Customer Insights

Customer Insights

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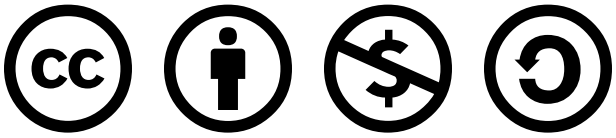
Aila Khan

Western Sydney University

Penrith



Contents

Introduction

This is the first part of the Open Access textbook. Our WSU team is putting their finishing touches to the second part which will be available soon. This is a work in progress so we will be progressively releasing sections as they are completed. I welcome any suggestions for improvements at: a.khan@westernsydney.edu.au.

Dr. Aila Khan is a Senior Lecturer in Marketing at the School of Business, Western Sydney University (WSU). Some of her most exciting projects – social robots, individuals' wellbeing, and charitable giving – were initiated by students as part of their thesis work. Aila would like to acknowledge all those wonderful students who – through their projects, queries, and publications – helped Aila develop in her field. This book would not have been possible without the students' hard work and resilience, which kept the supervisor on her toes – and motivated!

Some of the amazing scholars from WSU are featured below:

Higher Degree Research students (clockwise, from top-left): Bilal Mustafa, Anusha Ramgoolam, Sameera Nazmin, Isha Kharub. Photographer: Sally Tsoutas, Western Sydney University.

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Acknowledgement of country

Acknowledgment of the Traditional Owners of Western Sydney University Land

Western Sydney University acknowledges the custodians of the lands in which we meet, work, learn and socialise. We pay respect to the peoples of the Darug, Tharawal, Eora and Wiradjuri nations where are campuses are located. We acknowledge that the teaching, learning and research undertaken across our campuses continues the teaching, learning and research that has occurred on these lands for tens of thousands of years. We acknowledge and pay our respect to the Elders past, present and emerging.

Source: ‘Matta: Meeting place’ by Jason and Trevor Dalmarri

Co-created by the team of WSU School of Business, Parramatta, this artwork represents the lands and communities upon which the Parramatta City campus is built. The word Parramatta comes from the Aboriginal word ‘Baramada or Burramatta’. The Burramatta people (Burra meaning place and Matta meaning the eels) belong to the Dhurug people, who lived in this food-rich area before the time of the white invasion.

The story to this artwork is the land you work on today, showing the diversity of the area and paying respects to the past.

The “Matta” roamed along these rivers and grew large along the banks of the Burramatta river and in abundance. The green and blue waterways run through the artwork as they moved ever so gracefully up and down the inlets. The artwork shows the bubbles, the current, and the plentiful fish running through what today is known as Parramatta. The shoreline depicts the edge of the land as the waters head out to Sydney Harbour and the ocean.

The colourful sections represent all the towns surrounding Burramatta. inside those towns are circles belonging to multicultural families now living on Dhurug country. The dot lines and tracks were once walking lines of the Dhurug people, now turned into roads, routes, and railway lines.

These lands occupy the growth of the town now called Parramatta in honour of the first Australians.

Western Sydney University acknowledges the Dhurug nation as the traditional owners of the lands we work and live on today.

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Acknowledgments

Some amazing people at Western Sydney Uni (WSU) helped curate this book. I am grateful to WSU Library staff, in particular Paul Jewell, Karen Sheehy, Lucy Walton, Lauren Tupper, and Jeffrey Har who were great to collaborate with. Frank Hill, our University Copyright Officer helped immensely. Many of the images in this book were shot by our university's official photographer – thank you, Sally Tsoutas! Finally, my academic colleagues who offered to review the book and provide feedback at a short notice. You guys rock! They are (alphabetically):

- Dr Sabreena Amin, Sessional Academic
- Dr Abdul Babar, Sessional Academic
- Bruce Cameron, Sessional Academic
- Dr Munir Hossain, Sessional Academic
- Sana Yousaf, Teaching Assistant

I

Main Body

1

Difference between Marketing Research and Customer Insights

Learning Objectives

By the end of this chapter, students must be able to:

- Recognize the emergence of the concept of Customer Insights over the years
- Understand the key differences between the Marketing Research and Customer Insights
- Identify existing forms of data for analysis

The Emergence of ‘Customer Insights’

Traditionally, marketers have used tools such as surveys, interviews, and focus groups to undertake marketing research. While these tools are still very important, they have some inherent limitations. For a start, to get good quality data from these tools a key assumption is that respondents will accurately respond to research questions. In many cases, these respondents are expected to recall a previous experience and report on it. In other situations, customers are presented with scenarios and asked to predict the likelihood of them undertaking a certain behaviour (e.g., purchase). Therefore, the key to good quality data depends on respondents’ engagement with, ability, and willingness to provide all necessary information.

Another limitation of the traditional marketing research methods is the bias that can creep in as per the wording or presentation of a question. It is well-known that responses to a question can vary depending on who is asking the question, how it is being asked, and perhaps, even the time when it is asked. Moreover, survey questions are pre-determined and offer little flexibility to bring in new ideas. Respondents are usually restricted in the way they can respond. Similarly, generating good data in an interview usually requires a good rapport between the interviewer and the participant. Not all researchers are skillful in this area.

Finally, marketing research methods are not inexpensive. It takes time, money, and expertise to design a survey, an interview, or a focus group. Many small and medium-sized enterprises are usually not able to employ the traditional tools effectively to gather information.

The current world is making use of digital technologies. With the use of smart wallets, smartphones, smart appliances, streaming services, and social media platforms instantaneous information is being generated. This creates an ever-growing repository of ‘Big Data’ which – logically speaking – should be mined to gain insights into consumer behaviour. While the traditional marketing research methods are still useful, these need to be supplemented by other forms of data which is being created and stored on a regular basis.

Many organizations have developed ‘Insights Teams’ which consist of staff members from a variety of backgrounds. As opposed to a market research department, the task with the Insights Team is to be able to ‘synthesise’ the massive amounts of data being generated. Team members play the role of aggregators, interpreters, and disseminators. It is not sufficient to only present ‘findings’ to survey questions. As an Insights specialist, the key role is to be able to aggregate different pieces of information, interpret the data by collaborating with colleagues from other departments and be able to suggest key action points for future growth.

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Table: What is the difference between Marketing Research and Customer Insights Purcell, M 2021, *What's the difference between consumer insights and marketing research?,* Greenbook, viewed 28 February 2022, <https://www.greenbook.org/mr/market-research-news/whats-the-difference-between-consumer-insights-and-market-research>.
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Marketing Research	Customer Insights
Greater academic focus	Industry term
Definition: the practice of collecting and analysing data to answer distinct business questions.	Consumer Insights is the practice of using **available data** to derive a deeper understanding of customers which helps in effective business decision-making
Tools employed: surveys, interviews, focus groups, etc.	Available data: internal data, social media, online data, etc.
Focus is on findings	Focus is on findings and their reasons; recommendations
Focus on the original question/research goal	Focus is on using the information to understand customer attitudes & behaviour
Analyse data from each stream individually	Integrate multiple data streams
Factual information/data is summarised and forms the basis of a recommendation	Data is delivered as a story or a narrative
Focus on quantitative, qualitative, mixed methods	Has a multi-disciplinary focus
Delivers on research objectives. Used to answer specific questions.	Multi-disciplinary recommendations
Delivers data to marketing but is not involved in meetings with clients	Marketing is a business partner. Insights Team participates in client staff meetings
More popular in economies heavily reliant on manufacturing like China, Germany, Japan, Taiwan, Indonesia, Poland, and South Korea	More commonly used in service-based economies like the USA, Brazil, Bermuda, UK, Greece, Australia, Singapore
Build the research database	Give access to dashboards etc

Use of Existing Data to Gain Insights:

The concept behind ‘customer insights’ is not to gather information through traditional sources of data collection, but to mine the existing sources which generate data continuously. Some of these sources which may provide useful insights are discussed below:

Internal Sales Data

Organisations have a wealth of internal data being collected in various forms. Every time a transaction is made there is a record generated. Analysis of such sales data, revenue per customer, time, and place of sale may generate useful information for making decisions.

Customer Queries and Complaints

Every time a customer reaches out to make a query (or a complaint), a piece of data is being created. Many companies have learned that by analysing customers' queries and complaints a wealth of information can be mined. This includes analysing customers' chat transcripts or emails or voice mails.

Website Analytics

In today's online world, customer interest in a company's offering can be judged by web traffic and interactions. Tapping into relevant metrics may help to explain various aspects of visitors' online behaviours (e.g., time spent on the website) as well as their interest

Previous Marketing Research Data

While some managers may toss away old research as 'obsolete', it is quite possible that some of the findings could prove to be useful. Qualitative data may hold some interesting insights and quantitative data could be 'sliced and diced' in a number of ways.

Social Media Analytics

It is expected that there will be over 4 billion social media users by the year 2025. This is more than half of the world's population of 7.9 billion (2021). Ignoring social media is not affordable. While many organisations aim to have some presence on social media, small companies with a limited budget are still recommended to monitor – at the very least – conversations taking place on various social media platforms. Online communities, though different from Facebook and Instagram are also known to have discussions that could be vital for managers to follow.

Wearable Technologies and Smart Devices

Fitbit helps to generate wellbeing-related data while apps and smartphones can store a wealth of information. Integrating such data with other pieces of information collected is known to be helpful to marketers.

Third Party Sources of Information

Some information is shared by stakeholders across the network, while other types of information may also be available for sale. Getting consumer data, for instance from a credit card company may assist a manager in gaining a useful understanding of customers' purchases.

Employees

A company's own employees are generally the first point of face-to-face contact with a customer. Employees can provide firsthand information about the customer. There could be a wealth of information already present within a company that could be explored to better understand the customer.

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Source: Networx Brisbane
Networx Brisbane 2014, Consumer insights vs research with Donna Bonde, 31 July, online video, viewed 3 March 2022, <https://www.youtube.com/watch?v=OnCsIRNU5xg>.

