. **Nature of the Factors Derived**–determined by examining the factor loadings

D. **Naming Factors**

1. **Identify Factors**–the next step is to "name" the factors–name should communicate the concept that the researcher feels the questions are measuring

E. **Number of Factors to Retain**

1. **Final Results** –one factor or up to as many factors as there are variables

2. **Decision**–determined by the percent of the variation explained by each factor

3. **When to Stop**–stop factoring when additional factors no longer make sense

7. CONJOINT ANALYSIS

I. **Conjoint Analysis**

A. **Conjoint Analysis Defined**

1. Procedure used to quantify the value that consumers associate with different levels of product/service attributes

2. **Conjoint Analysis**

a. Is not a completely standardized procedure

b. A typical conjoint analysis application involves presenting various product or service combinations in a carefully controlled exercise, then estimating the relative value of each feature tested. They type of conjoint approach (e.g. ratings-based, discrete choice, graded pairs, dual choice, full profile, partial profile, adaptive choice, etc.) impacts how the exercise is presented and what statistical procedures are most appropriate for analyzing the results.

B. **Example of Conjoint Analysis**

1. Golf Ball Manufacturer – Titleist, a major manufacturer of golf balls conducted a focus group recently and determined from this group, past research studies, and personal experience that the three most important features are:

a. Average driving distance

b. Average ball life

c. Price

2. Approach

a. **Traditional Approach**

b. **Considering Features Conjointly**

1) Respondents are asked to evaluate features conjointly or in combination, so that advantages for one attribute can only be chosen at the expense of another attribute.

2) This allows researchers to examine acceptable tradeoffs

c. **Estimating Utilities**

1) The researcher calculates a set of values, referred to as **utilities**, for each attribute levels.

- Utilities for this simple example can be computed using ordinary least square regression.

d. **Simulating Buyer Choice**

1) Three steps discussed–collecting trade-off data, using the data to estimate buyer preference structures, and predicting choice–are the basis of any conjoint analysis application.

2) One of the most common approaches to conducting conjoint analysis is the use of a discrete choice or choice-based conjoint exercise. Two or more products are shown side-by-side with details provided on each key attribute being tested. Respondents are asked to select a single product from amongst the options shown. The exercise is repeated multiple times in order to present a wide variety of product designs, but no individual sees more than a fraction of the sometimes thousands or even millions of possible product combinations.

C. **Limitations of Conjoint Analysis**

1. Conjoint analysis suffers from a certain degree of artificiality
2. Respondents may be more deliberate in their choice processes in this context than in a real situation
3. The survey may provide more product information than respondents would get in a real market situation
4. If key attributes or popular options within key attributes are excluded from the study, demand estimates could be severely impacted.
5. Testing too many attributes or features will diminish the amount of attention that can be given to each individual's most desired features, reducing measurement precision.

6. The presentation of information (e.g. the order in which attributes are listed; whether pictures are used for some attributes, but not others; how price is displayed; etc.) can greatly impact what features a respondent focuses on and ultimately how they make their decisions.

7. It is important to either be as neutral as possible in the presentation of a conjoint exercise or else try to replicate how the product or service is actually evaluated and compared in the marketplace in order to avoid biasing results.

D. Big Data and Hadoop

1. Big Data:

a. "Big data" is the term used to describe large and complex data sets. Companies have been collecting transaction based information since the beginning of the computer age.

b. However, the sheer volume of information has grown exponentially over the last few years and the types of information now being generated does not easily fit into traditional hierarchical database structures.

c. Big data describes the new data capture and management approaches that are designed to handle the higher volume, faster acquisition rates and broader array of data types. Most of the tools for big data are still evolving and individuals with the skills to capitalize on them are in short supply.

2. Hadoop:

a. Hadoop is an open-source platform distributed by Apache for managing large amounts of information across hundreds or thousands of networked computers.

b. Each computer works independently on a small portion of the total dataset so that a task such as clustering several billion records can be handled in a fraction of the time taken for more conventional database structures.

c. There are numerous backup copies of each data chunk so that any failure can be immediately picked up by another computer with access to the same information.

d. Google and Yahoo have had a hand in developing the platform and underlying technology for Hadoop as they sought ways to store and access the vast array of search information they were collecting.

E. Predictive Analytics

1. Predictive analytics describes a wide array of tools and techniques that are used to extract and analyze information from data sets. Statistics, machine learning, database management and computer programming all play a part in identifying patterns and transforming data into insights.

2. Predictive analytics can apply to big data or traditional databases, observational data like loyalty card usage, Internet sources like social media text and web tracking data or primary survey research results. Fraud detection, trend analyses, targeted direct marketing, predicting heavy users and likely buyers are just some of the applications for predictive analytics.

F. **Predictive Analytics Process**

1. Acquiring a Data Set:

a. Before applying predictive analytics, an organization must assemble a target data set relevant to the problem of interest.

b. Predictive analytics can only uncover patterns and relationships that exist in the available data.

c. Typically, the data set must be large enough to include all the patterns and combinations that are likely to be found in the real world.

d. In the past, assembling such large data sets was very costly and time consuming. Today, most companies capture terabytes of information on their customers as a normal course of business and many social media companies provide access to massive amounts of data in real time for anyone to tap into.

e. In addition, third-party vendors provide a wide variety of data elements that can be purchased for just about any household or company in the United States.

2. Preprocessing:

a. Once assembled, the data set must be cleaned in a process where observations that contain excessive noise, errors and missing data are edited or excluded.

b. Data transformations may be used to smooth out irregular distributions and minimize extreme values.

c. Imputing missing values from comparable records and building predictive models to fill-in missing information is often used.

d. Linking multiple data sets is also part of pre-processing available data.

3. Modeling: a variety of techniques may be employed as part of the modeling process:

a. Clustering: This is the task of discovering groups and structures in the data that are similar in certain selected sets of variables.

b. Classification:

1) Readily available information like demographics and geography might be used to classify individuals on key behaviors such as purchase frequency or product preference.

2) Proprietary information such as online ads viewed or previous products purchased can be very effective at predictive future behaviors whenever such information is available.

3) Customer segments identified through clustering might also be modeled in order to predict which segment new customers and prospects belong. Successful models

c. Estimation:

1) Calculations such as risk scores, fraud detection, retention rates, lifetime value and likelihood to purchase rates may be calculated for individuals or groups.

2) These calculations can be used to predict future outcomes based on limited present-day data. They can also be used to monitor individuals or groups in order to detect changes in behavior that allow the organization to react before customers or revenues are lost.

G. **Validating Results**

1. A final step of knowledge discovery from the target data and modeling is to attempt to verify the patterns produced by the predictive modeling algorithms in a wider data set.

2. In the evaluation process, the patterns or models identified in the wider data set are applied to a test data set that was not used to develop the predictive modeling algorithm. The resulting output is compared to the desired output.

H. **Applying the Results**

1. Once the models and calculations are in place and have been validated, they are applied to existing and future customer records to improve the efficiency and effectiveness of marketing efforts. For example, specific information captured from a new sales inquiry can be used to classify an individual into the correct market segment. Based on their market segment, the most appropriate product offering can be prepared and the marketing messages can be adjusted to most resonate with that individual. Purchasing prospect lists with specific information

appended to each record allows an organization to avoid wasting marketing dollars on unlikely purchasers (based on applied predictive models) and focus resources on the most likely buyers and those with the greatest potential lifetime value.

QUESTIONS FOR REVIEW AND CRITICAL THINKING

1. Distinguish between multiple discriminant analysis and cluster analysis. Give several examples of situations in which each might be used.

Multiple discriminant analysis analyzes the relationships between a set of metric independent variables and a nominal or categorical dependent variable. It can test a hypothesized relationship and it describes how the independent variables discriminate between the groups of the dependent variable. Cluster analysis is a statistical tool used for clustering people or objects based on a particular criteria or variable in the study. For example, we might have 15 different measures of benefits and want to cluster people into benefit groups for market segmentation. The same concept could be used for personal values, attitudes toward rating healthy alternatives, or the types of restaurants frequented. Multiple discriminant analysis could be used for segmenting users from nonusers, light from heavy users, patrons from nonpatrons, and a host of other dependent categorical variables. A number of independent variable sets such as benefits, attributes, knowledge, and preferences could be used to predict group membership.

2. What purpose does multiple regression analysis serve? Give an example of how it might be used in marketing research. How is the strength of multiple regression measures of association determined?

Multiple regression analysis is used to examine the relationship between two or more metric predictor variables and one metric dependent variable. It can also be used to generate predictions for the dependent variable, given a combination of values for the independent variables. Multiple regression analysis has many applications in marketing research. One general application relates to determining the effects of various marketing variables on sales or market share. The

Coefficient of Determination or R^2 provides a measure of the percentage of variation in the dependent variable explained by variation in the independent variable(s).

3. What is a dummy variable? Give an example using a dummy variable.

The term "dummy variable" describes the coding of nominally scaled independent variables so that they can be used in regression analysis. An example of a dummy variable for a measure of location of birth would be

0 = born in the United States, 1 = born outside the United States

4. Describe the potential problem of collinearity and multiple regression. How might a researcher test for collinearity? If collinearity is a problem, what should the researcher do?

Collinearity refers to the condition when a significant correlation exists between two or more independent variables. This condition reduces the statistical power of significance tests for the regression coefficients. One can test for collinearity by examining the correlation matrix. If there is a value higher than .30, the researcher should consider corrective action. This correction might be accomplished be dropping one of the correlated variables, or collapsing the correlated variables into a single variable.

5. A sales manager examined age data, education level, a personality measure that indicated introvertedness / extrovertedness, and levels of sales attained by the company's 120-person sales force. The technique used was multiple regression analysis. After analyzing the data, the sales manager said, "It is apparent to me that the higher level of education and the greater the degree of extrovertedness a salesperson has, the higher will be an individual's level of sales. In other words, a good education and being extroverted cause a person to sell more." Would you agree or disagree with the sales manager's conclusions? Why?

The manager should consider whether age and education are correlated (collinearity), as older salespersons may have greater education and thus the "education effect" may really be an "age/ experience effect." It is also plausible that the extroverted salespersons are also older, as greater experience generally leads to greater confidence and performance. Another important issue is whether the manager has correctly specified the regression model. It is likely that many other factors that have a significant impact on salesperson performance have not been included in the model. Any of these could be confounded with the included variables. Perhaps most importantly, the manager should keep in mind that causation can never be proven with statistical evidence alone.

6. The factors produced and the result of the factor loadings from factor analysis are mathematical constructs. It is the task of the researcher to make sense out of these factors. The following table lists four factors produced from a study of cable TV viewers. What label would you put on each of these factors? Why?

See the text (p489) for the table.

- Factor 1 Variety of programming or repetitive programming. All of the questions deal with the movie channels playing the same movies over and over again.
- Factor 2 Emotional programming or “Tear-jerking” programming. All of the items are about programming that elicits an emotional response.
- Factor 3 Religious programming. These questions measure the viewers’ opinions of religious programs.
- Factor 4 Home entertainment. The items measure the viewers’ preferences for viewing movies at home.

7. The following table is a discriminant analysis that examines responses to various attitudinal questions from cable TV users, former cable TV users, and people that have never used cable TV. Looking at the various discriminant weights, what can you say about each of the three groups?

For “users,” the most discriminating variables are A19 (easygoing on repairs) and A18 (no repair service). For “formers,” the most discriminating variables are A4 and A18 (burned out on repeats and no repair service, respectively). For the “nevers,” the most discriminating variables are A7 and A19 (breakdown complainer and easygoing on repairs, respectively). These results suggest that concerns about, or reactions to, service failure (breakdowns/repairs) are the most predictive of whether a consumer is a user, a former user, or never a user.

8. The following table shows regression coefficients for two dependent variables. The first dependent variable is willingness to spend money for cable TV. The independent variables are responses to attitudinal statements. The second dependent variable is stated desire never to allow cable TV in their homes. By examining the regression coefficients, what can you say about persons willing to spend money for cable TV and those that will not allow cable TV in their home?

See the text (p490) for table.
Those who are willing to spend money for cable television enjoy watching movies and comedy, and they are likely to do so late at night. They may be somewhat lonely ("forlorn") and may have a greater need for external sources of "stimulation," such as might be offered by television programming. They are also dissatisfied with the service level and wish the cable stations offered more variety. Those who will not allow cable in their homes do not enjoy watching sporting events, object to sex on television, and do not feel a need for many choices in their television programming.

REAL-LIFE RESEARCH

Case 18.1 – Satisfaction Research for Pizza Quik

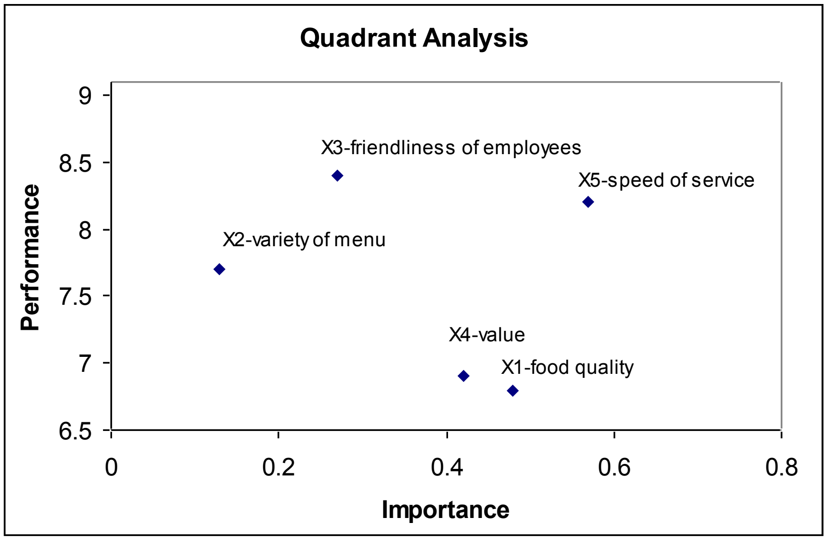
Key Points:

- Pizza Quik wants to know what performance factors define quality for their customers, which of these factors are most important to their customers, and how well Pizza Quik delivers these quality factors.
- Survey data was collected and a regression analysis conducted. The regression equation was:
    - $S = .48X_1 + .13X_2 + .27X_3 + .42X_4 + .57X_5$.
    - Average ratings were $S = 7.3$, $X_1 = 6.8$, $X_1 = 7.7$, $X_3 = 8.4$, $X_4 = 6.9$, and $X_5 = 8.2$.

○

Questions

1. Plot the importance and performance scores in a matrix. One axis would be importance from low to high, and the other would be performance from low to high.



2. Which quadrant should you pay the most attention to? Why?

In principle, you would attend to all quadrants for a full understanding of your situation. In terms of attractiveness, the upper right quadrant contains the elements that are rated by customers as the most important service factors and where performance is greatest (being good at the right things).

3. Which quadrant or quadrants should you pay the least attention to? Why?

The upper left quadrant contains items that are unimportant to consumers but where performance is high (being good at the wrong things).

4. Based upon your analysis, where would you advise the company to focus its efforts? What is the rationale behind this advice?

Quality of food is the second most important service factor and holds the lowest customer appraisal rating. This would be a good place to start. One problem is that we don't know how much it would cost to improve any of these service factors. What we would want to do is to work on the factor that would produce the highest return on investment for achieving an improved score.

Chapter Nineteen

Communicating The Research Results

LEARNING OBJECTIVES

1. Become aware of the primary purposes of a research report.
2. Learn how to organize and prepare a research report.
3. Gain insight into how to interpret and present marketing research results.
4. Learn how to make a personal presentation.

The Research Report

Organizing the Report:

1. Title Page
2. Table of Contents
3. Executive Summary
4. Background
5. Methodology
6. Findings *(primary and secondary)*
7. Appendices

Key Terms & Definitions

Interpreting the Findings

Executive Summary:

Portion of a research report that explains why the research was done, what was found, what those findings mean, and what action, if any, management should undertake.

Conclusions and Recommendations

Conclusions:

Generalizations that answer the questions raised by the research objectives or otherwise satisfy the objectives.

Recommendations:

Conclusions applied to marketing strategies or tactics that focus on a client's achievement of differential advantage.

The Presentation

Exhibit 19.1

Sample Title Slide

The Presentation

Sample Table of Contents

Table of Contents

Not more than a page. Helps user refer to specific areas of interest. List major sections.

2011 Customer Satisfaction Research | ACME Financial | May 2011 1 DSS Research

The Presentation

Sample Background and Objectives

Keep it concise. Put key objectives in bulleted list.

Background and Objectives

Background. ACME, like other progressive organizations, wants to develop a program to assess customer satisfaction with the services they receive from the organization. This information will be used in ACME's quality improvement efforts. The goal is to provide rational direction for those efforts.

Objectives. This type of research is designed to achieve the following objectives:

- Measure overall satisfaction with ACME compared to the competition.
- Measure customer satisfaction with ACME's new Web site where all transactions with ACME can be handled.
- Measure satisfaction with specific elements of all other programs and services provided to customers by ACME.
- Identify major reasons for satisfaction/dissatisfaction.
- Evaluate and classify program and service elements on the basis of their importance to customers and ACME's perceived performance of ACME (i.e., identify areas of strength and opportunities for improvement).

2011 Customer Satisfaction Research | ACME Financial | May 2011 2 DSS Research

The Presentation

Sample Executive Summary

Focus on key findings, not just reiteration of detailed results.

Executive Summary

The majority are loyal, but satisfaction declined.

- Four out of five customers see their relationship with ACME continuing on a long-term basis. Over half are categorized as secure or favorable and can be considered loyal to ACME.
- Two-thirds report they are satisfied with ACME in 2008. However, this is a significant decline from 80.1% in 2010.
- ACME overall satisfaction and loyalty measures are significantly lower than the National Average.

Heavy Users are highly satisfied; Light Users less so.

- Heavy users report significantly higher satisfaction than light users and are more likely to see their relationship with ACME continuing on a long-term basis.
- Although only a small percentage of customers is categorized as alienated, Light Users make up a higher proportion of this group.

ACME processes are primary areas of strength.

- Both the customer service and application processes are identified through key driver analysis as areas of strength for ACME.
- Satisfaction with the billing process continues an upward trend. Ratings are on par with the National Average and significantly higher than 2010.

Staff ratings remain strong, with knowledge a key asset.

- The majority of customers are satisfied with all aspects related to ACME staff. About four out of five are satisfied with staff knowledge, the area of highest satisfaction across all staff levels.
- Although still high, relatively lower staff ratings are associated with accessibility related measures. Key driver analysis identifies ease of reaching staff as an opportunity for improvement.

The Presentation

Sample Methodology

Explain what was done in a simple, straightforward manner.

Methodology

Questionnaire. DSS was responsible for developing the survey instrument. ACME approved the final draft of the questionnaire. A copy of the mail survey instrument used is provided in Appendix B.

Methodology employed. Eligible respondents included a list of customers provided by ACME. The sample design is as follows:

	2011			2010			2009		
	Heavy Users	Light Users	Overall	Heavy Users	Light Users	Overall	Heavy Users	Light Users	Overall
Completed surveys	52	60	**112**	101	71	**172**	87	71	**158**
Mailed Surveys	200	200	**400**	200	200	**400**	200	200	**400**
Returned undeliverable surveys	NA	NA	**4**	NA	NA	**8**	NA	NA	**14**
Response rate	26.0%	30.0%	**28.0%**	50.5%	35.5%	**43.0%**	43.5%	35.5%	**39.5%**
Adjusted response rate**	NA	NA	**28.3%**	NA	NA	**43.9%**	NA	NA	**40.9%**
Sample error*	NA	NA	**±7.9%**	NA	NA	**±5.6%**	NA	NA	**±6.1%**
Initial survey mailed	February 28, 2011			March 7, 2010			February 28, 2009		
Second survey mailed	March 21, 2011			March 28, 2010			March 21, 2009		
Last day to accept surveys	April 27, 2011			May 2, 2010			April 25, 2009		

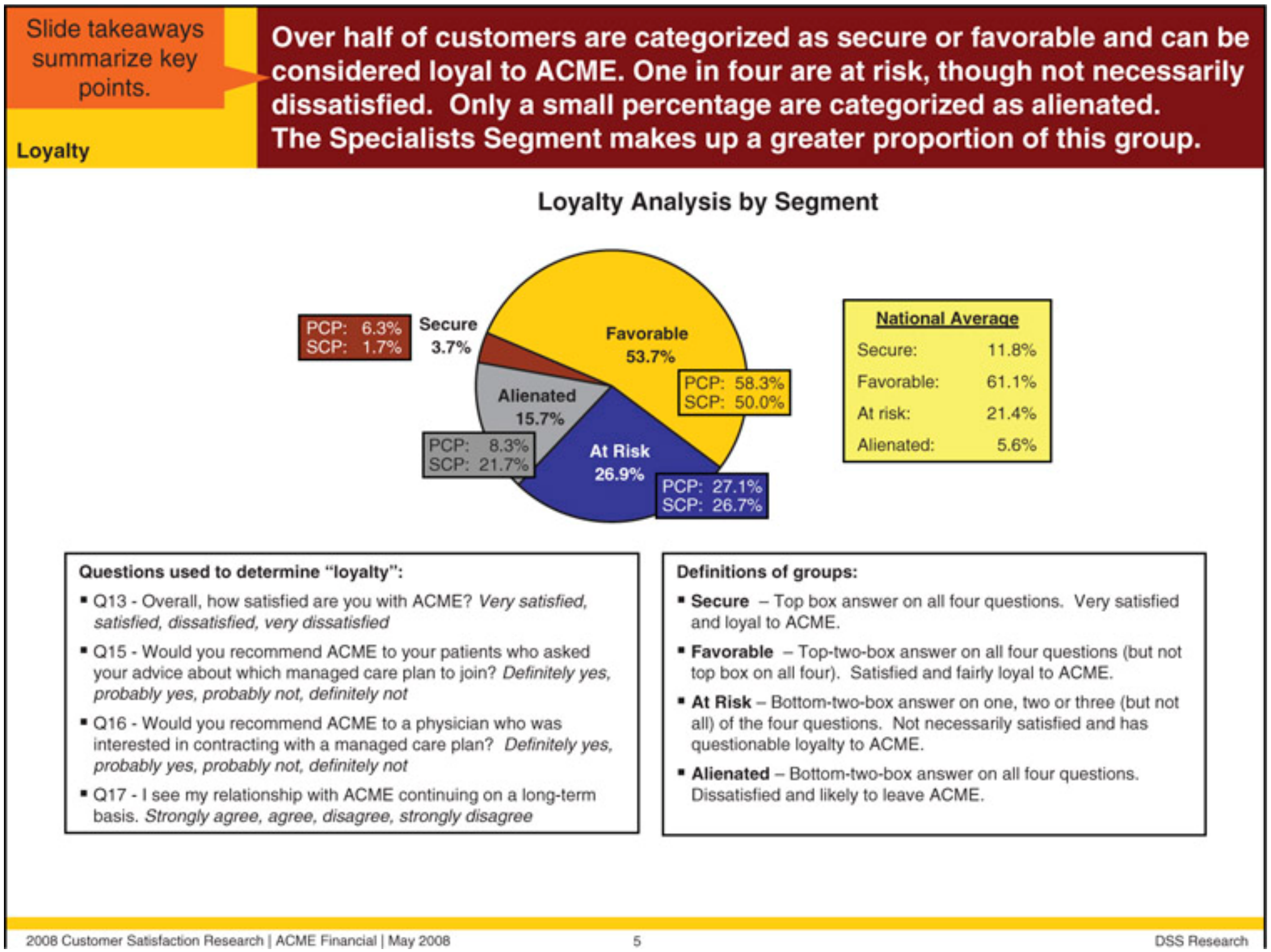
Data collection. All data were collected by DSS Research.

Data processing and analysis. DSS processed all completed surveys and analyzed the results. A complete set of survey tabulations is provided in Appendix C of this report.

* At 95% confidence, using the most pessimistic assumption regarding variance (p=0.5).
** Excludes undeliverables.

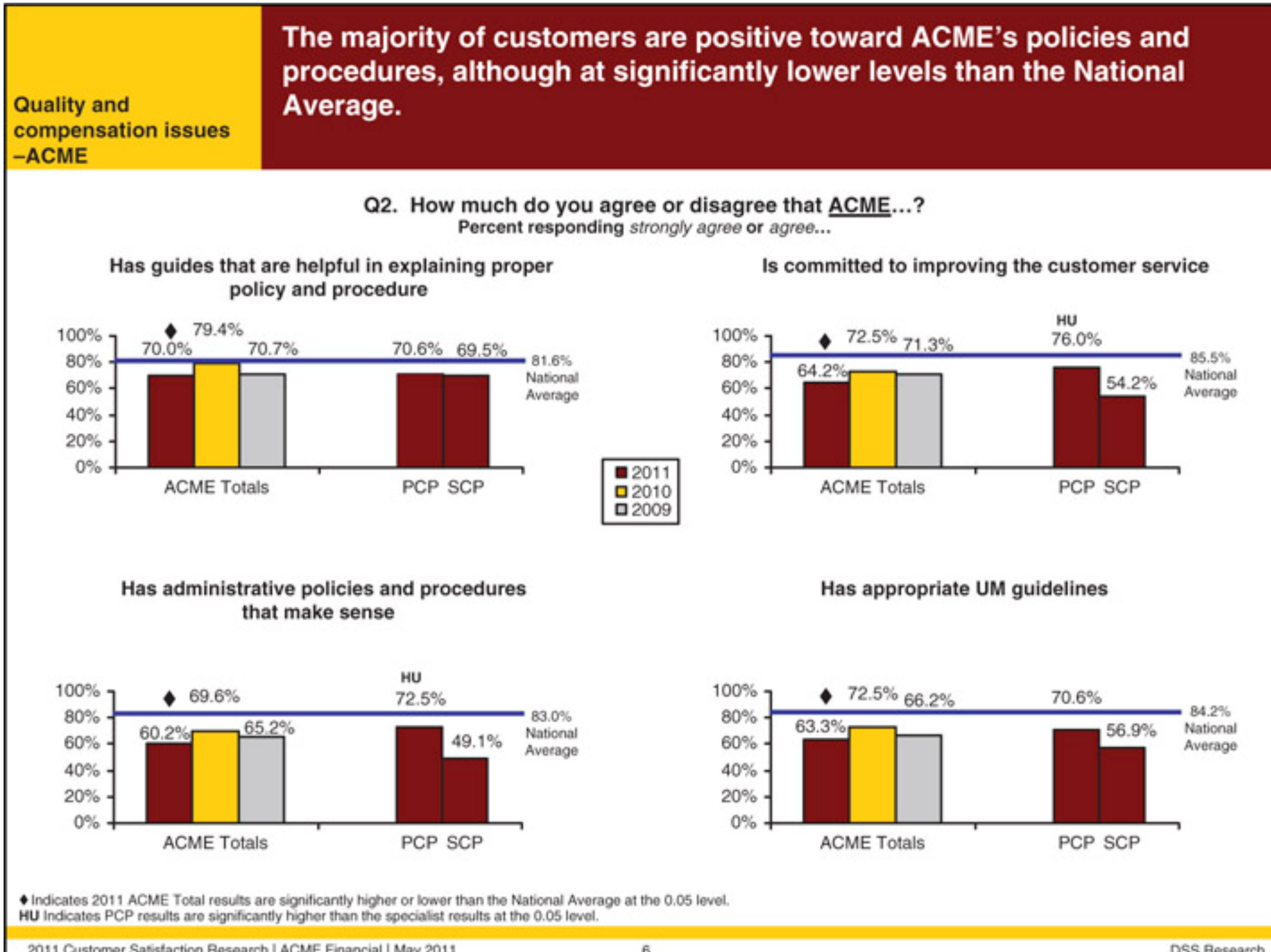
The Presentation

Communicate with Graphs/Charts/Pictures



Key Terms & Definitions

The Presentation



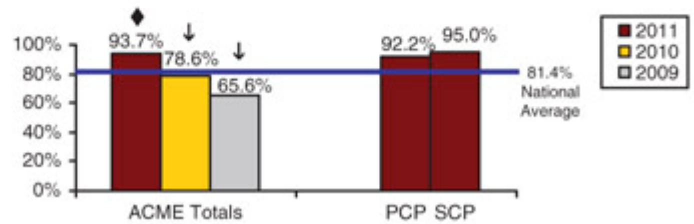
The Presentation

Provide direction.

Physician communications Internet access and usage

Internet access continues to increase among customers. Broadband is the most common connection type, used by more than half.

Q10. Do you and your staff currently have access to the Internet?
Percent responding *yes...*



If yes...

Q11. If yes, which of the following do you use?^**

	ACME Total	Usage Level	
	2011	Heavy	Light
Base	101	46	55
Broadband	55.4%	52.2%	58.2%
Dial-up	23.8%	19.6%	27.3%
Other	20.8%	28.3%	14.5%

^ New question in 2011.
** Note: National Average data not available.
↑↓ Indicates that year's result is significantly or lower than the 2011 ACME result at the 0.05 level.
♦Indicates 2011 ACME Total results are significantly higher or lower than the National Average at the 0.05 level.

The Presentation

Interpreting Statistical Results

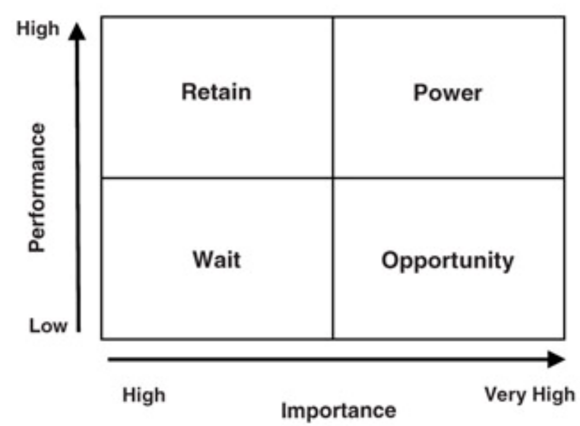
Key Driver Statistical Model

POWeR Chart™

Classification Matrix. The importance and performance results for each item in the model are plotted in a matrix like the one shown to the right. This matrix provides a quick summary of what is most important to customers and how ACME is doing on those items. The matrix is divided into four quadrants. The quadrants are defined by the point where the medians of the importance and performance scales intersect. The four quadrants can be interpreted as follows:

- *Power.* These items are very important to customers and ACME's performance levels on these items are high. Promote and leverage your strengths in this quadrant.
- *Opportunity.* Items in this quadrant are very important to customers, but ACME's performance is below average. Focus your resources on improving processes that underlie these items and look for significant improvements in your satisfaction scores.
- *Wait.* Though still important to customers, these items are somewhat less important than those that fall on the right hand of the chart. Relatively speaking, ACME's performance is low on these items. Dealing with these items can wait until more important items have been dealt with.
- *Retain.* Items in this quadrant are also somewhat less important to customers, but ACME's performance is above average. Simply maintain your performance on these items.