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Research Ethics

Learning Objectives

By the end of this chapter, students must:

- Understand the role and importance of ethical research
- Be familiar with the application of ethical conduct during the research process
- Be aware of the Code of Professional Behaviour for Marketing Researchers

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Source: Science in motion
Science in motion 2020, *Why research needs ethics,* 26 July, online video, viewed 28 February 2022, <http://www.youtube.com/watch?v=kA1dL6NqVyw>.

Ethics is defined as the moral principles that govern a person's behaviour, especially when this individual is a member of a professional body. Ethics are based on an individual's choice and are not governed by law. Legal matters involve the law, and not adhering to them is punishable (e.g., drunk driving). On the other hand, ethics are individuals' principles and values such as, accurately presenting information to customers. While ethical beliefs are held by individuals, they can also be reflected in the values, practices, and policies that shape the choices made by decision-makers on behalf of their organizations. Professions and organizations regularly establish a "Code of Ethics" that serves to guide the behaviour of members of the profession or organization.
Lumen Learning n.d., *Ethical and legal behaviour,* viewed 28 February 2022, <https://courses.lumenlearning.com/wmopen-introductiontobusiness/chapter/ethical-and-legal-behavior/>

In Australia, The Research Society – the peak body for everyone involved or interested in the market, social, and opinion research – provides codes and guidelines regarding ethical conduct in research. All Research Society Members and Company and Client Partners must comply with the Code. It applies to the professional activities of Members and Partners. Company and Client Partner organizations are required to ensure that all individuals employed or engaged by them (whether Research Society Members or not) comply with this Code. The Research Society Code of Professional Behaviour (the Code) was introduced in 1955 and has been reviewed regularly since then. The Code is designed as a framework for self-regulation. Its aim is to foster public confidence in research and to demonstrate that activities carried out by Members are carried out in a professional and ethical manner.

Code of Professional Behaviour in Research

While industry associations have their set of codes and guidelines, any research undertaken at academic institutions involving human participants (or animals) has to obtain ethical clearance from the university's Ethics Committees. Academic institutions also expect their researchers to abide by a code of practice to ensure integrity and responsibility during the research process. Some of the highest standards of conduct are expected from researchers by Australian universities and the Research Society. The key points are discussed below. A full document is available on The Research Society
The Research Society 2020, *Code of professional behaviour*, viewed 28 February 2022, <https://researchsociety.com.au/documents/item/2796>
and National Health and Medical Research Council websites.
National Health and Medical Research Council 2018, *National statement on ethical conduct of research: (NHMRC manual):,* viewed 3 March 2022*,* < https://www.nhmrc.gov.au/about-us/publications/national-statement-ethical-conduct-human-research-2007-updated-2018>

Respect

Respect for all research participants is a key value that researchers and their organisations need to abide by. This is discussed in the context of respect for participants' privacy, confidentiality, and sensitivity around cultural matters. Any agreements with research participants need to be fulfilled.

Rigour

When conducting their professional activities, researchers must ensure that their work is carried out in accordance with appropriate scientific research principles, methods, and techniques. No doubt, this is a key requirement for all projects seeking 'ethical approval' at universities and research institutions. Research must be carried out honestly, following the recognised principles of research conduct. Research findings – whether favourable or unfavourable – must be communicated/disseminated – so they can contribute to better knowledge and understanding.

Misleading information

Researchers must not make false or misleading statements about their own or their organisation's skills, experience, or activities. A researcher must not mislead participants when soliciting their assistance. It is acknowledged that all research causes some levels of discomfort and inconvenience. For instance, responding to lengthy surveys may result in annoyance for some respondents. At no stage should the researcher attempt to 'hide' the actual time needed for research participation. Similarly, some research questions may cause participants anxiety or distress. This could relate to a medical condition or religious views etc. Researchers need to be mindful of how to manage such a 'risk', even if they feel the likelihood of it happening is very small.

Distinguishing research from other activities

Any marketing activity aimed at individual participants, such as sales promotion, direct marketing, direct selling, and similar activities, must be clearly distinguished and separated from research. At all stages of the research process (proposal development, data collection, analysis, and reporting) a researcher must never engage in activities that aim to manipulate, mislead, or coerce individuals.

Consent and voluntary participation

If the researchers intend to disclose identifiable research information about participants, they must obtain consent. Participants, for example, must be informed before observation techniques or recording equipment are used for a project. At all stages of a project, participants' participation is entirely voluntary and a participant must be able to voluntarily opt-out of providing information at any point during the data collection process.

Disclosure of participants' information

Researchers must inform participants at the start of the project whether the project is anonymous or identifiable. If anonymous, a participants' anonymity must be strictly maintained. If identifiable,

participants must be informed at this stage of the purpose and the recipient of identifiable research information, unless there are methodological reasons not to do so at this point. Once the data has been collected, researchers must inform participants of the purpose and request that they reconfirm their consent for disclosure. Researchers must inform participants who will receive the research information and for what purpose it will be used.

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Consideration for vulnerable groups

At times information needs to be collected from specific groups of people. Such groups may consist of people who are pregnant, require constant medical care, or have a cognitive or physical disability. On other occasions, researchers may need to interview people who have been involved in illegal activities. Due consideration needs to be given in the design and conduct of research with such population segments. The well-being of both the participant and the researcher is of utmost importance.

When gathering information from children and young people, researchers must exercise extreme caution. Before gathering information, a parent or responsible adult's permission must be obtained. Moreover, the child or young person's safety, emotional and psychological security should be assured.

In some situations, a person can be in an unequal or dependent relationship (e.g., an employee of an organisation being asked to participate in a study by his employer) and may feel coerced into participating in a research study. The researcher would need to consider all such situations and take steps to minimise the detrimental effect of such a situation on the study as well as on the participants' relationships.

Data storage and security

Researchers must ensure the security of all project-related information. Researchers must take reasonable precautions to safeguard identifiable research data. Identifiable research data collected and stored in accordance with this Code must be kept for no longer than is necessary for the purpose for which the data was collected or further processed. When identifiable research information is no longer required, reasonable steps must be taken to destroy it or ensure that it is de-identified.

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Secondary Research

Learning Objectives

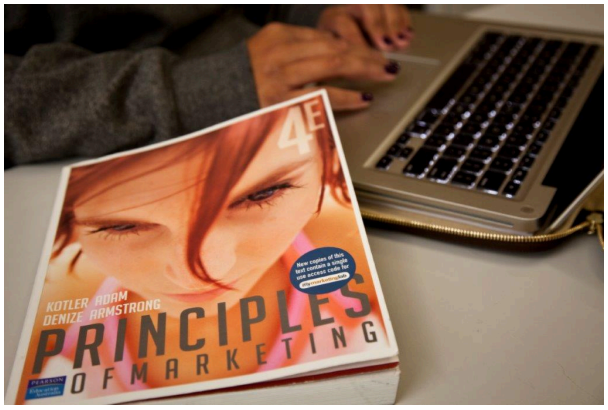
By the end of this chapter, students must be able to:

- Explain the concept of secondary research
- Highlight the key benefits and limitations of secondary research
- Evaluate different sources of secondary data

What is Secondary Research?

In situations where the researcher has not been involved in the data gathering process (primary research), one may have to rely on existing information and data to arrive at specific research conclusions or outcomes. Secondary research, also known as desk research, is a research method that involves the use of information previously collected for another research purpose.

In this chapter, we are going to explain what secondary research is, how it works, and share some examples of it in practice.



Sources of Secondary Data

The two main sources of secondary data are:

- Internal sources
- External sources

Internal sources of secondary data exist within the organisation. There could be reports, previous research findings, or old documents which may still be used to understand a particular phenomenon. This information may only be available to the organisation's members and could be a valuable asset.

External sources of secondary data lie outside the organisation and refer to information held at the public library, government departments, council offices, various associations as well as in newspapers or journal articles.

Benefits of using Secondary Data

It is only logical for researchers to look for secondary information thoroughly before investing their time and resources in collecting primary data. In academic research, scholars are not permitted to move to the next stage till they demonstrate they have undertaken a review of all previous studies. Suppose a researcher would like to examine the characteristics of a migrant population in the Western Sydney region. The following pieces of information are already available in various reports generated from the Australian Bureau of Statistics' census data:

- Birthplace of residents
- Language spoken at home by residents
- Family size
- Income levels
- Level of education

By accessing such readily available secondary data, the researcher is able to save time, money, and effort. When the data comes from a reputable source, it further adds to the researchers' credibility of identifying a trustworthy source of information.

Evaluation of Secondary Data

Griffith University n.d., *Research data: get started,* viewed 28 February 2022,<https://libraryguides.griffith.edu.au/finddata>.

Assessing secondary data is important. It may not always be available free of cost. The following factors must be considered as these relate to the reliability and validity of research results, such as whether:

- the source is trusted
- the sample characteristics, time of collection, and response rate (if relevant) of the data are appropriate
- the methods of data collection are appropriate and acceptable in your discipline
- the data were collected in a consistent way
- any data coding or modification is appropriate and sufficient
- the documentation of the original study in which the data were collected is detailed enough for you to assess its quality
- there is enough information in the metadata or data to properly cite the original source.

In addition to the above-mentioned points, some practical issues which need to be evaluated include the cost of accessing and the time frame involved in getting access to the data is relevant.

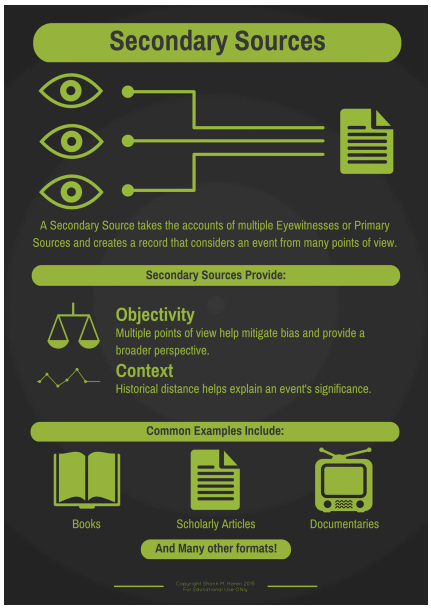


Table 2: Differences between Primary and Secondary Research

Qualtrics XM n.d., S*econdary research: definition, methods and examples*, viewed 28 February 2022, <https://www.qualtrics.com/au/experience-management/research/secondary-research/#:~:text=Unlike%20primary%20research%2C%20secondary%20research,secondary%20research%20have

Primary Research	Secondary Research
First-hand research to collect data. May require a lot of time	The research collects existing, published
Creates raw data that the researcher owns	The researcher has no control over data r
Relevant to the goals of the research	May not be relevant to the goals of the re
The researcher conducts research. May be subject to researcher bias	The researcher only uses findings of the
Can be expensive to carry out	More affordable due to access to free dat

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Primary Research

Learning Objectives

By the end of this chapter, students must be able to:

- Define primary research and identify the different methods for primary data collection
- Explain the pros and cons of different (primary) data collection methods
- Realise the advantages and disadvantages of primary research
- Understand the key differences between primary and secondary research

Primary Research

Primary data refers to information that is collected by the researcher specifically for the project at hand. This method is useful when simply relying on secondary data is not sufficient. Some research questions – such as, what do consumers think of our new brand of soft drink? – require first hand collection of primary data. While it can take time and resources to collect good, rigorous primary data, the benefit is that the data belongs to the researcher or his/her organisation.

Given below are some of the key tools used to collect primary data. It should be noted that primary data can be both quantitative as well qualitative information.
Qualtrics n.d., *Everything you need to know about primary research,* viewed 28 February 2022, <https://www.qualtrics.com/au/experience-management/research/primary-research/?rid=ip&prevsite=en&newsite=au&geo=AU&geomatch=au>.

Interviews

Interviews involve one-on-one sessions, either on phone or in a face-to-face context between the researcher and the interview participant. As a result of COVID-19, a lot of interviews were moved online and were carried out on different meeting platforms such as Zoom. Interviews are great for exploring a topic more deeply. For example, a researcher may wish to understand people's motivations behind making a charitable donation to a particular organisation. A one-on-one approach is far more effective in probing and understanding the reasons behind such an action. Interviews are also useful when one talks to experts. An expert in an area, such as a supply chain can provide useful insights into a problem. With their previous experience, such experts can be a useful addition to a researcher's list of interviewees. A drawback of interviews is the time spent interviewing different people. It can also become expensive and tedious, especially if interviewees are geographically spread out.

Surveys

Surveys or questionnaires are structured tools to collect quantitative data. Surveys can be conducted either face to face (for example in a supermarket) or these can also be undertaken on phone. Many surveys are disseminated via email. In other cases, specific individuals (such as employees of an organisation) will be invited to participate in a survey hosted on a specific website. Generally speaking, surveys will be completed by a large number of people so the results can be statistically significant. While surveys can be used to collect textual data, many people do not provide detailed information in writing. Thus, surveys should be used for closed-ended questions (e.g., *"do you own a car"*, *"when did you last purchase a fridge"* or *"on a scale of 1 to 5, where 1 is not at all likely and 5 is highly likely, what is the likelihood of you purchasing a new smartphone this year?"*). Surveys need to be well-designed so useful information can be collected. They are not flexible, so all relevant questions need to be inserted before the commencement of the research project.

Observations

Observational research requires no interaction between the researcher and the subject. Qualitative and quantitative information is collected on the basis of making a systematic observation and documenting it. While such an approach reduces the chance of researcher's bias, it is also limited in not providing an explanation for actions undertaken by an individual. For instance, while a retail store manager – with the

help of in-store cameras – can see how customers shop in the aisles but he or she may not be able to get an explanation for this behaviour. Similarly, mystery shoppers who are disguised as shoppers and are used by supermarkets such as Coles to evaluate their own service also carry out observational research.

Focus groups

Focus groups are effective at generating a significant amount of information in a limited time. Focus groups are particularly useful when a discussion amongst participants may lead to new ideas or solutions. This primary research method requires the expertise of a good facilitator who can skillfully get all group members to participate. While these are a favourite with some practitioners, care needs to be taken while running a focus group. Some people may not participate at all or may respond in a particular way to fit in with the majority.

Smart Devices

A consumer in the year 2022 uses a range of smart devices such as a smartphone, wearable technologies, smart appliances such as fridges and televisions. Since these devices are connected to the internet, not only do they create data but also store, process and transmit this information. While there can be many ethical questions around what kind of data is being accessed by whom, the fact is that this information can be useful to many businesses.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://westernsydney.pressbooks.pub/customerinsights/?p=52#oembed-1

Source: Tutor2u
Tutor2u 2018, *Primary market research*, 18 May, online video, viewed 3 March 2022, <https://www.youtube.com/watch?v=tJi_JsiOs2I>.

Social media data: secondary or primary?

This is a point often discussed in the research community. Should data from social media be classified as secondary or primary? It depends on how data on social media is being retrieved. If a social media platform such as Twitter is being used to collect all those tweets with a hashtagged brand (e.g., #Nike) then it must be considered as primary data. This primary data is being collected – firsthand – by the researcher for a specific purpose. Some people may argue that the researcher did not actively seek tweets from account holders. Yet, such a dataset is primary in nature as no one else has compiled this information (with #Nike) for a specific research objective. However, if the same researcher makes use of a report on social media analytics or downloads a report posted on Twitter (e.g., an article on the use of Twitter by 20-something-year-olds), such information may be classified as being ‘secondary’.

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Qualitative vs Quantitative Data

Learning Objectives

By the end of this chapter, students must be able to:

- Differentiate between qualitative and quantitative data
- Choose the appropriate method for different research questions
- Recognize limitations of qualitative and quantitative research

Qualitative and Quantitative Data

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://westernsydney.pressbooks.pub/customerinsights/?p=42#oembed-1

Source: Deakin University
Deakin University 2020, *Quantitative and qualitative: what's the difference?*, 21 August, online video, viewed 4 March 2022, <https://www.youtube.com/watch?v=4iws9XCyTEk>.

One of the main categories used to classify information is whether it is quantitative or qualitative. In many situations, researchers combine the two methods to arrive at 'mixed-methods research'. In the discussion below, we look at the differences between the two types of data and the situations in which these two types of data can be usefully sourced.

What is qualitative data?

Qualitative data involves a descriptive judgment using concept words instead of numbers. Gender, country name, animal species, and emotional state, feelings, and opinions are examples of qualitative information.

What is quantitative data?

Quantitative data involves a measurable quantity, that is numbers are used. Some examples are temperature, time, the amount spent, number of units bought and hours spent on the computer.

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://westernsydney.pressbooks.pub/customerinsights/?p=42#h5p-2

Table 2: Differences between qualitative and quantitative research

Qualitative	Quantitative
Based on focus groups, interviews, case studies, expert opinion	Based on surveys, polls
Uses open-ended questions	Uses closed-ended (yes/no) and multiple-choice questions
Helps formulate a theory to be researched	Tests and confirms a formulated theory
Findings are presented as themes (text)	Findings are presented in statistical format (numbers, tables, graphs)
Fewer respondents needed	Many respondents needed
Harder to replicate	Easy to replicate
Less suitable for sensitive data: respondents may be biased, too familiar, or inclined to leak information	Ideal for sensitive data as it can be anonymized and secured

Which type of data to collect?

Generally, the choice of data is directly linked to the research question being investigated. Below are some general guidelines on the kind of information produced with the help of different methods:

Qualitative research: is mostly used to understand a phenomenon, such as customers' experiences at a retail outlet. For example, a researcher may choose to interview a number of shoppers by asking them open text questions, e.g. *"Did you face any problems in this store today?"* or *"Did you enjoy shopping here?"* Such questions may encourage customers to chat freely and highlight any issues (e.g., parking issues, rude employees, or poor ventilation) which at times cannot be identified through a quantitative survey alone.

Quantitative research: is useful in estimating overall frequencies or numbers. For example, how many people visited the restaurant this evening? It is also used to test or confirm a hypothesis – that is, a manager's educated guess. For example, a teacher may survey his class, asking them, "On a scale of 1-5, how bored are you in this class? (with 1 = not at all bored and 5 = very bored)" By analysing the numerical responses, the teacher may conclude that his guess is accurate about student boredom as the average class score is 4.5.

Mixed method: as the name suggests makes use of both qualitative and quantitative research. A researcher may use qualitative research to better understand a phenomenon, and then use quantitative research to statistically test it. For instance, while interviewing customers a manager may find that some of them are complaining about parking issues. In order to understand how widespread this complaint is the manager may initiate a quick, short survey to find out how many customers require parking at the store's premises.

Alternatively, a researcher may stumble upon an unexpected finding via a survey (such as very low scores for customer service in a Sydney store). Interviews can be conducted to find out the reason for customer dissatisfaction. The store manager may find it useful to initiate conversations with customers to better understand the poor scores.

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Limitations of qualitative research

- **Subjectivity:** Qualitative data is written or spoken and requires careful interpretation. In some situations, the researcher may not be familiar with the participants' language. Analysing the data may require time and help from someone who is from the community and fluent at conversing in the relevant language. Even when language is not an issue, interpretation of textual content can be done differently by different researchers.
- **A smaller number of participants:** Interviews and focus groups can only be conducted with a smaller group of participants. While surveys can be sent out and completed by hundreds (or thousands) of people, it is simply not possible to undertake interviews with the same number of informants. Thus, any findings from qualitative research need to be generalized with care.
- **Bias**: The researcher or analyst plays a much bigger role in the interpretation of qualitative information than simply running a statistical test. At times, the interviewee may make a very important point but mention it only once – and that too, casually. While it is easy for a novice researcher to completely miss such information, a more experienced researcher would make a note of it.