POWeR Chart™



Making a Presentation

Key Issues to Address:

- What do the data really mean?
- What impact do they have?
- What have we learned from the data?
- What do we need to do, given the information we now have?
- How can future studies of this nature be enhanced?
- What could make this information more useful?

Presentation by Internet

With PowerPoint, publishing presentations to the Web is easier than ever. Publication to the Web enables individuals to access the presentation, regardless of where they are or when they need to access it. In addition, researchers can present results at multiple locations on the Internet.

Key Terms & Definitions

- Organizing the Research Report
- Executive Summary
- Conclusions
- Recommendations
- Presenting on the Internet
- Making a Presentation – *Key Issues to Address*
- Sample Title Slide
- Sample Table of Contents
- Sample Background and Objectives
- Sample Executive Summary
- Sample Methodology

Links and Key Terms & Definitions *button are active when in "Slide Show Mode"*

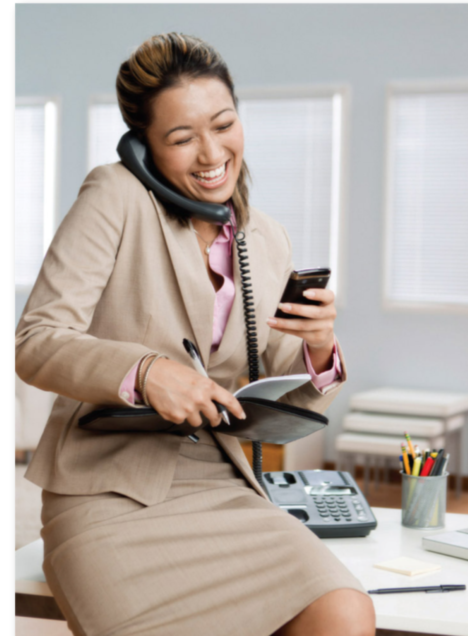
Chapter Twenty

Managing Marketing Research

LEARNING OBJECTIVES

1. Understand what clients want from a marketing research supplier or department.
2. Learn about managing a marketing research supplier organization.
3. Learn about communication.
4. Gain insights into the unique management issues of managing a corporate marketing research department.
5. Learn about client profitability management.
6. Gain insights into staff management and development.
7. Learn how to manage a marketing research department.

What Clients Want – A Researcher Who:



1. Maintains client confidentiality
2. Is honest
3. Is punctual
4. Is flexible
5. Delivers against project specifications
6. Provides high-quality output
7. Is responsive to the client’s needs
8. Has high quality-control standards
9. Is customer-oriented in interactions with client
10. Keeps the client informed throughout a project

Managing the Research Process

Research Management:

Overseeing the development of excellent communication systems, data quality, time schedules, cost controls, client profitability, and staff development.

Managing the Research Process

Some Key Issues:

- Organizing the Supplier Firm
- Data Quality Management
- Time Management
- Cost Management
- Outsourcing

Outsourcing

Outsourcing:

Having personnel in another country perform some or all of the functions involved in a marketing research project.

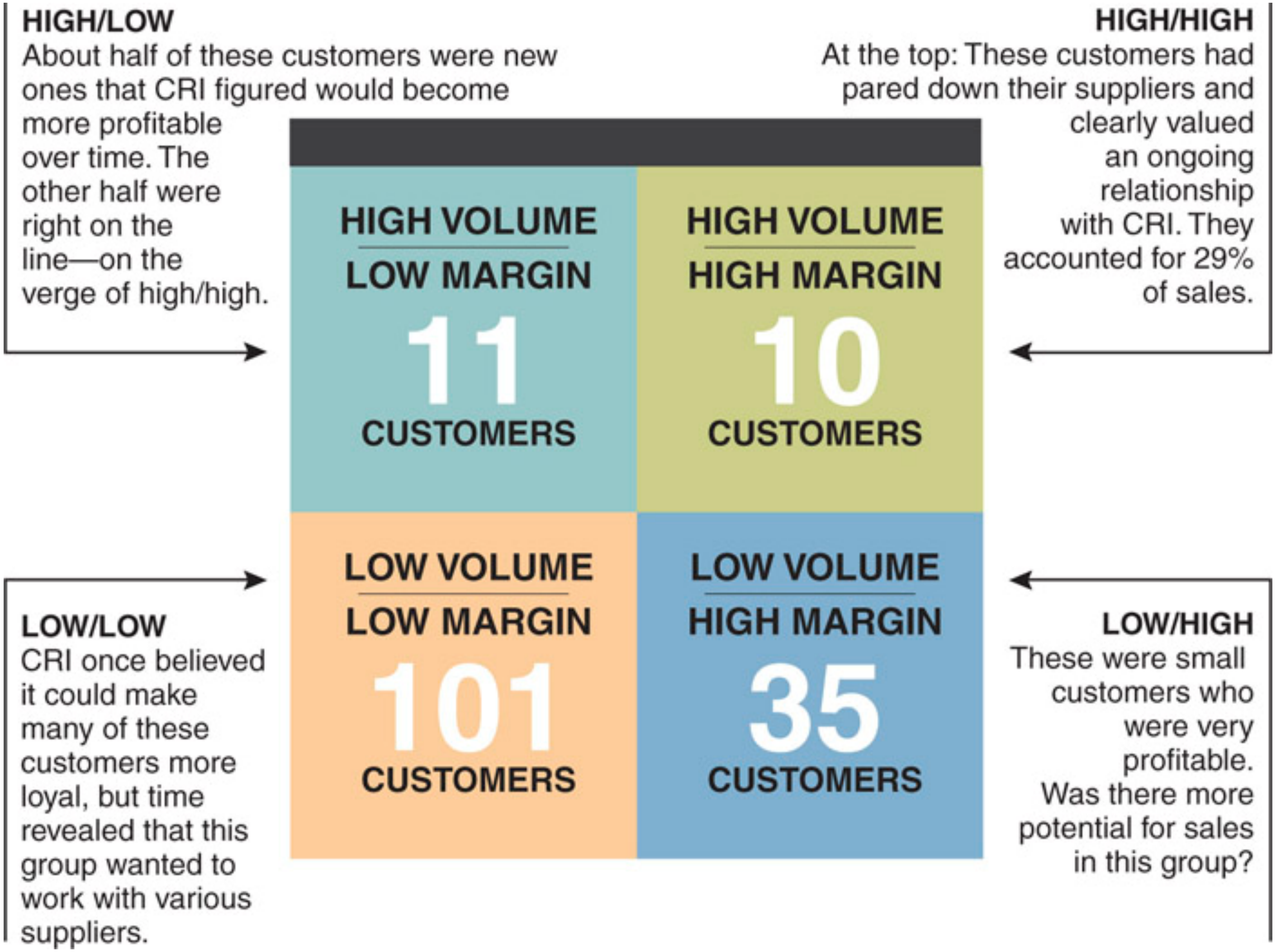
Captive Outsourcing:

When a research firm creates a wholly-owned foreign facility for outsourcing.

Outsourcing Issues

- Confidentiality
- Infrastructure
- Quality of deliverables
- Domain knowledge
- Cultural issues
- Job losses in the client country and associated negative publicity for the agency
- Employee liability

Client Profitability Analysis



Key Terms & Definitions

Screening Questions Used by CRI

- How did you hear about us?
- What king of work is it (in terms of industry scope)?
- What's your budget?
- What are your decision criteria?
- Whom are we competing against for your business?
- Why are you thinking of switching?

Staff Management and Development

Some Key Techniques:

• Create an environment that encourages risk taking, experimentation, and responsibility.
• Foster recognition and accountability.
• Provide job autonomy within a certain structure.
• Attract and support people with entrepreneurial attitudes.
• Connect rewards to a business result.
• Open your financial books.
• Offer diversity within your organization.
• Provide clear promotional paths.

Managing a Marketing Research Department

Critical Issues:

- Allocating the research department budget.
- Prioritizing projects.
- Retaining skilled staff.
- Selecting the right marketing research suppliers.
- Moving marketing research into a decision-making role.

Retaining A Skilled Staff

• Conduct regular performance reviews that give continuing feedback on a job well done—or offer ways to improve.

• Offer public recognition for great work. Some examples are in the text.

• Give differential pay raises that recognize superior performance.

• Vary the work in order to keep everyone interested.

Selecting the Right Marketing Research Suppliers

Key Questions:

- How long has the vendor been in business?

- For what other companies has the vendor conducted research projects?

- What are the academic backgrounds and experience of those persons who will be working on the projects, that is, the project director, field director, data processing manager, and so forth?

- Does the composition of the project team strike the right balance between top-level management and technical researchers and analysts?

- Does the success of the project depend on the capabilities of a subcontractor?

Soft Skills of the Ideal Marketing Researcher

- Lifelong Learners
- Adapt Easily
- Act as a Partner

Two Approaches to Measuring ROI

ROI Lite

$$\text{ROI Lite} = \frac{\$\ \text{Value} \times \text{Increased Confidence}}{\text{Cost of Research}}$$

ROI Complete

$$\text{ROI Complete} = \frac{\$\ \text{Value} \times \text{Increased Confidence} \times \text{Increased Likelihood of Acting}}{\text{Cost of Research}}$$

Key Terms & Definitions

- Research Management
- Outsourcing
- Captive Outsourcing
- Outsourcing Issues
- What Clients Want
- Client Profitability Management
- Sample Client Screening Questions
- Managing Difficult Clients
- Staff Management and Development
- Managing a Marketing Research Department
- Retaining a Good Staff
- Selecting the Right Marketing Research Supplier
- Maintaining a Competitive Advantage
- Measuring Return on Investment (ROI)
- ROI Example

Links and Key Terms & Definitions *button are active when in "Slide Show Mode"*

Chapter 1

The Role of Marketing Research in Management Decision Making

	LEARNING OBJECTIVES
	1. Review the marketing concept and the marketing mix.
	2. Comprehend the marketing environment within which managers must make decisions.
	3. Examine the history of marketing research.

Why Study Marketing Research?

- Some students eventually become marketing researchers
- Everyone needs to be a smarter consumer of marketing research
- Every manager needs to understand what marketing research can and cannot do.

Comment on the following statement

- **The owner of a restaurant in a downtown : "I see customers every day whom I know on a first-name basis. I understand their likes and dislikes. If I put something on the menu and it doesn't sell, I know that they didn't like it. I also read the magazine *Modern Restaurants*, to keep up with industry trends. This is all of the marketing research that I need to do."**

Who Does Marketing Research?

- Producers of Products and Services
    - e.g., Goodyear, Silver Dollar City ;
- – Advertising Agencies
    - e.g., Dentsu, McCann-Erickson WorldGroup
- Marketing Research Companies
    - » e.g., The Nielsen Company, Arbitron;

Who Does Marketing Research?

- **What differences might you note among marketing research conducted for (a) a retailer, (b) a consumer goods manufacturer, (c) a charitable organization?**

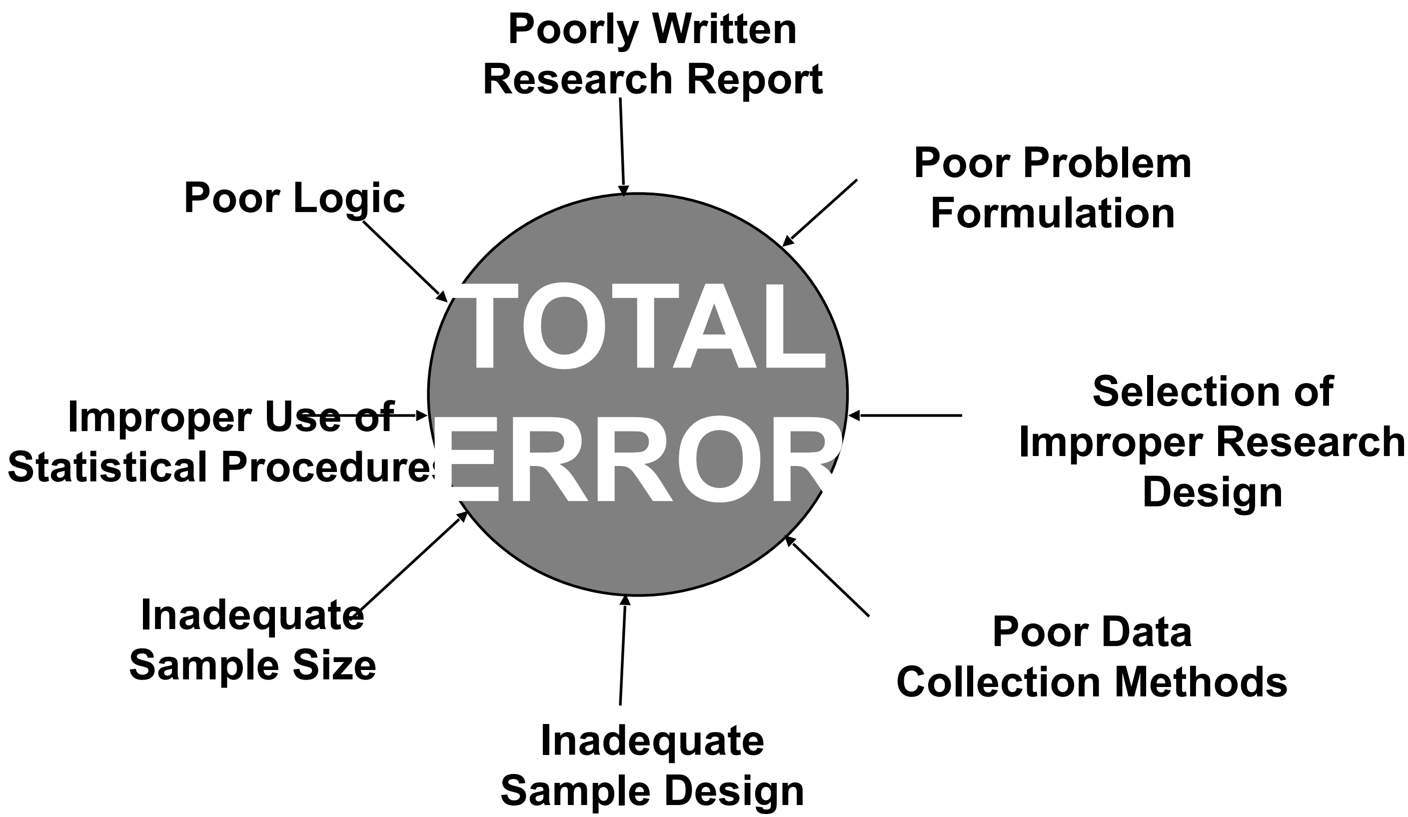
Chapter Two

The Marketing Research Industry and Research Ethics

LEARNING OBJECTIVES

1. Appreciate the structure of the marketing research industry.
2. Comprehend the nature of corporate marketing research departments.
3. Understand the types of marketing research suppliers.
4. Examine how corporations use marketing research.
5. Review the current state of the marketing research industry.
6. Appraise ethical trends and unethical practices among marketing research suppliers, clients, and marketing research field services.