Limitations of quantitative research

- **Large sample size:** In order for quantitative research to be statistically valid, a large number of respondents must be included in the survey. While there is no exact figure which is seen as being accurate, the larger the sample size the greater would be the confidence in the findings. This requires a large number of resources in terms of skills at designing the research project, time, and money.
- **Pre-determined questions:** When a large survey has to be undertaken, all questions in the survey need to be pre-determined. In case the researcher wants to include any additional questions, it is not possible to do it in a short period of time.

6

Types of Research Design

Learning Objectives

By the end of this chapter, students must be able to:

- Explain the three types of research design used by marketers
- Understand the application of these designs

Research Design

This chapter looks at the types of research designs that are utilized by marketers. A research design is an overall plan or structure for a research project. A research design will use different combinations of primary, secondary, qualitative, and quantitative data. Depending on the overall research questions, research designs in marketing may fall into one of the following three categories:

1. Exploratory research design
2. Descriptive research design
3. Causal research design (experiments)

An **exploratory research design** is more informal and unstructured than the other two types of designs. Exploratory design is used to explore a situation, especially when the researcher is in unfamiliar territory. Most academic projects begin with exploratory research when researchers undertake desk

research. Similarly, when marketers plan to venture into new markets, such as India, it is advisable to employ an exploratory research design. This could mean going through case studies, accessing published reports (i.e., secondary data) on the market, undertaking experience interviews with experts, and conducting focus groups – if needed. Exploratory design is useful in gaining background information and deciding about future research approaches. It may generate more questions, which need to be tackled with other research designs.

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As the name suggests, **descriptive research design** is employed to describe the market or respondents' characteristics. This type of research design generates quantitative information. Therefore, such a design would often involve surveys. Surveys are useful to measure the descriptive numbers relating to respondents' age groups, income levels, expenditure patterns, and even attitudes. This can be done by employing relevant scales, such as, "On a scale of 1–5, how satisfied were you with this organisation's service?".

Physiological measurements, such as people's involuntary responses (such as heart rate, skin changes, and eye movement) to marketing stimuli, such as an advertisement may also be categorised in descriptive research. While recording such information requires special instruments, it is nevertheless a type of descriptive information that can be useful for marketers.

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A descriptive research design could be either a *cross-sectional study* that is undertaken at one point in time (such as in March 2022) or a *longitudinal study* that is implemented with the same respondents – repeatedly – over a given time period. Thus, a longitudinal survey may be undertaken with WSU students in April, May, and June to track student satisfaction with a subject over a semester.

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Source: Meanthat and authentic data science
Meanthat and authentic data science 2016, *1.3 Exploratory, descriptive and explanatory nature of research*, 17 March, online video, viewed 3 March 2022, <https://www.youtube.com/watch?v=FlBFdEgrTBM>.

Causal research design (also known as experimental research design) examines cause-and-effect relationships. A well-designed experiment is the best way of understanding how one variable (e.g.,

advertisement) may influence another variable (e.g., sale of a product). An experiment involves one or more independent variables (for example, price level, and product features) which are manipulated to determine how they may impact one or more dependent variables (such as customer preference or customer satisfaction). Independent variables can be 'manipulated' by the researcher while the dependent variables are variables that get influenced due to changes in the independent variables.

Experiments can be categorised as *field experiments* or *lab experiments*. When an experiment is conducted in a natural setting – such as in a retail store – it is referred to as a field experiment. On the other hand, experiments conducted in a researcher's office or a university classroom are lab experiments. A lab experiment may be undertaken to measure the impact of an ad on the subject's attitude.

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A field experiment is often seen as providing researchers with reliable results as it is undertaken in the actual environment. However, it is not easy to implement a field experiment. It is difficult to control other factors – in the real environment – which may also impact the final results. Moreover, running an experiment requires expertise in the design of the experiment. It may also require financial and time resources. As an example, Mcdonald's may wish to see if a drop in the price of its cheeseburger results in greater sales. The fast-food restaurant may drop the price in one locality, such as Fairfield. It may also tediously measure the sales around the time of a price reduction. While interpreting the results, it would need to be assured that any changes in sales figures can be attributed to the price change – and not to other environmental factors such as an increase in prices at Hungry Jacks or an overall increase in customers due to a local football match. Thus, controlling such extraneous variables – that is, all those variables besides the identified independent variables which may also affect the dependent variable.

One of the popular experimental research designs is the **'Before-After' Testing design**. As the name suggests, it measures the dependent variable, before and after a change in the independent variable. An example will help clarify the concept:

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

Experimental Effect (E) = $(O_2 - O_1) - (O_4 - O_3)$

R = random allocation of subjects to experimental or control group

O = observation

X = treatment or manipulation of the independent variable, such as a change in price

Explanation of the above example:

1. Subjects or research participants are randomly allocated to one of the groups
2. The experimental group is the one in which the independent variable (e.g., price) is manipulated (e.g., reduced)
3. The control group is not exposed to any changes in the independent variable
4. Measurements (i.e., O) for the dependent variable (e.g., sales) – for both groups – are taken before the change in price (X) – PRE-TEST
5. Measurements (i..e., O) for the dependent variable are taken after the change in price – POST-TEST
6. The difference between O_2 and O_1 demonstrates the change in the dependent variable due to the change in X (independent variable)
7. The difference between O_4 and O_3 demonstrate any change in the dependent variable due to factors other than X
8. Therefore, the difference between the two groups $(O_2 - O_1) - (O_4 - O_3)$ demonstrates the true effect of the independent variable as it removes any influence of extraneous variables.

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7

Focus Groups

This chapter is derived from the Community Tool Box Center
Center for Community Health and Development (n.d.), 'Conducting concerns surveys', in *Community assessment,* Community tool, University of Kansas, chapter 3.6, viewed 3 March 2022, <https://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/conduct-focus-groups/main>.

Learning Objectives

By the end of this chapter, students must be able to:

- Define and apply the concept of focus groups to a research project

- Explain the various stages in organising a focus group
- Evaluate the need to run a discussion via focus groups

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Source: Ted-Ed – Hector Lanz
Lanz, H 2017, *Focus groups,* 11 April, online video, viewed 3 March 2022, <https://www.youtube.com/watch?v=3TwgVQIZPsw>.

What is a Focus Group?

A focus group is a small-group discussion guided by a trained facilitator. It is used to learn about participants' opinions on a designated topic, and to guide future action.

Examples:

- A focus group of parents of preschoolers meets to discuss child care needs. Parents share their views on local child care programs, and on what could be done to improve them.
- A focus group of senior citizens meets at the new senior center. What do they think of the programs being offered? What are their own suggestions and ideas?
- An agency wants to open a group home for developmentally disabled adults in a quiet residential area. It convenes a group of prospective neighbors. What are their concerns? Can this work?

How are Focus Groups Different from Regular Groups?

A focus group is different from any general group in three basic ways:

- The main difference is the group has a specific, focused discussion topic.

- The group has a trained leader or facilitator.
- The group's composition and the group discussion are carefully planned to create a nonthreatening environment in which people are free to talk openly. Members are actively encouraged to express their opinions.

Why are Focus Groups Used?

Responses in a focus group are typically *spoken*, *open-ended*, *relatively broad*, and *qualitative*. They have more depth, nuance, and variety. Nonverbal communications and group interactions can also be observed. Focus groups can therefore get closer to what people are really thinking and feeling, even though their responses may be harder to score on a scale.

When Should you use a Focus Group?

- When you are considering the introduction of a new program or service.
- When you want to ask questions that can't easily be asked or answered on a written survey.
- When you want to supplement the knowledge you can gain from written surveys.
- When you know, or can find someone, who is an experienced and skilled group leader.
- When you have the time, knowledge, and resources to recruit a willing group of focus group participants.

The Pros and Cons of Groups

One advantage of focus groups is the depth and complexity of the response, as mentioned before. Group members can often stimulate new thoughts for each other, which might not have otherwise occurred. The researcher is able to collect a lot of information from a group of people in a relatively short period of time.

There are some limitations to running focus groups. For example, focus groups usually take more time per respondent than individual surveys — because recruiting a group and organizing the session can take time. Some group members might feel hesitant about speaking openly. The focus group leader needs to be familiar with the dynamics of running focus groups. Good focus group moderators can be expensive to recruit. Very importantly, sensitive topics (e.g., religion or individuals' sexuality or medical conditions) may not yield good data if discussed via a focus group.

Here is an example of a screening questionnaire:

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How do you run a Focus Group?

Part A: Before you Begin

The group's composition and the group discussion should be carefully planned to create a non-threatening environment so that participants feel free to talk openly and give honest opinions.

State your goals

- "Why do I want to conduct a focus group?"
- "Why am I doing this?"
- "What do I hope to learn?"

Consider other methods

Are you planning to use other methods for learning about opinions as well?

In other words, so far: Think before you start, look before you leap.

- If yes, which ones, and why?
- If not, is this the single best method to use to find out what you want?

Find a good leader/facilitator/moderator

A good focus group facilitator will usually have the following qualities:

- Has experience facilitating groups
- Knows something about the topic OR is willing to research the topic
- Will relate well to the focus group participants
- Will work together with you to give you the outcomes you want

Find a recorder and appoint an observer

One has to make sure the discussion is documented/recorded. Someone should be writing down what is said, in the same way as taking minutes at a meeting. Arrange for this in advance. Alternatively, you can audio-record, with the group's permission. This will take more time — to transcribe the audio, and interpret the transcription– but you will have a more complete, accurate, and permanent record. In some sessions, it is useful to have both an observer as well as a recording device.