The Concept of Total Error



Ethics

- Marketing ethics
  - The principles, values, and standards of conduct followed by marketers
- Ethical considerations are applicable to
  - Research participants
  - Research clients
  - Research teams

Questionable Ethical Decision Making

- Forrester Research Inc. published their comparison studies.
  - Microsoft and PeopleSoft was favored over their respective competitors.

Questionable Ethical Decision Making

- Forrester Research Inc. published their comparison studies.
  - Microsoft and PeopleSoft was favored over their respective competitors.
- Microsoft and PeopleSoft had funded the research.

Approaches to Ethical Reasoning

- Utility Approach
  - Focuses on society
  - Benefit > Cost, Ethical; Benefit < Cost, Unethical
- Use video cameras to record consumer’s behaviors in the store to decide how to display nutritional content.

Approaches to Ethical Reasoning

- Use video cameras to record consumer's behaviors in the store to decide how to display nutritional content.
  - Benefits: knowing how consumers really behave so that companies can develop better ways of communicating the information.
  - Costs: violation of shoppers' privacy. The cost of doing research.

Chapter Three

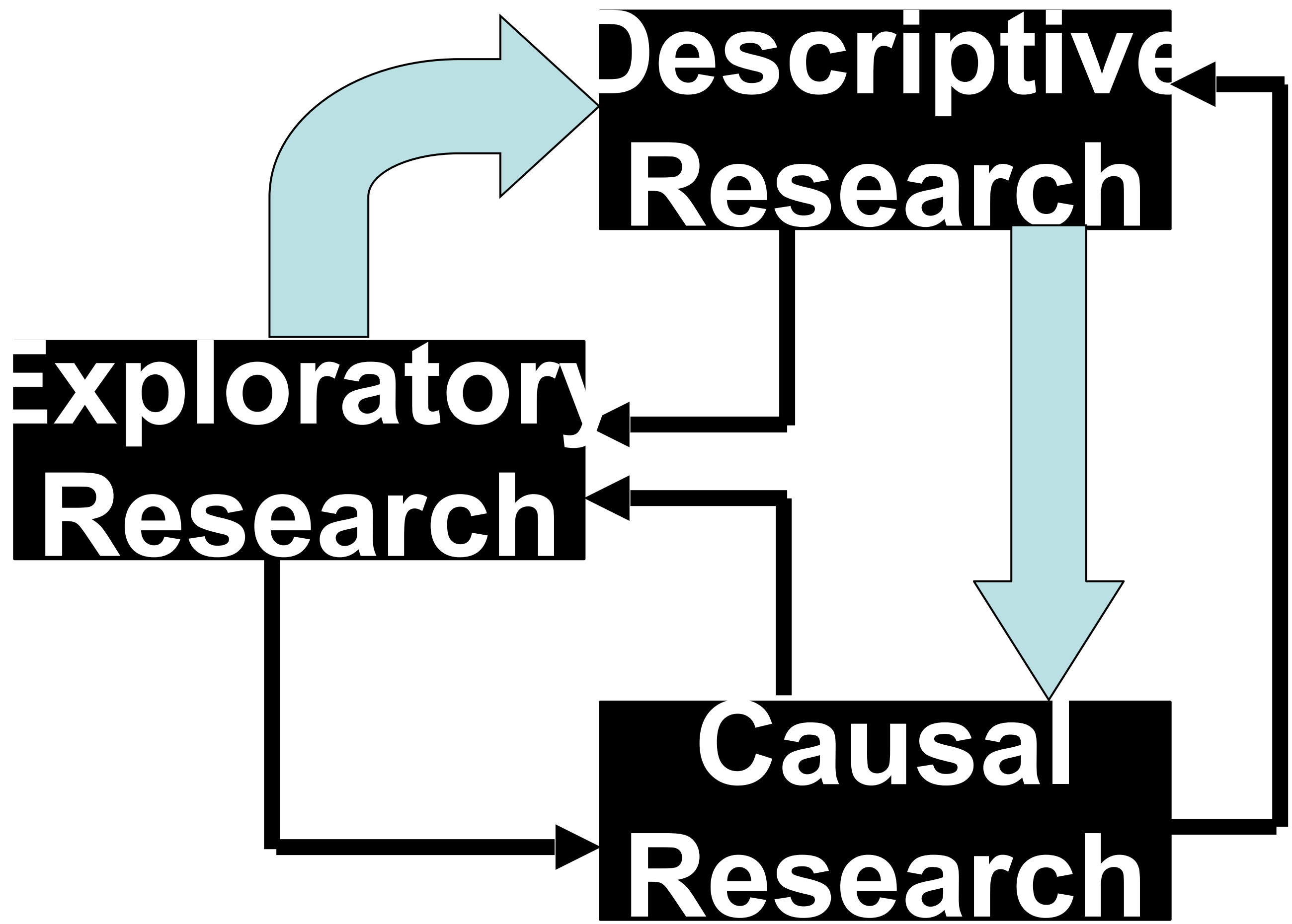
Problem Definition, Exploratory Research, and the Research Process

	LEARNING OBJECTIVES
	1. Analyze the problem definition process.
	2. Learn the steps involved in the marketing research process.
	3. Understand the components of the research request.
	4. Appreciate the importance of the marketing research proposal.
	5. Examine what motivates decision makers to use marketing research information.

Types of Research Design

- Exploratory Research
  - Major emphasis: gaining ideas and insights
- Descriptive Research
  - Major emphasis: determining the frequency with which something occurs
- Causal Research
  - Major emphasis: determining cause-and-effect relationships

Relationships Among the Research Designs



Case

- Manager's decision problem (broad)
  - Revenue is not as high as expected, why?

- Research problem (specific)

Case

- Your friend opened a coffee shop but the business is not running well.
- Your friend consulted you since you are a marketing research expert.

Case

Questionnaire:

- What kind of questions are you going to put in a survey?
  - Current customer satisfaction?
  - What kind of products do they prefer?
  - What are the demographics of targeted market?

Case

Questionnaire:

•What kind of questions are you going to put in a survey?

•Many possibilities

– Advertising, store design, competitors, etc.

•It is impossible to include everything in a single questionnaire.

Case

- You have to visit the coffee shop and ask your friend many questions before you identify the research questions.
  - *How bad is the store's financial position?*
  - *What are your prices like?*
  - *What is your target market?*
  - *Where do you place your advertisements?*
  - *What is your store hour?*
  - *How often do you have promotions?*

Case

- Manager's decision problem (broad)
  - Revenue is not as high as expected, why?
- Research problem (specific)
- Reasons could be:1) Product limitation, 2) possible pricing problem, 3) target market inappropriate 4) too many competitors

Case

- Exploratory research
  - Interview customers
  - Literature search
  - Focus group
- Descriptive research
  - Survey
  - Observational study

Exploratory Research

- Basic uses
  - Better understanding of the situation
  - Not designed to come up with final answers and decisions
- Key Characteristics
  - Small scale
  - Flexibility

Types of Exploratory Research

- Literature Search
- Depth Interviews
- Focus Groups
- Case Analyses
- Projective Methods
- Experience survey

Types of Exploratory Research

- Literature Search
  - A search of statistics, trade journal articles, other articles, magazines, newspapers, and books for data or insight into the problem at hand
- Depth Interviews
  - Interviews with people knowledgeable about the general subject being investigated
- Focus Groups
  - An interview conducted among a small number of individuals simultaneously

Types of Exploratory Research

- Case Analysis
  - Intensive study of selected examples of the phenomenon of interest
- Projective Methods
  - Methods that encourage respondents to reveal their own feelings, thoughts, and behaviors by shifting the focus away from the individual through the use of indirect tasks

Focus Group

Focus Groups

- Extremely popular research technique
- Format
  - Typically 8-12 people
  - Homogeneous within group
  - 1.5 to 2 hours in length
  - Sessions recorded and transcribed
- Key person: the moderator

2a. Descriptive Research Studies

Marketing Research Design, Continued

Descriptive Studies Defined

Descriptive research studies answer the, who what, where, when and how questions. It is used when one wants to gain a better understanding of the specifics or details the research issue.

Purpose

- Confirm Theories
- Brand Loyalty Measure
- Describes Population
- Build Customer Profile
- Gain Specific Information

Key Methods

- Secondary Data
- Cross sectional Surveys
- Longitudinal Surveys
- Statistical Data Analysis

Key Terms & Definitions

Descriptive Research

- Has six specifications:
  - **Who**
  - **What**
  - **When**
  - **Where**
  - **Why**
  - **How**
- Surveys and Observations

A descriptive research design

- Super Savers is a chain of department stores located in large towns and metropolitan centers in the northeastern United States.
- In order to improve its understanding of the market, management has decided to develop a profile of the “average” customer (customer segments). You are requested to design the study.

A descriptive research design

	Store Preference by Income	
Income	Prefer Super Savers	Prefer Competitors
>$100,000		
$50,000~$100,000		
$<50,000		

A descriptive research design

	Store Preference by Education	
Education Level	Prefer Super Savers	Prefer Competitors
Some high school		
High school		
Some college		
….		

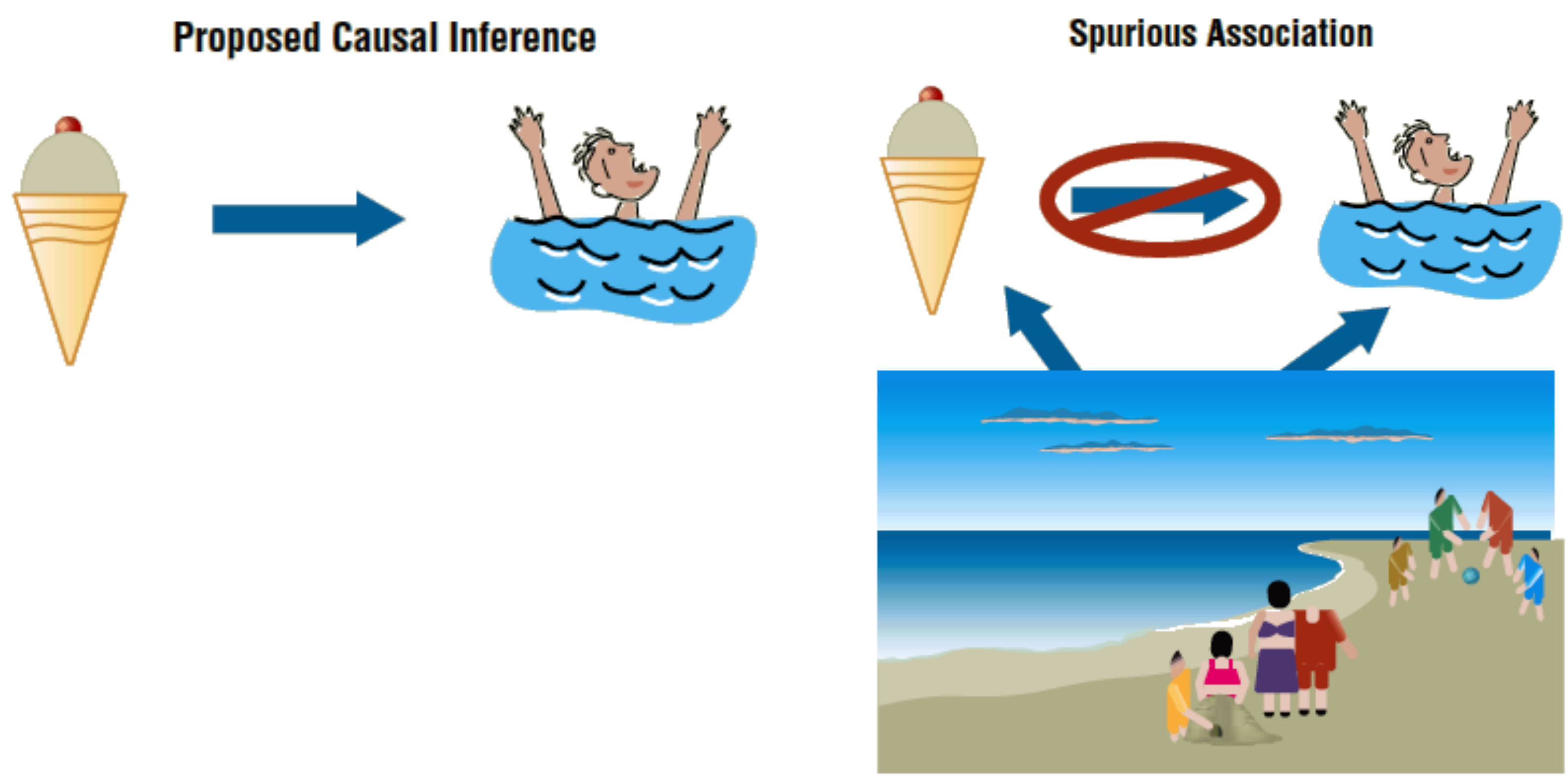
Causal Research

- The purpose of causal research is to test cause and effect relationships
- Condition X causes Event Y
- (e.g., X $\longrightarrow$ Y)

Causal Research

- Evidence of Causality
  - Time Order
    - Evidence that shows X occurs before Y
  - Consistent variation
    - Evidence of the extent to which X and Y occur together or vary together in the way predicted by the hypothesis
  - Elimination of Other Explanations
    - Evidence that allows the elimination of factors other than X as the cause of Y

The Spurious Effect of Ice Cream



Evidence of Causality

- Because we can never know for certain that we have eliminated all other possible causes of an effect, we can never state with certainty that *X* caused *Y*.

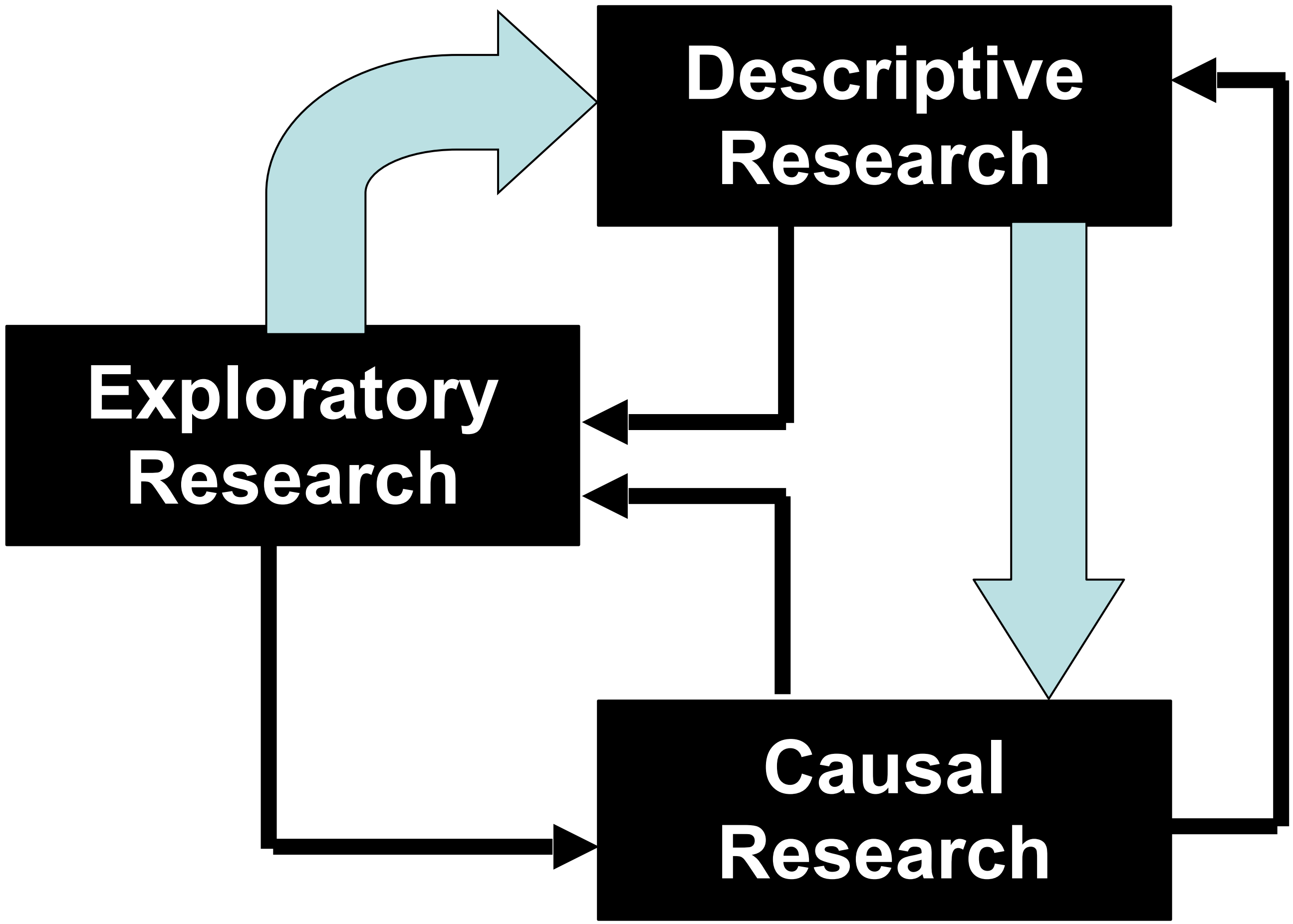
Spurious Relationship

- Shoe size and reading performance for elementary school children.
- Number of police officers and number of crimes.
- Number of doctors in region and number of people dying from disease.
- Tea drinking and lung cancer

Causal Research

- Causation is often tested through experimentation
- Experimentation includes independent (condition X) and dependent (event Y) variables
- The basic point of an experiment is to change the levels of one or more X variables and examine the resulting impact on Y variables
- At the same time, it is very important to control (i.e., hold constant) other variables that might impact Y variables

Relationships Among the Research Designs



Relationships Among the Research Designs

- Manager’s decision problem (broad)
  Brand X’s share of the soft drink market is slipping. Why?
- Research problem (specific)
  Identify the reasons

Symptoms of problems and underlying real problems

- **Symptom**s: Declining sales
- Reasons:1) poor positioning strategy, 2) possible pricing problem, 3) a promotional strategy error, or 4) a product / service that is not competitive.

Case Discussion

- Decision problem
  - “Should enter this market?”
  - “How should the business be organized?”

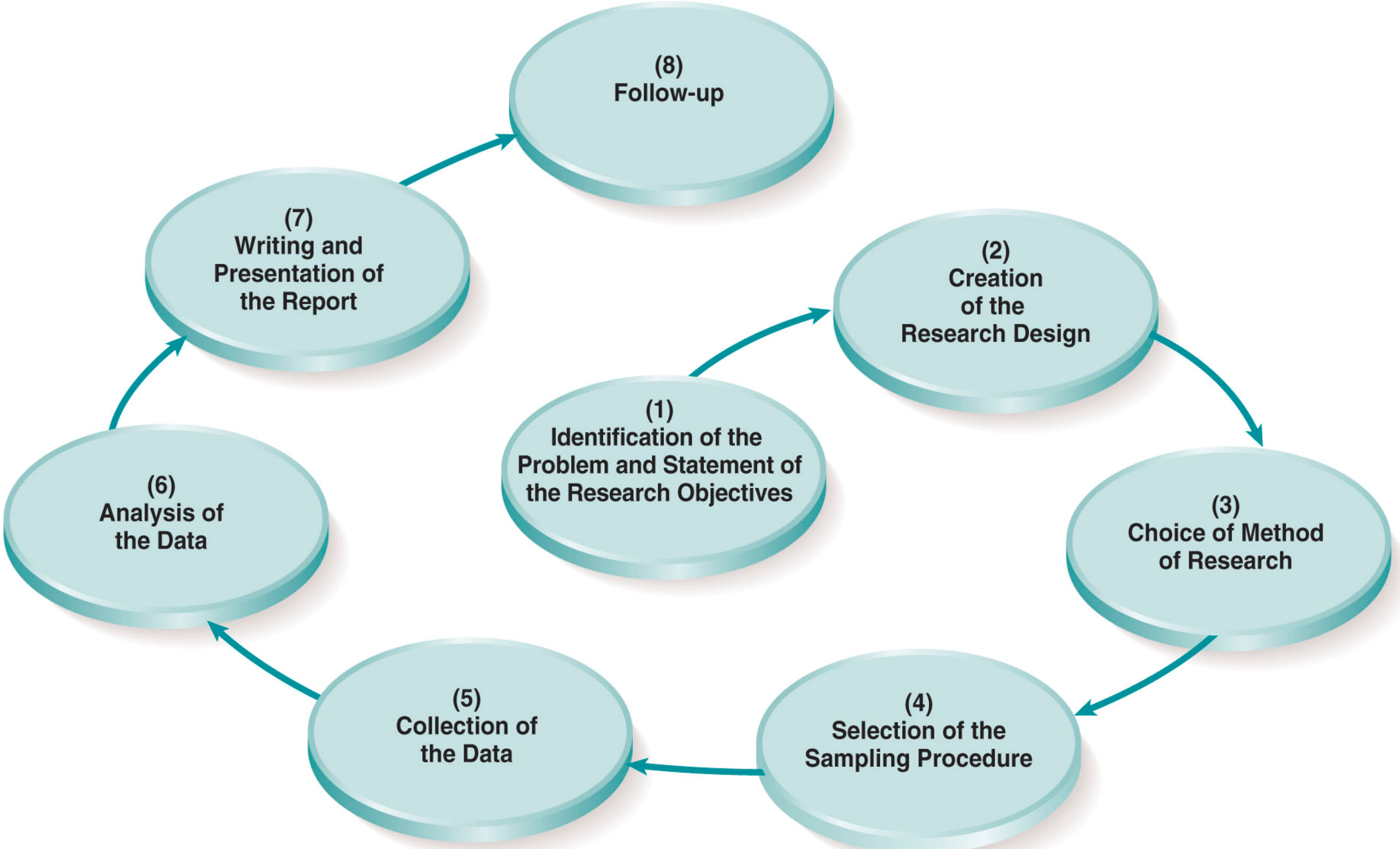
Case Discussion

Research problems:
– determine awareness of online grocery shopping among target market
– assess satisfaction of existing online grocery shoppers
– determine existing levels of online shopping in target market
– investigate target market preferences for products to be purchased online
–determine level of demand for online grocery shopping among target market

Census vs. Sample

- If your target market is new homeowners in a small city in any given month, a census would be better.
- If your target market is parents of babies born in December in a particular county, a census might be better.

The Marketing Research Process
An Overview



Steps to do marketing research

- **You have been charged with determining how to attract more business majors to your school. Outline the steps you would take, including the sampling procedures to accomplish this task.**

Steps

1. **Identify the problem and state the marketing research objectives.**
2. **Create the Research Design.**
3. **Choose the Basic Method of Research.**
4. **Selection of the Sampling Procedure.**
5. **Collecting the Data.**
6. **Analysis of the Data.**
7. **Preparation and Writing the Report.**
8. **Follow up.**

Chapter Four

Secondary Data and Big Data Analytics

LEARNING OBJECTIVES

1. Understand the advantages and disadvantages of secondary data.
2. Comprehend data mining and behavioral targeting.
3. Learn the advantages of big data analytics, how to make it actionable, and the importance of data visualization.

Secondary Data vs. Primary Data

Secondary Data:

- Data than have been previously gathered.

Primary Data:

- New data gathered to help solve the problem under investigation.

Online Secondary Data Resources

- www.marketingpower.com
- factfinder.census.gov
- www.bis.gov/cex
- www.bea.gov
- www.bts.gov
- bizjournals.com
- www.ciesin.com
- www.cdc.gov/nchs
- www.clickz.com
- dismal.com
- easidemographics.com
- www.econdata.net
- freedemographics.com
- harrisinfo.com
- www.hoovers.com
- www.opinionresearch.com
- www.ipl.org/div/aon
- www.mra-net.org
- mediamark.com
- www.prb.org
- www.quirks.com
- serviceintelligence.com
- socialsecurity.gov
- www.census.gov
- www.ers.usda.gov
- worldopinion.com
- www.usadata.com
- www.fedstats.gov
- www.wikipedia.org

Online Secondary Data Resources

US Federal Statistics

SBA

US Small Business Administration

US Bureau of Labor Statistics

US Census Bureau

abc NEWS

FOX NEWS channel

MSNBC HOME

USA TODAY

CNN

CBS NEWS

THE GALLUP ORGANIZATION

THE WALL STREET JOURNAL. ONLINE

The New York Times ON THE WEB

The Washington Post

Key Terms & Definitions

External (Secondary) Data

- **You work for Whirlpool, a major supplier of kitchen appliances.**
- **Go to *http://www.nahb.com***
- **Describe what types of information at this site might be of interest to Whirlpool.**

Discussion topic

1.Go to the National Opinion Research Center at www.norc.org and describe what new reports are available for researchers.

Note: Please clearly state the name of the reports. You can select any areas that you are interested. You only need to provide a short description of one or two reports.

2.Go to www.Nielsen.com and describe 1-2 interesting things you find from the website (anything that you feel interesting, such as their product/service, industry trend, new measurement etc.)

The Balancing Act with Secondary Data

POTENTIAL ADVANTAGES

- **Time**
- **Cost**

POTENTIAL DISADVANTAGES

- **Fit**
- **Accuracy**

Disadvantages of Secondary Data

- Problems of fit:
  - Different units of measurement
    - e.g., consumer income (individual, household, family)
  - Different class definitions

Before 5 Years	After 5 Years
2500-5000	5000-6000
5001-7500	6001-7000
7500-10000	7001-10000

  - Outdated

Internal versus External (Secondary) Data

- Internal Data
  - Data that originate within the organization for which the research is being done
  - (e.g., sales invoice, salespeople's expense account)
- External Data
  - Data that originate outside the organization for which the research is being done
  - (e.g., financial records, scanner data)

Most studies should begin with a search for internal data.

Discussion Scenario

- Pam Hathaway and Ashley Shafer founded **The Art Terrace** five years ago.
- Idea: to acquire unique decorative art pieces from around the world and market them to local affluent home owners.
- Market response: positive.
- Product assortment available online later.
- A small sales staff handles in-store and telephone inquiries, orders, and return credit requests.
- It also works to establish and maintain affiliate relationships with larger higher-traffic websites.

Discussion Scenario

- Having experienced growth levels beyond their wildest dreams, the partners are now concerned they have gotten too busy to properly monitor market conditions.
- In a recent meeting they agreed to hire some employees to do some secondary research for them.
- Assuming you were among these employees, what <u>internal secondary data sources</u> would you access and analyze?

Internal Secondary Data Sources

- Do these apply to The Art Terrace?
  - Cash register receipts
  - Sales invoices
  - Financial records
  - Credit memos
  - Salespersons’ call reports
  - Salespersons’ customer/prospect records
  - Salespersons’ expense accounts
  - Warranty cards
  - Previous marketing research reports

Chapter Five

Qualitative Research

LEARNING OBJECTIVES

1. Define qualitative research and understand its popularity.
2. Learn about focus groups, how to conduct them, and their advantages and disadvantages.
3. Compare other forms of qualitative research with focus groups.
4. Appreciate the future of qualitative research.

The Nature of Qualitative Research

Qualitative:

- Research whose findings are not subject to quantification or quantitative analysis. Its research conclusions are not based on precisely, measurable statistics but on more subjective observations and analysis.

Quantitative:

- Research that uses mathematical analysis. Typically research analysis is done using measurable and numeric standards.

Qualitative vs. Qualitative Research

EXHIBIT 5.1	Qualitative versus Quantitative Research	
	Qualitative Research	**Quantitative Research**
Types of questions	Probing	Limited probing
Sample size	Small	Large
Amount of information from each respondent	Substantial	Varies
Requirements for administration	Interviewer with special skills	Interviewer with fewer special skills or no interviewer
Type of analysis	Subjective, interpretive	Statistical, summation
Hardware	Sound recorders, projection devices, video recorders, pictures, discussion guides	Questionnaries, computers, printouts, mobile devices
Degree of replicability	Low	High
Researcher training	Psychology, sociology, social psychology, consumer behavior, marketing, marketing research	Statistical, decision models, decision support systems, computer programming, marketing, marketing research
Type of research	Exploratory	Descriptive or causal

General Limitations of Qualitative Research

1. Attitudinal, perceptual, and belief differences revealed during qualitative research might not be easily measured. Quantitative research will more precisely measure these differences.

2. Qualitative research is often not statistically representative of the general population. Although qualitative results might give you a good idea about the population, they do not allow you to precisely gauge the populations' responses based on the limited sample typical of qualitative research.

3. Anyone can purport to be an expert.

Focus Groups

Focus Group Defined:

- *A group of eight to 12 participants who are led by a moderator in an in-depth discussion on one particular topic or concept.*

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Focus Group

Focus Groups

- Extremely popular research technique
- Format
  - Typically 8-12 people
  - Homogeneous within group
  - 1.5 to 2 hours in length
  - Sessions recorded and transcribed
- Key person: the moderator

Advantages of Focus Groups

1. Interactions among respondents can stimulate new ideas and thoughts.

2. Opportunities to observe customers or prospects through one-way mirrors.

3. They can be executed more quickly than many other research techniques.

Focus group video

- **Fun video -Silicon Valley S02E06**
  - https://www.youtube.com/watch?v=Sx1J3S6vUJ8

- **Conducting a Focus Group**
  - **https://www.youtube.com/watch?v=Auf9pkuCc8k**

Disadvantages of Focus Groups

1. Managers can be misled instead of informed.

2. Recruiting for focus group participants can be a problem.

Focus Group Exercise

- Topic: How students spend their entertainment dollars and what additional entertainment opportunities they would like to see offered.
  – Create discussion guide
  – Moderator
  – Participants

Other Qualitative Methods

Depth Interviews (IDIs):

One-on-one interviews that probe and elicit detailed answers to questions, often using non-directive techniques to uncover hidden motivations.

Advantages of IDIs

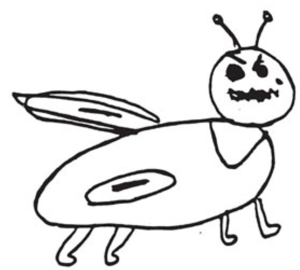
- Group pressure is eliminated
- Respondent feels important and truly wanted
- Respondent attains a heightened state of awareness
- Encourages the revelation of new information
- Respondents can be questioned at length to reveal feelings and motivations
- Individual interviews allow greater flexibility to the direction of questioning
- The interviewer becomes more sensitive to nonverbal feedback
- A singular viewpoint can be obtained without influence from others
- Interviews can be conducted anywhere

Disadvantages of IDIs

- Costs in terms of time and money
- Less client involvement
- Do not cover much material in one day
- Do not allow for a group discussion and resolution
- Some respondent reactions cannot be generated from a one-on-one session

Other Qualitative Methods

Projective Tests: Techniques that tap into respondents' deepest feelings by having them project those feelings into an unstructured situation.