Decide who should be invited i.e., focus group participants.

Ideally, those invited should be a *representative sample* of those whose opinions you are concerned about.

Or suppose you are concerned about the opinions of Main Street shopkeepers. Get a complete list. Select a representative group, for example by size, type, or whether they have local or outside ownership. You probably want to hear from all kinds of businesses; so make sure you do.

A screening questionnaire may assist a researcher in ensuring that only those people are recruited who fulfill inclusion criteria.

Decide about incentives

Should you offer an incentive for people to participate?

Possibly people will come just because they want to help. Or because they think they will meet other interesting people, learn something, or just have fun. Maybe the novelty of the experience itself will be a motivator. And maybe all these reasons are true.

But maybe those reasons aren't enough, and some other incentive is called for. Money is one; sometimes focus group members get paid, even a small amount. If you can afford this, consider it. If you can't, then think about other possible incentives: food and drink (more than chips and soda?); public recognition; something to take home; a later training opportunity.

Decide on the meeting particulars

Specifically:

Pin these down before you start signing people up.

- What day?
- What place?
- What time?

- How long?
- How many groups?

Prepare your questions

Go in prepared. Write out in advance a list of topics and questions you want to ask. This will serve as your guide.

Below are some examples of general questions. These apply largely to groups discussing a current program or service, but they can be adjusted for planned programs, as well as for groups dealing with other concerns. The precise language and order of presentation will depend on your topic and group, but some of these questions may be adapted to your own needs.

- "What are some of your thoughts about what's going on now?"
- "Would you say you are satisfied with the current situation, with the way things are going on?"
- (If so) "What are you satisfied about? Why is that?" (Or, "What's going well…?")
- "Are there things you are dissatisfied with, that you would like to see changed?" (Or, "What's not going well…?")
- (If so) "What are they? Why is that? How should they change? What kinds of things would you like to see happen?"
- "How about this particular aspect (of the topic). What do you think about that?"
- Repeat for different aspects of the topic, with variations in style. For example, if the main focus group topic was "community policing," some key aspects to cover might be visibility, sensitivity, interaction, respect, etc.
- "Some people have said that one way to improve X is to do Y.
- Do you agree with this?' (Or, "How do you feel about that?")
- "Are there other recommendations that you have, or suggestions you would like to make?"
- "Are there other things you would like to say before we wind up?"
- Some "probes" or follow-ups" designed to get more information on a given question:
    - "Can you say more about that?"
    - "Can you give an example?"
    - "Jane says X. How about others of you. What do you think?"
    - "How about you, Joe. [Or, "you folks in the corner over there…."] Do you have some thoughts on this?"
    - "Does anyone else have some thoughts on that?"

Recruit your members

Call them up. Email them. Or find them. Many third parties are available to help researchers in identifying the right mix of participants.

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Example of a screening questionnaire for the selection of participants.

B. During the Meeting

Conduct the group

A common sequence of events for many focus groups goes something like this: (The leader usually takes responsibility for carrying them out.)

- Thank people for coming.
- Review the purpose of the group, and the goals of the meeting. Set the stage.
- Go over the flow of the meeting — how it will proceed, and how the members can contribute. Lay out the ground rules. Encourage open participation.
- Set the tone. This is important because probably few of your members will have been in a focus group before.
- Ask an opening question. This could be a very general question ("What are your general thoughts about X?"), or something more specific. Both choices are justifiable, and both types of questions might be asked before the group ends.
- Make sure that all opinions on that question get a chance to be heard. How do you do this?

Some common techniques

- Summarize what you think you have heard, and ask if the group agrees
- Phrase the same question in a different way
- Ask if anyone else has any comments on that question
- Ask a follow-up question
- Look around the room, and make brief eye contact, especially with those who may not have spoken

Reminder: The leader's job is to elicit opinion, and not judge it. All opinions should be respected.

- Ask your next question — and proceed with other questions in the same general manner. The phrasing of the questions, the follow-ups, the ordering of the questions, and how much time to spend on each one are points that the leader will have to decide — sometimes on the spot. An experienced leader will be able to do this. This is why you have spent time looking for one!

- When all your questions have been asked, and before the group ends, ask if anyone has any other comments to make. This can be an effective way of gathering other opinions that have not yet been voiced.
- Tell the members about any next steps that will occur, and what they can expect to happen now.
- Don't forget to thank the group for coming!

C. After the Meeting

Look at the data

If you have audio-recorded, make a transcript. If not, make a written summary from the group notes. But in any case, look closely at the information you have collected.

In some cases, you can devise and use a coding system to "score" the data and count the number of times a particular theme is expressed. Experience helps here. But whether you do this or not, try to have more than one person review the results independently. (Because even the best of us have our biases.) Then come together to compare your interpretations and conclusions.

- What patterns emerge?
- What are the common themes?
- What new questions arise?
- What conclusions seem true?

Share results with the group

They gave you their time. The least you can do is to give them some feedback — it's an obligation that you have. This can be done by mail, phone, or email if you'd like. Sometimes it's even possible to bring the group back for a second session, to review results, verify their accuracy, and/or explore other themes.

And **note**: Perhaps members have now become more interested in the issue, and would like to get more involved. Consider offering them an opportunity to do so. A focus group, indirectly, can be a recruiting tool.

Use the results

Collecting useful information was the reason you wanted to do a focus group in the first place. Now you have the *opportunity*, and perhaps also the *responsibility*, to put it to use. You can improve the situation that originally motivated you, and made you think about a focus group at the very beginning.

8

Observational Research

Learning Objectives

By the end of this chapter, students must be able to:

- Explain different types of observational research methods
- Choose an appropriate type of method for a particular situation

WHAT IS OBSERVATIONAL RESEARCH?

The term **observational research** is used to refer to several different types of non-experimental studies in which behavior is systematically observed and recorded. The goal of observational research is to describe a variable or set of variables. More generally, the goal is to obtain a snapshot of specific characteristics of an individual, group, or setting. As described previously, observational research is non-experimental because nothing is manipulated or controlled, and as such, we cannot arrive at causal conclusions using this approach. The data that is collected in observational research studies are often qualitative in nature but they may also be quantitative or both (mixed-methods). There are several different types of observational research designs that will be described below.

NATURALISTIC VS CONTRIVED OBSERVATION

Naturalistic observation is an observational method that involves observing people's behavior in the environment in which it typically occurs. Thus naturalistic observation is a type of field research (as opposed to a type of laboratory research). Jane Goodall's famous research on chimpanzees is a classic example of naturalistic observation. Dr. Goodall spent three decades observing chimpanzees in their natural environment in East Africa. She examined such things as chimpanzees' social structure, mating patterns, gender roles, family structure, and care of offspring by observing them in the wild. However, naturalistic observation could more simply involve observing shoppers in a grocery store, children on a school playground, or psychiatric inpatients in their wards. Researchers engaged in naturalistic observation usually make their observations as unobtrusively as possible so that participants are not aware that they are being studied. Such an approach is called **disguised naturalistic observation.** Ethically, this method is considered to be acceptable if the participants remain anonymous and the behavior occurs in a public setting where people would not normally have an expectation of privacy. Grocery shoppers putting items into their shopping carts, for example, are engaged in public behavior that is easily observable by store employees and other shoppers. For this reason, most researchers would consider it ethically acceptable to observe them for a study. On the other hand, one of the arguments against the ethicality of the naturalistic observation of "bathroom behavior" is that people have a reasonable expectation of privacy even in a public restroom and that this expectation was violated.

Contrived observation occurs in an artificial environment, such as a lab setting. For example, researchers may wish to measure people's physiological responses to an ad that is being screened in the university researcher's classroom.

Source: DW News.
DW News 2013, *Market researchers observe where we look: made in Germany,* online video, 4 September, viewed 3 March 2022, <https://www.youtube.com/watch?v=Hatmm84sqm0>.

DISGUISED VS UNDISGUISED OBSERVATION

In cases where it is not ethical or practical to conduct disguised naturalistic observation, researchers can conduct **undisguised naturalistic observation** where the participants are made aware of the researcher's presence and monitoring of their behavior. However, one concern with undisguised naturalistic observation is reactivity. **Reactivity** refers to when a measure changes participants' behavior. In the case of undisguised naturalistic observation, the concern with reactivity is that when people know they are being observed and studied, they may act differently than they normally would. For instance, you may act much differently in a bar if you know that someone is observing you and recording your behaviors and this would invalidate the study. So disguised observation is less reactive and therefore can have higher validity because people are not aware that their behaviors are being observed and recorded. However, we now know that people often become used to being observed and with time they begin to behave naturally in the researcher's presence. In other words, over time people habituate to being observed. Think about reality shows like Big Brother or Survivor where people are constantly being observed and recorded. While they may be on their best behavior at first, in a fairly short amount of time they are, flirting, having sex, wearing next to nothing, screaming at each other, and at times acting like complete fools in front of the entire nation.

PARTICIPANT VS MECHANICAL OBSERVATION

Another approach to data collection in observational research is participant observation.
In **participant observation**, researchers become active participants in the group or situation they are studying. Participant observation is very similar to naturalistic observation in that it involves observing people's behavior in the environment in which it typically occurs. As with naturalistic observation, the data that is collected can include interviews (usually unstructured), notes based on their observations and interactions, documents, photographs, and other artifacts. The only difference between naturalistic observation and participant observation is that researchers engaged in participant observation become active members of the group or situations they are studying. The basic rationale for participant observation is that there may be important information that is only accessible to or can be interpreted only by, someone who is an active participant in the group or situation. Like naturalistic observation, participant observation can be either disguised or undisguised. In **disguised participant observation,** the researchers pretend to be members of the social group they are observing and conceal their true identity as researchers. In contrast with **undisguised participant observation,** the researchers become a part of the group they are studying and they disclose their true identity as researchers to the group under investigation. Once again there are important ethical issues to consider with disguised participant observation. First, no informed consent can be obtained and second passive deception is being used. The researcher is passively deceiving the participants by intentionally withholding information about their motivations for being a part of the social group they are studying. But sometimes disguised participation is the only way to access a protective group (like a cult). Further, disguised participant observation is less prone to reactivity than undisguised participant observation.