Examples:

- Word Association Test
- Analogy
- Personification
- Sentence and Story Completion Test
- Cartoon Tests and Photo Sorts
- Customer Drawings
- Storytelling
- Third Person Technique

Projective Methods

- Word association
  - Example: First word that comes to mind for "Just Do It "
  - *What comes to your mind when I mentioned the word breakfast?*

Projective Methods

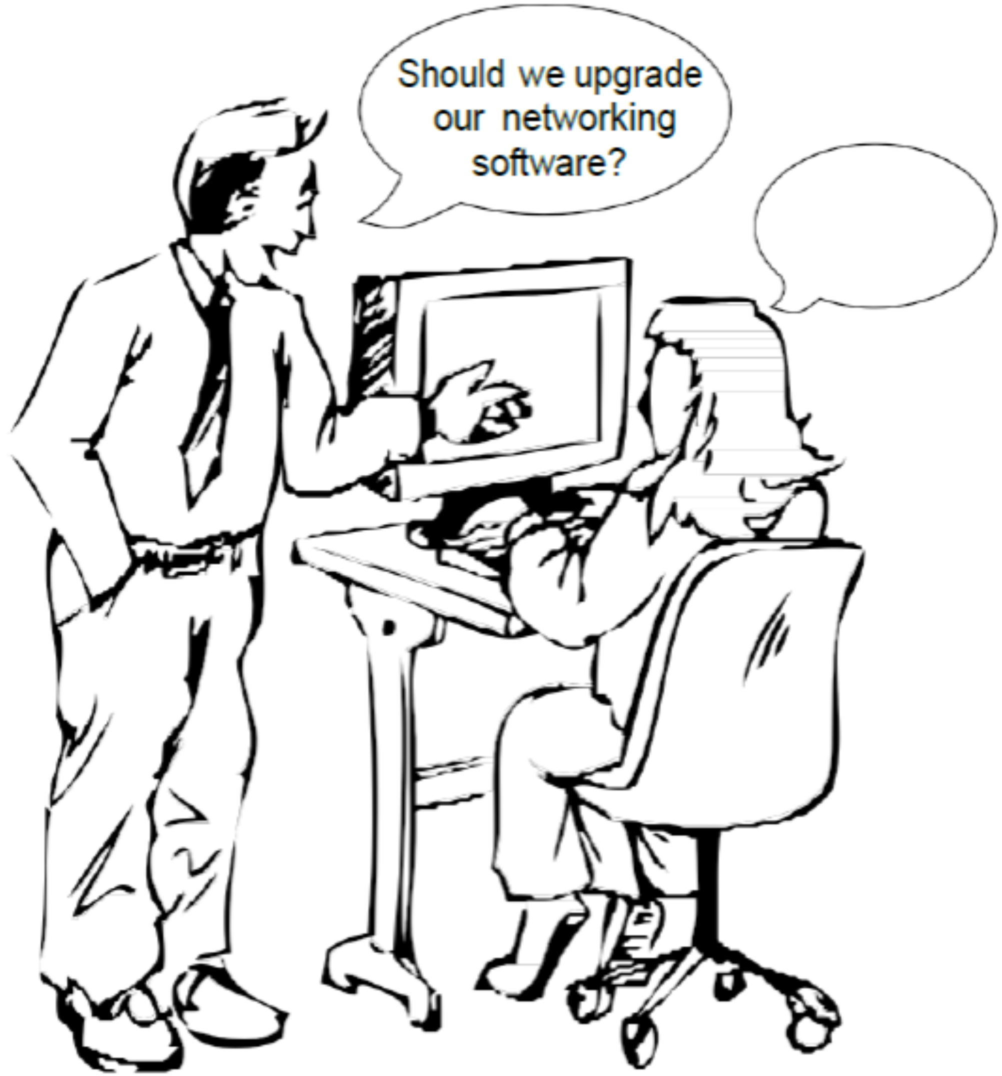
- Sentence and Story Completion Test
  - Example:
  - A man who drinks light beer is …
  - People who visit museums are...
  - I would describe a perfect marriage as one where…

Projective Methods

- Sentence completion
  - *People who are concerned about pollution …*
    - “care about the future” versus “are just tree-huggers who want to run up my taxes”
  - *When I think of living in a city, I….*
    - “ can’t help but think of the smog over L.A.” versus “think about cruising my car downtown on Saturday night!”

Projective Methods

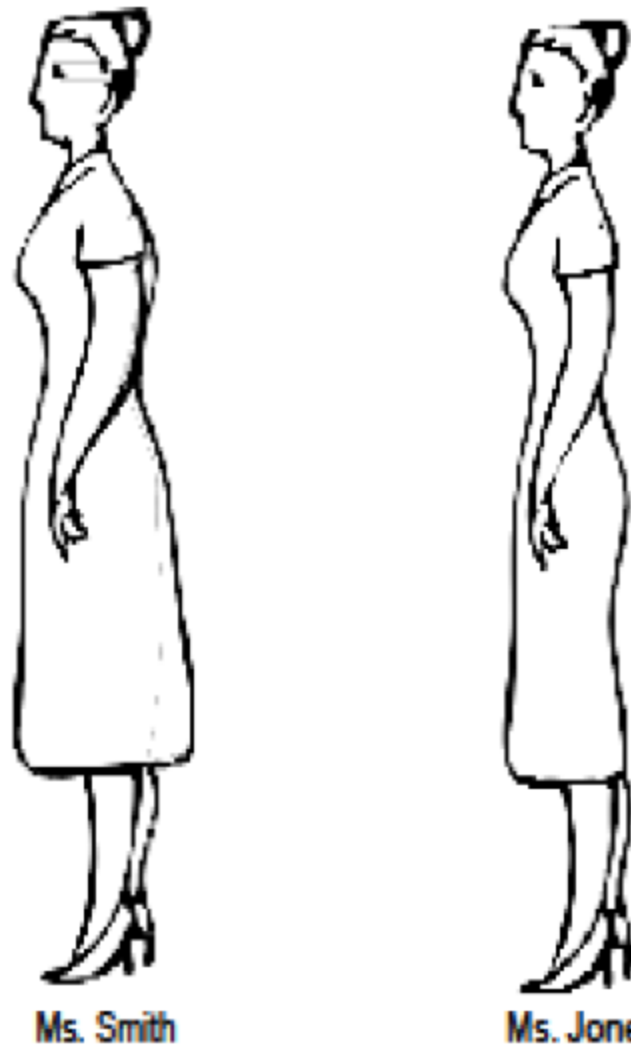
- Storytelling/Picture interpretation
  - Example: *Tell me a story about this picture*


Should we upgrade our networking software?

Projective Methods

- “Let’s wait until the upgrade has been out a few more months because new upgrades always contain bugs”
- “It’s critical to upgrade now to maintain compatibility.”

Do you believe Ms. Smith or Ms. Jones drinks more milk?



Projective Methods

- *Do you believe Ms. Smith or Ms. Jones drinks more milk?*

- ‘Ms. Smith’
  – She appears older, less active, and dowdy.
  – If such responses were typical, then milk producers may have chosen to reposition their product so it would be more attractive to younger and more active consumers.

Projective Methods

$10

$75

Description 1

- A woman goes to the store, sees the $10.00 perfume, and knows that such inexpensive perfume can't be any good.

- Later, she sees the $75.00 perfume, and reluctantly acknowledges that good perfume is very pricey. She then buys the more expensive perfume.

Description 2

- A woman sees the $10.00 perfume and buys it because she believes all perfume is of similar quality, so if it smells OK to you, then you should buy it.
- Later, when she sees the $75.00 perfume, she wonders about women who would be silly enough to pay 10 times more for the same thing in a slightly more attractive package.

Projective Methods

- Third-person role playing
  - Study participants either project themselves into a third person and respond accordingly,
  - Imagine they are a third person and then describe themselves.

Projective Methods

- Third-person role playing
  - A classic motivation research study.
  - Two similar samples of 50 housewives.
  - All received a shopping list, a list written by a housewife,
  - Asked to describe her.
  - The lists were identical except for one product:
    - one list included Nescafe Instant Coffee, and the other list included Maxwell House Coffee.

Projective Methods

Mid-1950s

- Instant coffee
  - lazy, a poor purchase planner, and a poor spouse;
- Ground coffee
  - hardworking, a good purchase planner, and a good spouse.
- Lukewarm opinions about instant coffee in the mid-1950s.

Projective Methods

In 1970

- Instant coffee
  - modern, thrifty, and a good spouse.
- Ground coffee
  - old fashioned and a poor spouse.
- Consumers' attitudes changed markedly during the 15 years between studies.
- Difficult to uncover the findings through more structured questionnaires.

Projective Methods

Brand Personification

Objective: When you want to discover the likes and dislikes to a certain brand/product/idea/application etc.

- *Now I would like you to imagine that I have this wand, like Harry Potter (*aww Emma Watson*).*
- *And I have this magical power that would transform whatever that this wand touches into a person.*
- *And if this brand X came alive and became a person, what kind of person would it be?*

Projective Methods

Brand Personification

Demographic: *how old? Is it a he/she? What's their job?*

Lifestyle: *What do they like to do? Their outfit? Where do they live?*

Values: *what is important to them? What do they value?*

Relationship: *if this is a person, how is your relationship with this person? How do you feel about them?*

Projective Methods

Brand Personification

•*If this brand is a celebrity, who would it be? Why?*

•*If this brand is at a party, who is he/she? Who is he/she mingle with? Would you approach him/her?*

Projective Methods

Brand Personification

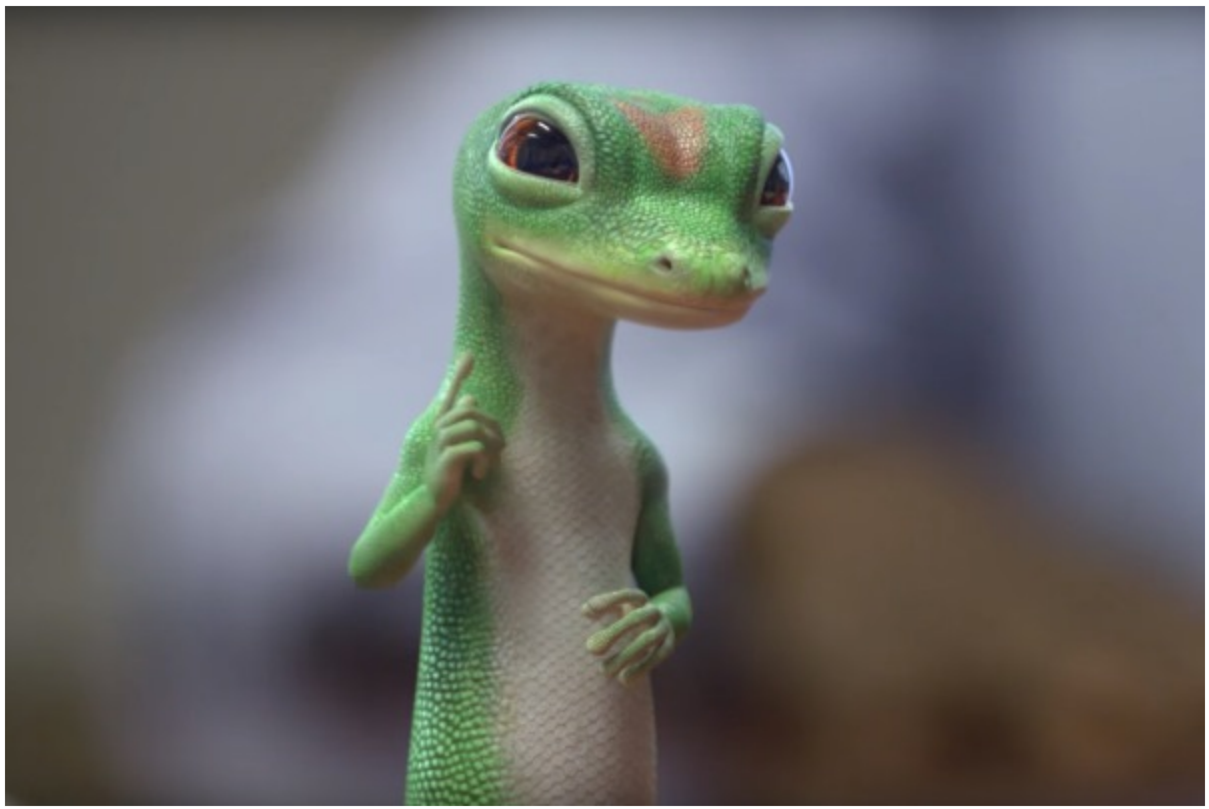
•Friendliness.

•Trustworthiness.

•Expertise.

•Enthusiasm.

Projective Methods



Projective Methods

Chapter Six

Traditional Survey Research

LEARNING OBJECTIVES

1. Understand the reasons for the popularity of survey research.
2. Learn about the types of errors in survey research.
3. Distinguish the types of surveys.
4. Gain insight into the factors that determine the choice of particular survey methods.

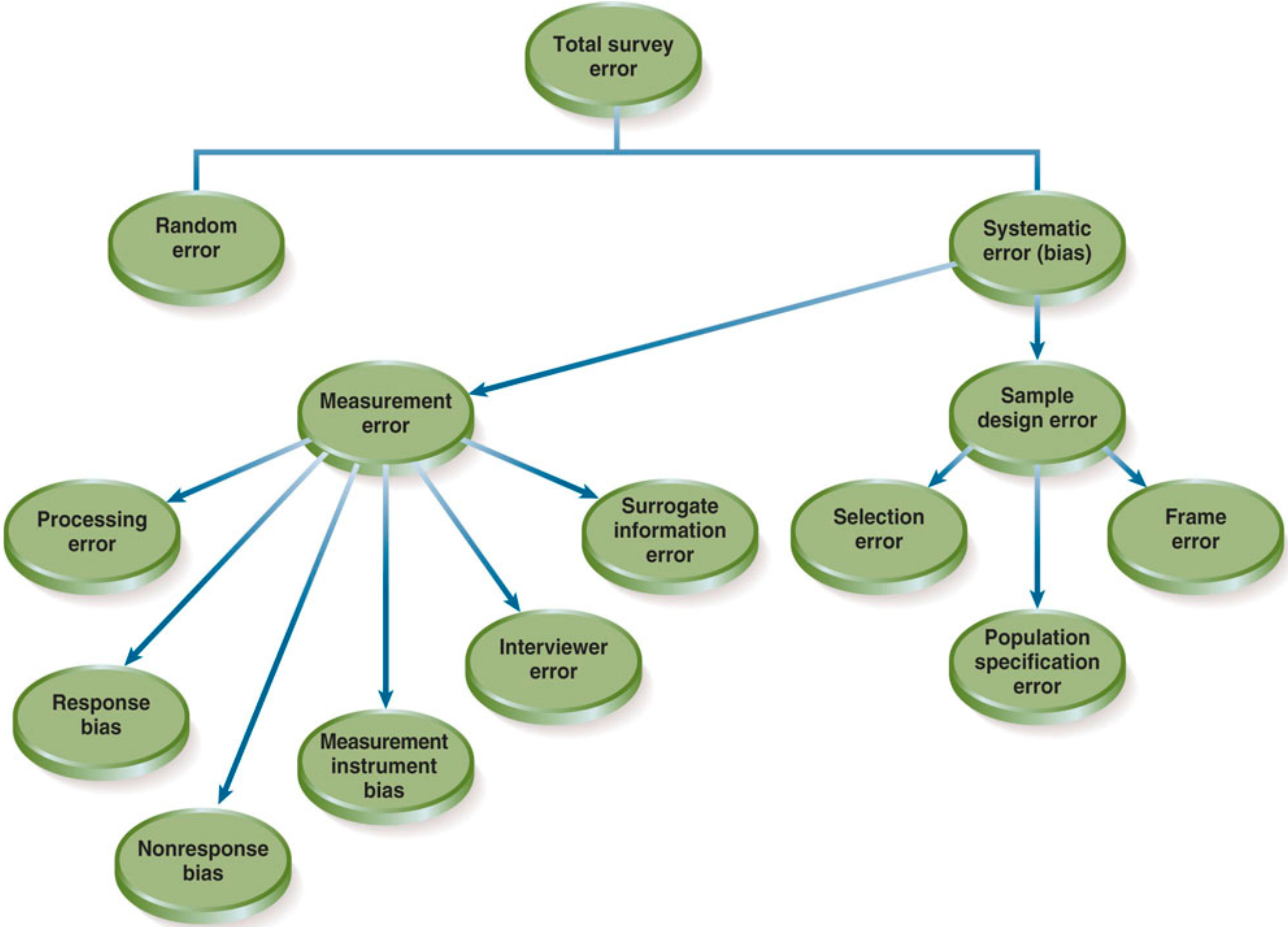
Why is Survey Research so Popular?

•***The need to know why.*** For example, why did they buy or not buy a particular brand? What did they like or dislike about it? Who or what influenced them?

•***The need to know how.*** How did they make the decision? What time period passed? What did they examine or consider? When and where was the decision made? What do they plan to do next?

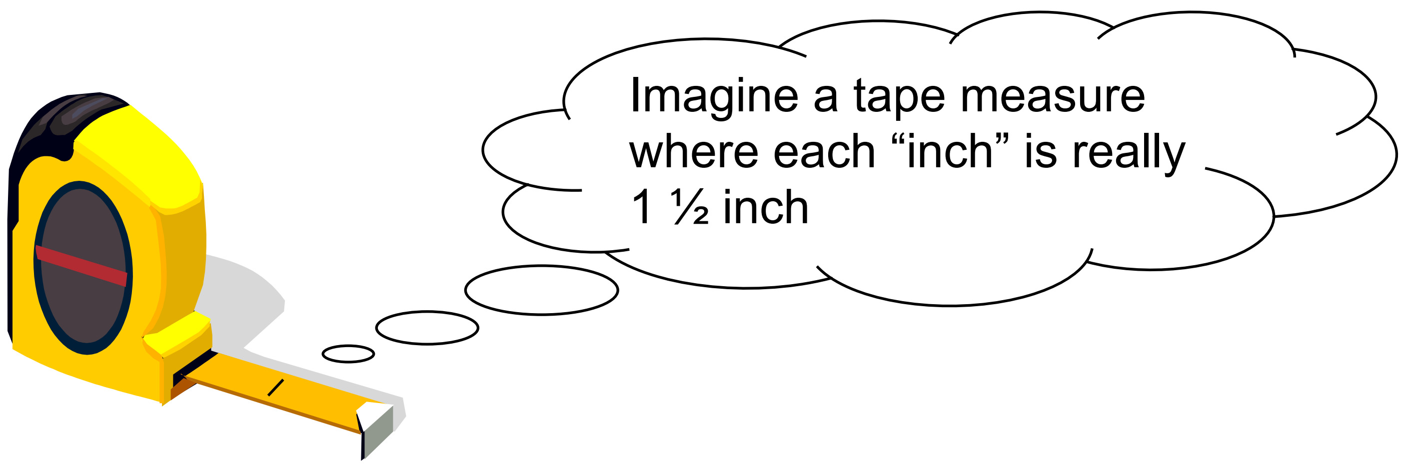
•***The need to know who.*** Who is the person, and who played an influencing role in the decision making process, from a demographic or lifestyle perspective?

Survey Research Error



Two Types of Error

- Systematic Error
  - Error that is constant.



Two Types of Error

- Random Error
  - Error due to temporary aspects.

Imagine measuring “inches” with your fingers

Survey Research Error

Key Definitions

Random Error or Random Sampling Error:

- Error that results from chance variation.
- Can not be eliminated.
- Can be reduced by increasing sample size.

Chance Variation:

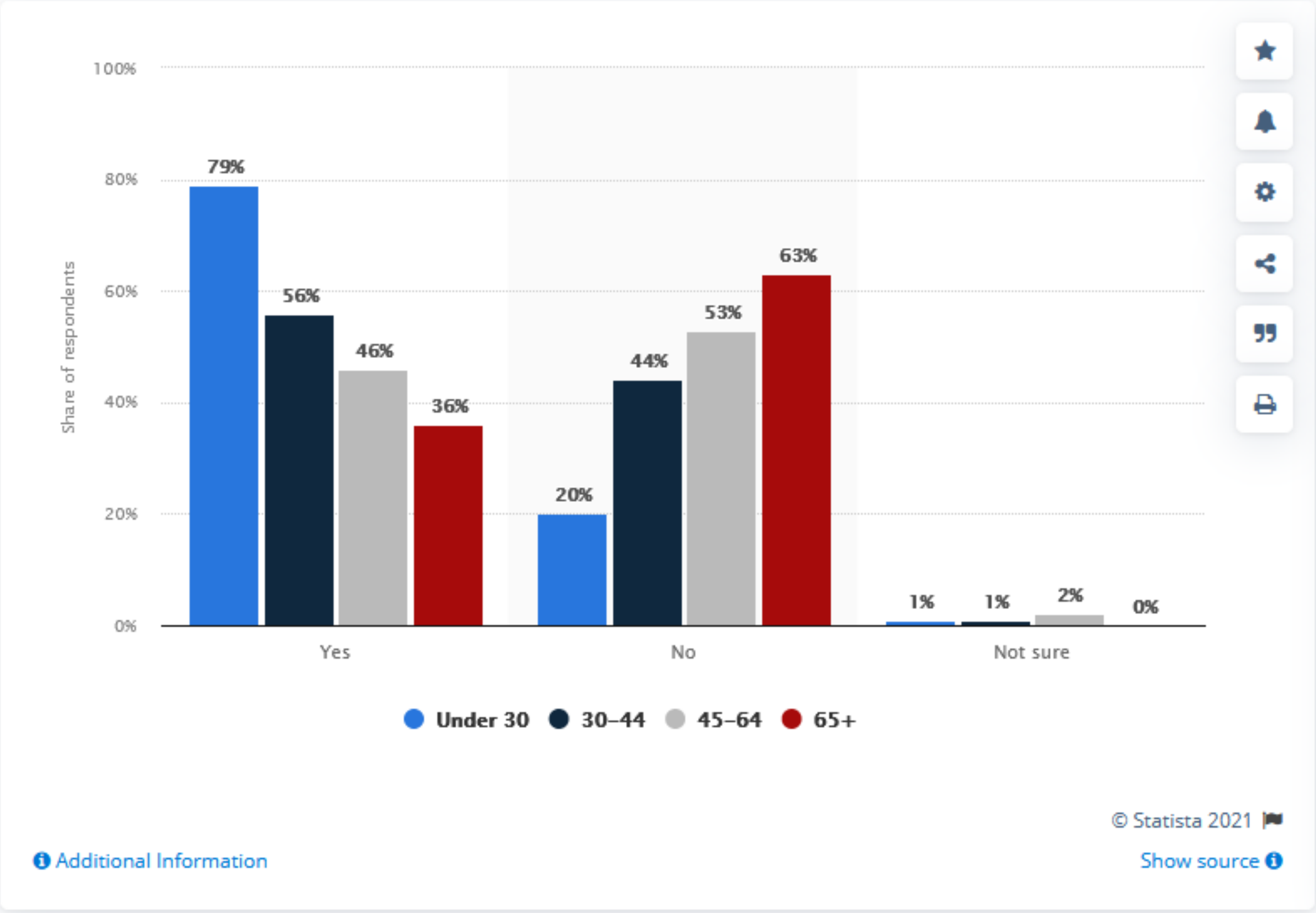
- The difference between the sample value and the true value of the population mean.

Random Error or Random Sampling Error

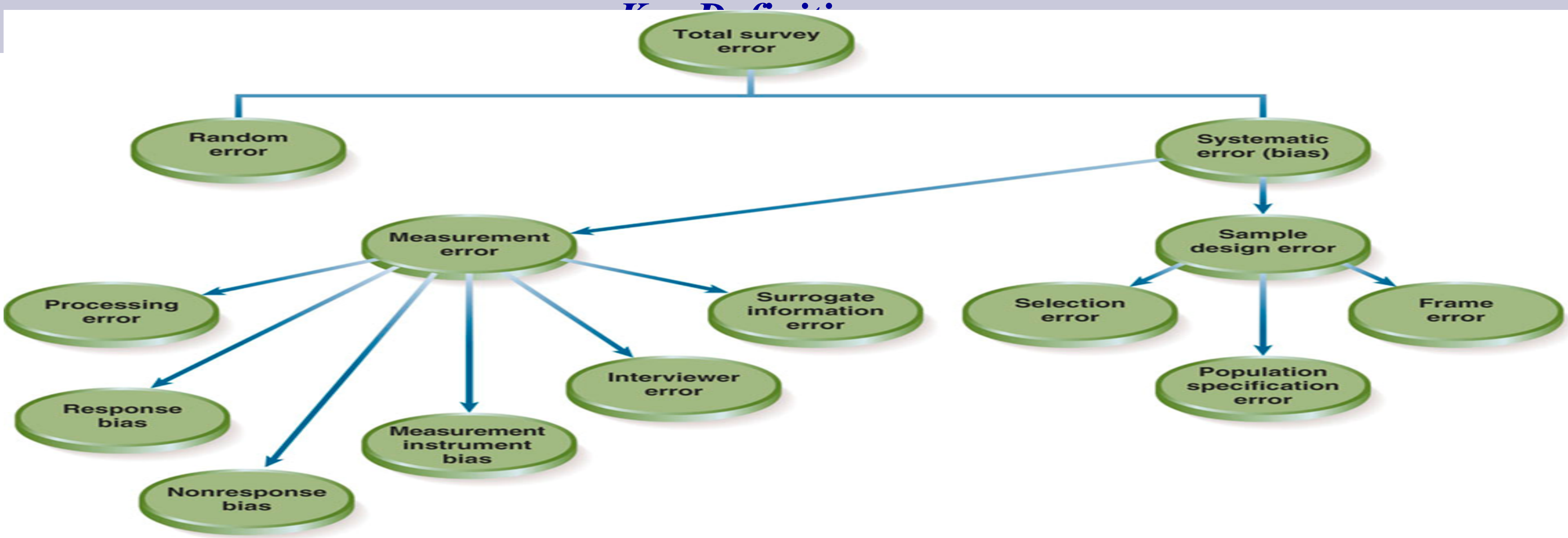
Survey the satisfaction rating towards the Harry Potter movie series

- Assume population rating:8
- Sub sample rating 1: 9
- Sub sample rating 2: 8.4
- Sub sample rating 3: 7.6

Percentage of people who have read any of Harry Potter books or watch any of the movies



Survey Research Error

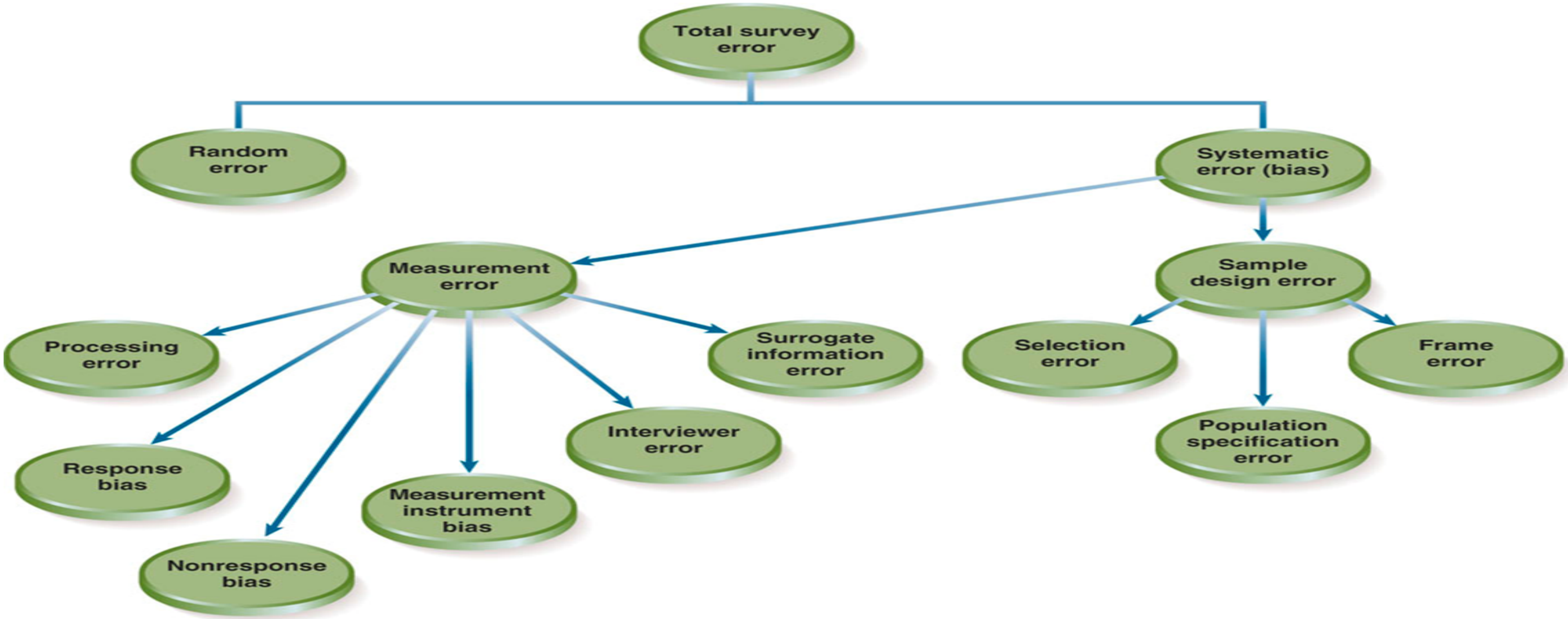


Systematic Error or Bias:

- Error that results from problems or flaws in the execution of the research design; Sometimes called non-sampling error.

Survey Research Error

Key Definitions



Sample Design Error:

- Systematic error that results from an error in the sample design or sampling procedures.

Survey Research Error

Key Definitions

•Frame error

Sampling frame:

➢the list of population elements or members from which samples to be selected.

➢a list of all the items in your population. It’s a complete list of everyone or everything you want to study.

- **Population**: Students in MKT101.
  Sampling Frame: Adrian, Anna, Bob, Billy, Howie, Jess, Jin, Kate, Kaley, Lin, Manuel, Norah, Paul, Roger, Stu, Tim, Vanessa, Yasmin.