One of the primary benefits of participant observation is that the researcher is in a much better position to understand the viewpoint and experiences of the people they are studying when they are a part of the social group. The primary limitation with this approach is that the mere presence of the observer could affect the behavior of the people being observed. While this is also a concern with naturalistic observation when researchers because active members of the social group they are studying, additional concerns arise that they may change the social dynamics and/or influence the behavior of the people

they are studying. Similarly, if the researcher acts as a participant-observer there can be concerns with biases resulting from developing relationships with the participants. Concretely, the researcher may become less objective resulting in more experimenter bias.

Exhibit 1: Different types of equipment are used to study physiological/neurological responses in humans.

Eye-tracking equipment

Neuromorphic camera/sensor equipment

In many situations, the means of observation are mechanical rather than human. This involves video cameras, traffic counters, checkout scanners, smartphones, and a range of devices that measure physiological responses. These devices include eye-tracking monitors, pupilometers, psychogalvanometers, voice pitch analyzers, and instruments to measure neurological signals.

STRUCTURED VS UNSTRUCTURED OBSERVATION

In structured observation, the emphasis is on gathering quantitative rather than qualitative data. Researchers using this approach are interested in a limited set of behaviors. This allows them to quantify the behaviors they are observing. In other words, structured observation is less global than naturalistic and participant observation because the researcher engaged in structured observations is interested in a small number of specific behaviors. Therefore, rather than recording everything that happens, the researcher only focuses on very specific behaviors of interest. For example, a marketer may be interested in the number of people entering a mall, or the number of times people stop to take a look at a displayed ad. Unstructured observation, on the other hand, is flexible and more informal. There is no checklist for the researcher to follow. The researcher may observe all aspects of a phenomenon and then provides details about things that he/she found to be relevant in understanding a situation. This technique can be more subjective than the structured approach.

When the observations require a judgment on the part of the observers (e.g., do customers look happy while shopping in a store?) this process is often described as **coding**. Coding generally requires clearly defining a set of target behaviors. The observers then categorize participants individually in terms of which behavior they have engaged in and the number of times they engaged in each behavior. The observers might even record the duration of each behavior. The target behaviors must be defined in such a way that different observers code them in the same way. In one study, for example, researchers video-recorded a subset of their participants' reactions and had two observers independently code them. The two observers showed that they agreed on the reactions that were exhibited 97% of the time, indicating good interrater reliability.

One of the primary benefits of structured observation is that it is far more efficient than naturalistic and participant observation. Since the researchers are focused on specific behaviors this reduces time and expense. Also, oftentimes the environment is structured to encourage the behaviors of interest which again means that researchers do not have to invest as much time in waiting for the behaviors of interest to naturally occur. Finally, researchers using this approach can clearly exert greater control over the environment. However, when researchers exert more control over the environment it may make the environment less natural which decreases external validity. It is less clear for instance whether structured observations made in a laboratory environment will generalize to a real-world environment. Furthermore, since researchers engaged in structured observation are often not disguised there may be more concerns with reactivity.

OBSERVATION OF PHYSICAL EVIDENCE

Market researchers are able to gather data by observing physical evidence which can provide key insights. Artefacts – such as food cans in garbage bins and counting of physical inventories are key

methods that can be used. Content analysis of ads, newspapers, images, or memos can help researchers understand certain aspects of a phenomenon.

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://westernsydney.pressbooks.pub/customerinsights/?p=78#h5p-6

9

Measures or Types of Variables

This chapter is derived from Curtin University UniSkills
Curtin University 2021, Introduction to statistics, Curtin University, viewed 2 March 2022, <https://libguides.library.curtin.edu.au/uniskills/numeracy-skills/statistics/data-variable-types>. content and is used under a Creative Commons Attribution ShareAlike 4.0 International Licence.

Learning Objectives

By the end of this chapter, students must be able to:

- Identify the different types of data/scales used for measurement
- Understand the application of different scales in surveys

Measures or Types of Variables

Data and Variable Types

This chapter details some important concepts that will be referred to in subsequent pages, including what data and variables are, and how to distinguish between different types.

What is data?

The word **data** refers to observations and measurements which have been collected in some way, often through research.

Data that is recorded as numbers (and therefore measures quantities) is **quantitative data**, while data

that is recorded as text (and therefore records qualities) is **qualitative data**. Quantitative data can be analysed using statistics, as can qualitative data that records qualities in terms of different categories (for example what hair colour someone has, what country someone was born in, what their marital status is, etc.), as opposed to data that records qualities in terms of thoughts, feelings and opinions.

It is the former two types of data that you will be working within this module, and shortly you will be introduced to some other terms that are typically used in statistics to describe data of this nature.

What is a variable?

Variables are the characteristics or attributes that you are observing, measuring and recording data for – some examples include height, weight, eye colour, dog breed, climate, electrical conductivity, customer service satisfaction and class attendance, just to name a few.

As the word suggests, the value of a variable varies from one subject (i.e. person, place or thing) to another. For example, the variable height could have a value of 170cm for one person, 163cm for another person and 154cm for another person; the variable climate could have a value of arid for one city, tropical for another city and the Mediterranean for another city; and the variable class attendance could have the value 17 for one class, 25 for another class and 32 for another class, etc.

Categorical and continuous data

Choosing the correct statistic or statistical test to analyse your data depends on the type of data, and hence type of variable(s), so it is very important to be able to distinguish between these. Most of the time you will simply need to classify your data (and hence variables) as either **categorical** or **continuous**, but each of these types can also be sub-classified. Definitions and sub-classifications for each are as follows:

Categorical data

is data that is grouped into categories, such as data for a ‘gender’ or ‘smoking status’ variable. Categorical data can be further classified as:

- **nominal** when the categories do not have an order, such as for a ‘marital status’ variable (furthermore, if there are only two categories then the terms **binary** and/or **dichotomous** are sometimes used); or

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- **ordinal** when the categories do have an order, such as for a 'best' car, the 'runners up' car and the 'third' car in a list of Australia's most favourite vehicles.

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Continuous data

is data that is measured on a continuous numerical scale and which can take on a large number of possible values, such as data for a 'weight' or 'distance' variable. Continuous data can be further classified as:

- **the interval** when it does not have an absolute zero, and negative numbers also have meaning, such as for a 'temperature in degrees Celsius' variable. In marketing, any variable which is measured on a Likert scale is seen as an interval variable. Here's an example:

Example: On a scale of 1 to 5 (where 1 = extremely dissatisfied) and 5 = extremely satisfied), how would you rate the restaurant on the following criteria:

Cleanliness	1	2	3	4	5
Food presentation	1	2	3	4	5
Food (taste)	1	2	3	4	5
Prompt service	1	2	3	4	5
Courteous employees	1	2	3	4	5

Customers' ratings on the above criteria can be averaged to arrive at a score for 'satisfaction with restaurant'.

- **ratio** when it does have an absolute zero, and negative numbers don't have meaning, such as the 'expenditure' on groceries or 'time spent' in the kitchen

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https://westernsydney.pressbooks.pub/customerinsights/?p=138#h5p-21

One final thing to note on this topic is that any continuous data can always be turned into categorical data, by simply creating categories out of it. Continuous data for a 'weight' variable could be turned into categorical data by creating categories of 50−59kg, 60−69kg, 70−79kg, etc., for example, and this can be useful if you want to analyse your continuous data using statistics and statistical tests designed for categorical data. You can't go the other way around though and turn categorical data into continuous data, so if you have the choice then for maximum flexibility it is preferable to collect continuous data.

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Source: Methodology Related Presentations – TCSPP
Methodology Related Presentations - TCSPP 2015, *Conducting qualitative research decisions, actions and implications by Phillip Adu Ph.D.,* 5 February, online video, viewed 4 March 2022, <https://www.youtube.com/watch?v=z4YIrykEL8M>.

10

Questionnaire Design

This chapter is derived from the Australian Bureau of Statistics
Australian Bureau of Statistics n.d., *Questionnaire design,* viewed 3 March 2022, <https://www.abs.gov.au/websitedbs/D3310114.nsf/home/Basic+Survey+Design+-+Questionnaire+Design>.

Learning Objectives

By the end of this chapter, students must be able to:

- Highlight the steps in the questionnaire design process
- Familiarise themselves with the principles of good questionnaire design
- Identify common issues in questionnaires

Questionnaire Design

The questionnaire can influence the response rate achieved in the survey, the quality of responses obtained, and consequently the conclusions drawn from the survey results. Questionnaire design should be started by considering the objectives of the survey and the required output, and then devising a list of questions to accurately obtain this information. Careful consideration should be given to a number of factors including the types of questions to be asked, the questionnaire wording, the structure and design

of the questionnaire, and testing the questionnaire to ensure that quality data is collected. A poorly designed questionnaire can be the biggest source of non-sampling error (either directly or indirectly).

This section discusses the developmental phase of questionnaire design, question-wording, different types of questions, and the structure and design of the questionnaire. Testing the draft questionnaire will also be covered in this chapter.

Questionnaire Development

This section lists down the various steps involved in the development of a questionnaire. This development phase needs to ensure that the data items in the final questionnaire are appropriate and can be collected accurately. It is also important to consider early on, the coding of questionnaire responses and the type of processing system to be used to process the questionnaire.