Survey Research Error

Key Definitions

- Frame error
  - Error results from using an incomplete or inaccurate sampling frame.
    - E.g., a published telephone directory as a sampling frame
      - Not listed or moved or changed

Survey Research Error

Continued

Population Specification Error:

•Error that results from incorrectly defining the population or universe from which a sample is chosen.

–E.g., Apple products user

- by specifying a young population.

–E.g., TikTok's User.

Survey Research Error

Continued

Population Specification Error:

- Error that results from incorrectly defining the population or universe from which a sample is chosen.
  - –E.g., Apple products user
    - by specifying a young population.
  - –E.g., TikTok’s User.

- **25%** of TikTok’s active users accounts in the U.S. are people aged 10-19.
- **22.4%** of TikTok’s active users accounts in the U.S. are 20-29.
- **21.7%** of TikTok’s active users accounts in the U.S. are 30-39.
- **20.3%** of TikTok’s active users accounts in the U.S. are 40-49.
- **11%** of TikTok’s active users accounts in the U.S. are 50+.

Survey Research Error

Continued

Selection Error:

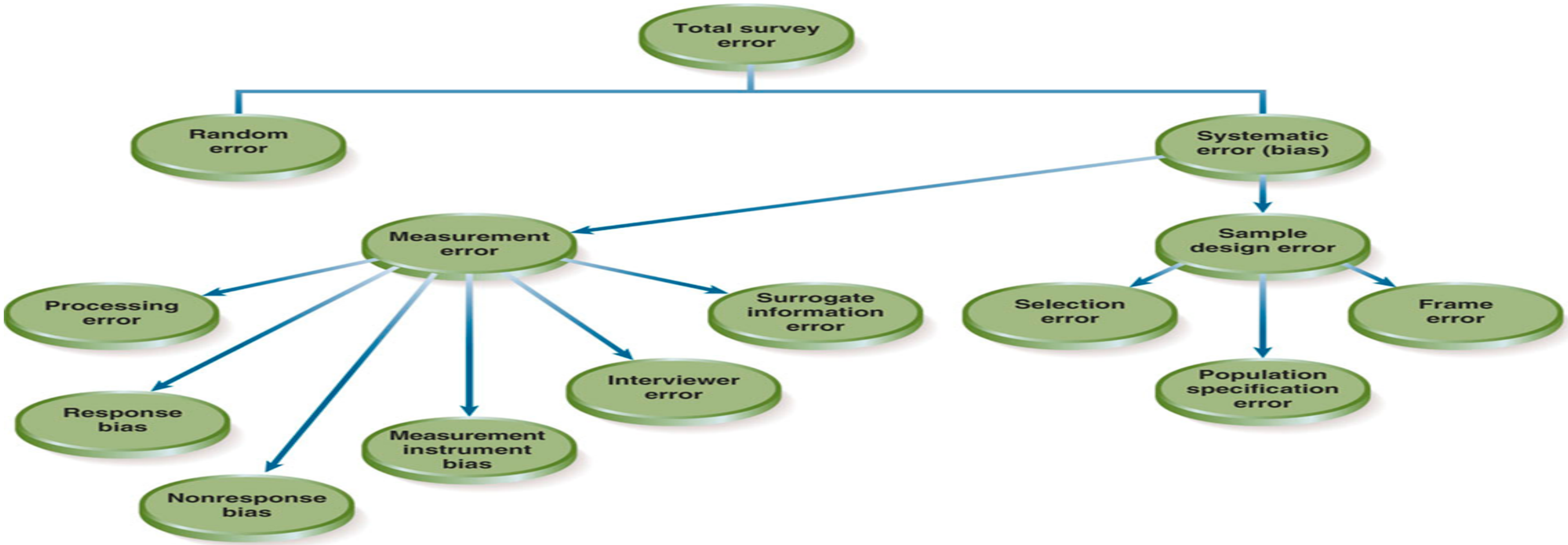
- Error that results from incomplete or improper sampling procedures or not following appropriate procedures.

–E.g., Mall intercept method leaves out the elderly, because he or she doesn't want to talk to older people.

–E.g., door-to-door interviewers might decide to avoid houses that do not look neat and tidy because they think the inhabitants will not be agreeable to doing a survey.

Survey Research Error

Continued



Measurement Error:

- Systematic error that results from a variation between the information being sought and what is actually obtained by the measurement process.

Survey Research Error

Continued

Surrogate Information Error:

- Error that results from a discrepancy between the information needed to solve a problem and that sought by the researcher.

- For example:
  - How likely are you going to the theatre to watch the movie?
  - How likely are you going to like the movie?

Interviewer Error or Interviewer Bias:

- Error that results from the interviewer's influencing – consciously or unconsciously – the answers of the respondent.
- Professor survey students how many hours do you study for the class.

Survey Research Error

Continued

Measurement Instrument Error:

- Error that results from the design of the questionnaire or measurement instrument; also known as *questionnaire bias*.
- For example, leading questions:

–Do you shop at lower-class stores like xxx?

–Are you satisfied with the good service provided in your stay at Holiday Inn?

Input Error:

- Error that results from the incorrect transfer of information from a survey document to a computer.

Survey Research Error

Continued

Nonresponse Bias:

•Error that results from a systematic difference between those who do and those who do not respond to the measurement instrument.

•Sampled units typically do not respond because they are unable, unavailable, or unwilling to do so.

- E.g., people who are more active runners might be more inclined to answer a survey about running than people who aren't as active in the community.

Response Bias:

• Error that results from the tendency of people to answer a question incorrectly through either deliberate falsification (e.g., restroom usage) or unconscious misrepresentation (e.g., # of times purchase) .

Question

What types of error might be associated with the following situations?

a. Conducting a survey about attitudes toward city government using the telephone directory as a sample frame.

b. Interviewing respondents only between 8:00 a.m. and 5:00 p.m. on features they would like to see in a new condominium development.

c. Asking people if they have visited the public library in the past two months.

d. Asking people how many tubes of toothpaste they used in the past year.

e. Telling interviewers they can probe using any particular example they wish to make up.

Answer

a) Sample frame error.
b) Sample selection error.
c) Response bias.
d) Response bias.
e) Interviewer error.

Chapter 16-18 Q & A

MKT572

Question

What is the purpose of hypothesis testing?

A.to draw conclusive decisions about sample estimates

B.to determine whether there is support to draw conclusions about some characteristics of the population given the evidence provided by the sample results

C.to summarize and describe the sample data

D.to test whether the sample is scientifically drawn from a target population

E.to conduct statistical tests on census data

Answer

- Ans: B

Question

- The hypothesis of the status quo is typically referred to as the _______________ hypothesis.

A. type III
B. alternative
C. statistical
D. null
E. valid

Answer

- Ans: D

Question

What is the meaning of testing a hypothesis at an alpha level of 0.05?

A.There is 95% confidence that the observed results are due to sampling error or because of sample randomness.

B.The chances of not rejecting the null hypothesis when it is false is more than 5%.

C.There is a 95% chance that the observed result from the sample analysis will also occur in the population.

D.The probability of committing a Type II error is about 5%.

E.There is 95% chance of a gamma error.

Answer

- Ans: C

Question

Hypotheses about frequency distributions that involve one or more nominally scaled variables can be tested using ______________.

a. chi-square test

b. t-test

c. f-test

d. z-test

e. ANOVA test

Answer

- Ans: A

Question

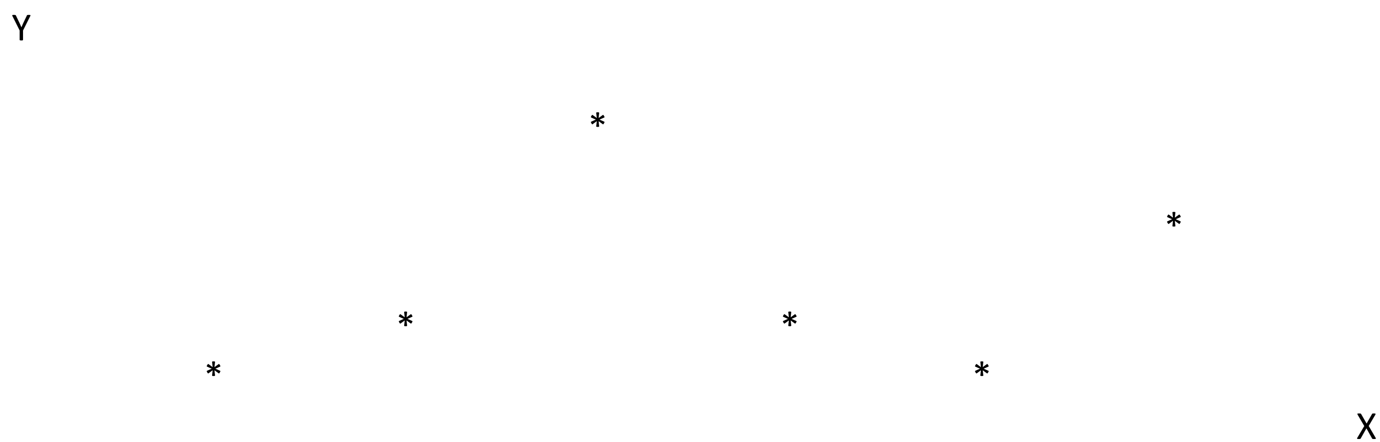
Researchers must be careful to distinguish statistical significance from:

a. mathematical significance.
b. chance significance.
c. practical significance.
d. random significance.

Answer

- Ans: C

Question



Given this plot, which of the following provides the best description?

a. perfect linear association

b. strong exponential association

c. strong parabolic association

d. no association

e. strong curvilinear association

Answer

Ans: D

Question

When two variables are not correlated at all, the correlation coefficient would be _______.

a. -1

b. 0

c. 1

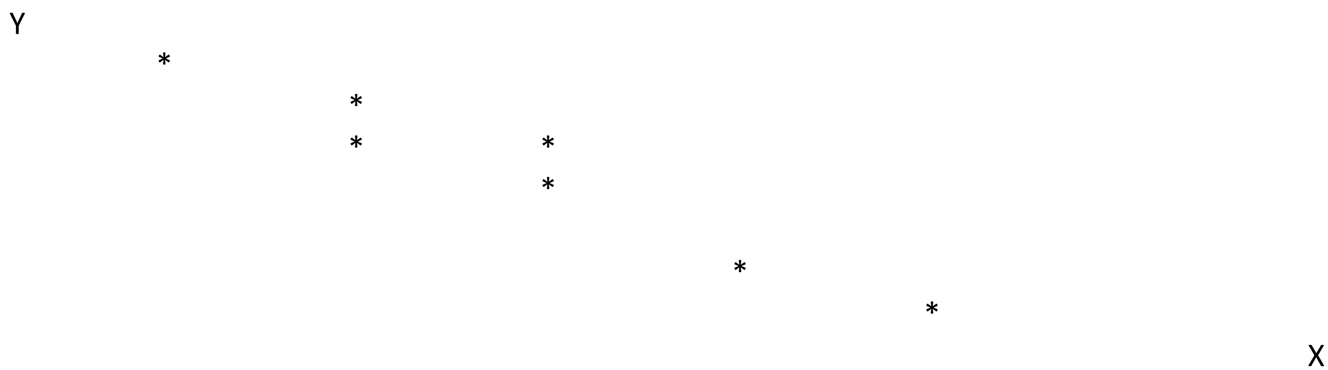
d. -2

e. 0.5

Answer

- Ans: B

Question



Given this plot, which of the following provides the best description?

a. strong inverse linear association
b. strong exponential association
c. strong parabolic association
d. no association
e. strong curvilinear association

Answer

- Ans: A

Question

____________ are statistical methods of analyzing the relationship between two variables.

a. Bivariate techniques
b. Univariate techniques
c. Multivariate techniques
d. None of these

Answer

- Ans: A

Question

Interpret the correlation coefficient for the following data:

Sales	Sales Training Score
45,000	98
34,500	74
23,750	57
51,450	99
41,000	85

The resulting correlation coefficient is +.98 and the probability of insignificance is 1%.

Answer

Ans: There is a strong positive correlation between sales and sales training scores. Hence, higher sales are associated with higher sales training scores and vice-versa.

Question

The coefficient of determination is normally associated with which of the following multivariate procedures?

a. multiple regression analysis

b. factor analysis

c. conjoint analysis

d. cluster analysis

Answer

Ans: A

Question

A dependent variable is coded 1=respondent did purchase and 0=respondent did not purchase. Independent variables include various demographic and lifestyle characteristics of the respondents. The goal of the analysis is to determine how respondents who did purchase are different from respondents who did not purchase. Which of the following procedures goes with the preceding description?

a. multiple discriminant analysis
b. multiple regression analysis
c. cluster analysis
d. perceptual mapping

Answer

Ans: A

Question

Suppose an analyst wanted to determine whether or not dollars spent on advertising, number of sales people, number of new products introduced, and dollars spent on research and development were contributing to the growth in company market share. Which of the following procedures would be most appropriate?

a. conjoint analysis

b. cluster analysis

c. multiple regression analysis

d. perceptual mapping

Answer

Ans: C

Question

_______________ is a measure of the percentage of the variation in the dependent variable that is explained by the variation in the independent variables.

a. Discriminant weights

b. Factor loadings

c. Coefficient of determination

d. Coefficient of correlation

Answer

- Ans: C

Question

Dummy variables created to include nominally scaled variables in an analysis are commonly used in:

a. multiple discriminant analysis.
b. factor analysis.
c. conjoint analysis.
d. multiple regression analysis.

Answer

Ans: D

Question

Which of the following is multiple discriminant analysis most similar to?

a. multiple regression analysis

b. factor analysis

c. conjoint analysis

d. cluster analysis

Answer

- Ans: A

Question

If the goal is to classify business travelers into distinct groups based on their responses to 20 questions on preferences to mode of transportation, hotel accommodation, and ethnic food, which of the following techniques would be most appropriate?

a. multiple regression analysis

b. conjoint analysis

c. cluster analysis

d. factor analysis

Answer

Ans: C

Question

All of the following are techniques for multivariate analysis procedure except _________.

a. Cluster analysis
b. Factor analysis
c. Conjoint analysis
d. Bivariate Regression analysis

Answer

- Ans: D

Question

- An advertising agency has been doing work for a client selling widgets. The three-month campaign has produced a low correlation between advertising expenditures and sales for its client. Hence, the client is considering firing the ad agency. The ad agency counters that consumer sales are not a fair assessment of the effectiveness of the ad campaign after only three months. They counter with an analysis of advertising expenditures in relation to number of requests for information about the widgets; number of distributors stocking widgets; and number of retailers requesting shipments of widgets. The ad agency has a database with such information. What kind of analysis would best assist the ad agency in making their case for the effectiveness of their ad campaign?

Answer

- Ans: Since the ad agency wants to show that advertising expenditures are strongly related to the requests for information about widgets, number of distributors stocking widgets, and number of retailers requesting shipments of widgets, they should invoke a multiple regression analysis.

Question

- Describe the potential problem of collinearity and multiple regression. How might a researcher test for collinearity? If collinearity is a problem, what should the researcher do?

Answer

- Collinearity refers to the condition when a significant correlation exists between two or more independent variables. This condition reduces the statistical power of significance tests for the regression coefficients. One can test for collinearity by examining the correlation matrix. If there is a value higher than .30, the researcher should consider corrective action. This correction might be accomplished be dropping one of the correlated variables, or collapsing the correlated variables into a single variable.