Step 1: Defining the Objectives with the Client

Before a questionnaire can be designed, time must first be spent clarifying the objectives of the survey with the client. It is important that the reasons for collecting the information are clearly articulated. Defining the objectives with the client includes:

- clarifying the objectives of the survey;
- justifying the collection in terms of the benefits;
- determining the scope of the survey, ie who is to be surveyed;
- determining the desired output, ie specify the tables according to the objectives and the precision required;
- preparing a list of content, ie information needed according to the objectives. A number of questions may be necessary to obtain the desired information;
- defining the content;
- justifying the content, ie is all the information collected necessary; and
- establishing priorities for each data item. This is important in ensuring that the most important data items are collected. It also makes it easier to discard less important questions if the survey budget is reduced.

Step 2: Researching the Topic

It is very important that the researcher who is going to design the questionnaire undertakes background research into the topic under consideration. In terms of questionnaire design, the research should aim to:

- clearly define the concepts and definitions to be used in the survey. The use of standard definitions and classifications will enhance data comparability; and
- accurately identify the target population characteristics. This needs to be done so that questions can be pitched at an appropriate level

It is also worthwhile looking at past surveys on the same topic to learn from past experience. Such collections can prove to be useful as it helps to avoid possible mistakes. It is important to look at the concepts, definitions, and question wording of past collections if a time series is to be created since changes in these will result in changes in responses. For example, a question in the 1981 Population Census, 'Do you have a mortgage?' received very different responses from those that were obtained in the 1986 Census when the question was changed to 'Have you paid off your house?' Many people who had second mortgages included this in the 1981 Census but not in the 1986 Census.

Step 3: Decide on Screening Questions (to select the respondents)

Screening questions (also known as "screeners") are used to either qualify or disqualify respondents from taking the survey—depending on how they answer. To make a comprehensive list of screening questions, researchers need to develop a clear set of inclusion and exclusion criteria. Inclusion criteria may be based on demographics (e.g., females, based in Sydney, between the ages 18-25 years, and enrolled in a Business degree), attitudes (such as prefers to purchase locally-grown produce), lifestyle (spending weekends on the beach), and/or behaviour (a regular purchaser of Nescafe coffee).

Example

Imagine you work for Nestle. You want feedback on a new blend of instant coffee. However, you only want to collect information from heavy users in Sydney. Your screening questionnaire could include questions such as:

- Where do you live? (NOTE: Stop survey if the response is anything other than Sydney)
- Do you enjoy instant coffee? (If No, – or not sure or not applicable – then do not proceed with questions)
- On average, how much instant coffee would you have in a day? (Anyone with less than 4 cups will be screened out)

Step 4: Finalising the Questions and Type of Scales

Deciding on the content of the questions and the scale used to measure them will have an impact on data analysis. All question content should be linked to the original objectives decided in consultation with the client.

Open vs. Closed Questions

Questions can generally be classified as one of two types – open or closed – depending on the amount of information that can be provided. Open questions allow the respondents to answer the question in their own words. An example is 'What is your occupation?' The advantage of these types of questions is that they allow many possible answers and they can collect exact data from a variety of possible responses. However, they are more demanding than closed questions, both to answer and process. Open questions are often used in pilot tests to determine the range of likely responses.

Closed questions provide respondents with a range of the most likely answers to choose from. These questions are appropriate when the researcher can anticipate most of the responses and when exact values are not needed. However, they require more effort than open questions in the development and testing stages. The processing time of closed responses is much less than that of open-ended responses.

Table: Types of Closed Questions

Types of Closed Questions	Answer Format
Limited Choice	Yes/No
Multiple Choice	Choose from a number of responses
Checklist	Choose more than one of the responses from a given list
Partially Closed	Last alternative states 'Other, please specify'

The table below lists all the different types of questions that are used to collect different pieces of information from respondents.

Table: Types of Questions for Different Types of Information

Types of Questions	Information Sought
Factual Questions	Factual information, e.g., Do you have a driver's license?
Opinion Questions	Respondent's personal opinion towards, for instance, soft drinks
Behavioural Questions	Respondent's actions or undertaking an activity, e.g., have you travelled overseas this year?
Hypothetical Questions	Respondent's answers to hypothetical situations, e.g., what would you do if….
Demographic Questions	Respondent's personal information, such as gender, age, profession, postcode; Used for creating respondent segments
Knowledge Questions	Used to check respondents' knowledge about certain issues, e.g., who is the current PM of Australia?

While the type of question relates to the information sought from the respondent, the way it is 'measured' (with appropriate scales) will make it feasible to carry out different types of statistical analyses. Given below is an example that demonstrates how the four scales can be used to measure the same concept.

Assume, a marketer is interested in measuring people's ice cream-related attitudes and purchase behaviours. Below are some of the ways in which questions/scales could be drafted:

A. "Have you purchased an ice cream product in the past few days?" **Yes ___** **No ___**
(Nominal scale)

B. "Assume you are making a shopping list. Place the following products from 1 to 4, where 1 = top priority and 4 = least priority on the list" (Ordinal Scale)

Products: Coffee, Soft Drinks, Ice cream, Juice, Chocolate

1.

2.

3.

4.

C. "On a scale of 1 to 5, where 1 = Strongly Disagree and 5 = Strongly Agree, please rate your level of agreement to the following items:" (Interval Scale)

Strongly disagree				**Strongly agree**
I love ice cream	1	2	3	4 5
I feel happy when I have an ice cream	1	2	3	4 5
I will go out of my way to purchase my favourite ice cream	1	2	3	4 5

D. How much did you spend on ice cream last week? $ _____
(Ratio scale)

Step 5: Check Question-Wording and Response Categories

There are a number of factors to consider when designing questions to ensure that appropriate answers are obtained. Several aspects of question design can introduce error, namely:

Language

Questions that employ complex or technical language or jargon can confuse or irritate respondents. In the case of interviewer-based surveys, respondents who do not understand the question may be unwilling to appear ignorant by asking the interviewer to explain the questions. The respondent may then either refuse to answer or give an inaccurate response.

Technical language or jargon should only be used in cases where it is part of the normal language of the survey's target population. An example of this case would be a survey of information technology specialists: the survey would need to use language that is 'jargon' to the survey designer, but appropriate for the respondent.

A general principle to keep in mind is that the wording of questionnaire items should be specific, definitive, consistent, brief, simple, and self-explanatory.

Ambiguity

If ambiguous words or phrases are included in a question, the meaning may be interpreted differently by different people. This will introduce errors in the data since different respondents will be virtually answering different questions.

For example, consider the question 'Has your standard of living decreased substantially because of a sharp increase in your monthly mortgage repayments?' A 'No' answer could mean any one of a number of things – for instance: 'No my standard of living has not dropped because of increased repayments' or 'No, my repayments have not increased'.

A question may also seem straightforward but allow for a variety of different kinds of answers. It is important to include the measurement unit you require wherever one applies, e.g. dollars, days, litres.

Double-Barrelled Questions (Multiple Concepts in one Question)

These are apparently single questions that actually incorporate two different questions. For example: ' Do you intend to leave work and return to full-time study this year?' A person may be intending to leave work, but not to return to study, and vice versa. When different parts of the question have different answers or parts of the question are not relevant, respondents may be unsure how to answer. When attempting to interpret answers to such questions, it can be unclear to which part of the question the answer corresponds.

Leading Questions

An error will be introduced if questions lead respondents towards a particular response. For example, the question 'How many days did you work last week?', if asked without first determining whether respondents did in fact work in the previous week, is a leading question. It implies that the person would have or should have been at work. Respondents may answer incorrectly to avoid telling the interviewer that they were not working.

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Unbalanced Questions

Another form of leading questions is unbalanced questions. For example, 'Are you in favour of gun control?' provides only one alternative to consider. The question should be reworded to something like 'Do you favour gun control, or are you against gun control?', which gives respondents more than one alternative. The answer options of a question can also be unbalanced. For example, a respondent could be asked in a neutral way "Please rate your overall health" but required to select from the answers "Poor", "Good" and "Excellent".

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Recall/Memory Error

A significant degree of error can be introduced in questions that require respondents to recall events, expenditure, etc., particularly if details are being sought for a long period. The quality of the data collected from recall questions is influenced by the importance of the event to the respondent and the length of time since the event took place. Respondents also tend to remember what should have been

done rather than what was done.

Subjects that are of greater importance or interest to respondents, or events that happen infrequently, will be remembered over longer periods and more accurately. Where possible (eg. with financial information), questions should be framed so that respondents can refer to their own records which would enhance accurate reporting. Minimising the recall period also helps to reduce memory bias.

A specific type of memory error is telescoping. This occurs if respondents report events as occurring either earlier or later than they actually occur, incorrectly bringing events into the reference period. This effect is alleviated somewhat by being very specific about when the reference period begins and ends, for example using "the week ending Saturday 1st September" rather than "last week".

Intrusive (Sensitive) Questions

Questions on topics that respondents may see as embarrassing or highly sensitive can produce inaccurate answers. Respondents may refuse to provide information on personal issues such as health or income details. If respondents are required to answer questions with information that might seem socially undesirable, they may provide the interviewer with responses they believe are more 'acceptable'. In these cases, it is often better to provide the respondent with a self-administered questionnaire that the interviewer doesn't see.

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Business survey respondents can also find some topics sensitive, such as IT security breaches or donations to charity, as well as not wanting to reveal commercial-in-confidence information about their business. Business surveys add a new dimension to collecting sensitive data as it is often necessary for different respondents, sometimes from different areas, to complete parts of the form and approve its content. Some respondents might not want others to see particular answers.

The negative effect of sensitive questions may be aggravated if they are placed at the beginning of the questionnaire and can therefore contribute to non-response if respondents are unwilling to continue with the remaining questions. If a sensitive question is further into a form the respondent is more committed to completion, and if they do refuse to continue, the partial response is more useful. Ways of overcoming difficulties associated with sensitive questions may include reassuring respondents that the information they provide is confidential, and not requiring respondents to write their name anywhere on the survey form.

Acquiescence

This situation arises when respondents have a general tendency to agree rather than disagree with anything. It occurs when respondents are asked whether they agree or disagree with a statement, especially when the supplied statements are presented as plausible generalities. It can also appear for

questions requiring a yes or no response.

This tendency can be due to a combination of factors, such as the personality and education level of respondents, as well as conditions of the interview or design of a self-completed questionnaire. Respondents will often agree when the question is ambiguous or otherwise difficult to answer. The effect may be exaggerated when the respondent is fatigued or has to answer a long string of questions with the same response categories. A related effect is satisficing, where respondents select the first reasonable answer rather than make the effort to find or remember the best answer.

Adequate Response Categories

It is important to make sure that there are adequate response categories and that they incorporate every possible response. For example:

Age: 15-19, 21-25
This provides a problem for those respondents whose age is 20.

Another problem that could arise is overlapping response categories. Ranges should always be mutually exclusive. For example:

Age 15-20, 20-25
This provides a problem for respondents whose age is 20 since they could respond in either or both categories.

Response categories also need to be worded carefully, as respondents will use them to clarify or extend the meaning of the question. For example, if a question using a frequency scale with five points "Never", "Rarely", "Average", "Often", and "Frequently" a respondent may incorrectly assume the scale represents the population distribution. If they consider themselves to be normal or extreme compared to the population on the activity of interest their answers will differ regardless of the actual frequency they engage in the activity.

Number of Response Options

The number of response categories can influence the quality of the data as both too few and too many categories can cause errors. Too many can cause respondent fatigue and inattention, resulting in ill-considered answers. If there are too few categories respondents may have difficulty finding one which accurately describes their situation.

Don't Know Category

The decision about whether to include or exclude a Don't Know option depends to a large extent on the subject matter. The remaining responses are usually evenly distributed on the negative and positive sides of a scale if this category is excluded, although it depends to a large extent on the nature of the question. Excluding this option may not be a good idea, as respondents may be forced to give an answer when, for example, they really do not know what their attitude is to a particular subject, or they do not know the answer to a factual question that has been asked. When respondents are forced to develop an attitude on

the spot this attitude will be highly unreliable.

Tone

A change in wording can result in a change in responses. For example, different responses may be obtained through using the following two questions:

'Do you think that gun ownership should be forbidden?'

or

'Do you think that gun ownership should not be allowed?'

Minor changes in wording can also have a significant effect on responses. One should therefore be careful when looking at alternative wordings. The use of negative words like "not" should be avoided in questions as they are easily missed by respondents. In addition, using "not" in a scale such as "Satisfied", "Neither" and "Not satisfied" doesn't provide a true opposite. "Dissatisfied" would be a better alternative, however "Unsatisfied" could also be used and would mean something slightly different to respondents.

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Step 6: Finalise the Structure and Layout of the Questionnaire

Not only does the wording of questions require attention to detail, but also the 'look' of the questionnaire. Poorly designed questionnaires (eg. hard-to-read text) not only serve as a disincentive to respondents completing the questionnaire but can also result in respondents making errors. Some of the important elements of questionnaire structure and layout are outlined below.

Sequencing

The questions on a form should follow a sequence that is logical to the respondents. Regardless of the method used to administer the questionnaire, the sequence should flow smoothly from one question to the next. A smooth progression through the questions is particularly important if the questionnaire is answered in difficult circumstances (e.g. a mother trying to fill in a questionnaire while her children are seeking her attention). It is a good idea to start the questionnaire with pleasant and easy questions to promote interest in the survey, and to give respondents confidence in their ability to answer the remaining questions. In particular, the opening questions should establish that the respondent is a member of the survey population.

The remaining questions should be logically structured so that the interviewer or respondent does not

need to alternate between pages of the questionnaire. For example, any explanatory notes should be presented as part of the question they refer to, not on a separate page.

Questions that may be sensitive to respondents should generally not be placed at the beginning of a questionnaire. Rather, they should be placed in a section of the form where they are most meaningful to the context of other questions. In this way, the format of the questionnaire can act as a buffer to help the respondent feel more comfortable with sensitive questions after establishing rapport.

In self-enumeration questionnaires, to ensure that respondents answer only those parts of the questionnaire that are relevant, filter questions may be used to direct respondents to skip the questions that do not apply to them. Filter questions are also used in interviewer-based surveys to direct interviewers to follow a series of questions according to answers given by respondents. Filter questions need to be used with care as respondents (and interviewers) need to have sufficient information about the skip condition to judge whether the respondent should skip. Filters should also generally be avoided for sensitive topics as respondents will tend to give the answer that avoids answering the sensitive questions.

If the instructions are not clear and straightforward, interviewers or respondents can follow an incorrect sequence or miss questions. In general, only one or two conditions should be placed in each sequence guide. Computer-assisted interviewing and electronic self-completion forms can make complex sequencing much easier.

Filter questions also identify sub-populations. For example:

Q7 ‘Were you born overseas?’
If ‘Yes’ go to Q8,
if ‘No’ go to Q12.

Order of Questions

The order in which the questions appear may influence the responses given to particular questions. Responses given to earlier questions can influence responses to later questions. For example, if a question asks participants whether they believe trade unions are disruptive in the community, and then a later question asks about problems in Australian industry, the negative influence of trade unions on industry may receive much more attention than would otherwise have been the case.

Order of Response Options

The actual order of response options can also introduce bias. The options presented first may be selected because they make an initial impact on respondents, or because respondents lose concentration and do not hear or read the remaining options. Equally, the last options may be chosen because they are more easily recalled, particularly if respondents are given a long list of options. Thus, the order of response options has a greater effect on data quality when a question includes a large number of response options.

If possible, options should be presented in a meaningful order. If some options are more socially desirable than others these should go last to reduce bias. For example, an education question should present the qualifications in order from lowest to highest. For some self-completed lists, alphabetical order is the most appropriate to help the respondent find which option they want, for example, if respondents have to select which crops they produce.

Response Options and Respondent Difficulties

When the survey is interviewer-based, the response options can be presented either verbally or on a prompt card. A prompt card is a list of possible responses to a question that are shown by the interviewer to assist the respondents. This helps to decrease errors resulting from respondents being unable to remember all the options read out to them. However, respondents with poor eyesight, migrants with limited English, or adults with literacy problems will experience difficulties in answering accurately.

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Length

The length of a questionnaire can be described in different ways. Survey designers tend to worry about number of pages, whereas the number of questions (especially mandatory ones) and the time taken to complete are usually more important. How long is too long varies across mode of data collection, the ease and interest of the topic and the design of the questionnaire. Towards the end of a long questionnaire, respondents may give less thought to their answers and concentrate less on the instructions and questions, thereby decreasing the accuracy of the information they provide. If a respondent is told an interview will last several hours, or they receive a questionnaire that is many pages thick, that can lead the respondent to refuse to participate at all.

Questionnaire Layout

Respondents or interviewers using a questionnaire with poor layout can miss questions, follow an incorrect sequence or enter responses in the wrong response box, which will result in missing or incorrect data. Poor layout can also contribute to errors at the processing stage. For example, if response boxes are not aligned some answers may be missed completely during the data entry.

Particularly for those questionnaires which are completed by respondents, the design may contribute to errors as a result of:

1. poor legibility (e.g. unclear printing or very small text);
2. violating the normal reading path of the respondent (English readers expect to read from top left to the bottom right and e.g. big headings and bright pictures in the middle of pages disrupt this);
3. instructions which can be easily overlooked (e.g. those which are not clearly differentiated from the questions or are not placed near the relevant part of the question); and
4. inadequate space for answers.

Physical Design

The questionnaire should be physically set out so as to minimise the time needed to interview, respond and process the results. Specifically, consideration should be given to the form's construction, graphics, and layout. Poor layout leads to mistakes in understanding questions and recording the responses. In

general, the questionnaire:

1. needs to be understood by respondents, interviewers, and processors. This is done by providing clear instructions. For respondents, this means an adequate layout of questions and response categories with appropriate sequencing. Interviewers require prompts to be clearly understood and response codes need to be adequate for processors;
2. should have a good appearance as it might affect the response, i.e. the questionnaire should be well designed and presented and therefore easy to answer;
3. should clearly identify the date, title, and the organisation;
4. should clearly outline the purpose of the survey;
5. should assure respondents about the confidentiality of the information they are providing;
6. should provide a contact number so that respondents can obtain help if they require it and due date; and
7. should have pages that are numbered consecutively, with a simple numbering system.

Step 7: Testing the Questionnaire

Once the understanding of concepts and definitions has been investigated through focus groups, a rough questionnaire can be produced and tested informally on a small group of people, perhaps one's colleagues at work. Such testing is not intended to obtain representative results but aims to find out the major flaws with the questions, for example, awkward wording. This testing is designed to take the 'rough edges' off a questionnaire. It is a good idea to use open questions to work out the likely responses. The questions can be restructured and developed into a draft questionnaire which can be used in rounds of informal pretesting and later pilot testing.

Conclusion

Questionnaire design begins by clarifying the objectives of the survey, determining the data which is to be produced by the survey and devising a list of questions to obtain this data. Careful consideration should be given to a number of factors, including the type of questions to be used, the logical sequence and wording of questions, and the physical design of the form. It is important to test each of these aspects of questionnaire design with a group of respondents before finalising the questionnaire. If necessary, the form can then be modified and retested until respondents can complete it accurately and quickly with a minimum of errors.

Sampling Methods

This chapter is derived from the Australian Bureau of Statistics
Australian Bureau of Statistics n.d., Sample design, viewed 31 March 2022, <https://www.abs.gov.au/websitedbs/d3310114.nsf/home/Basic+Survey+Design+-+Sample+Design>.

Learning Objectives

By the end of this chapter, students must be able to:

- understand the steps in a sampling plan
- differentiate between different types of sampling methods

INTRODUCTION

In most situations, it is not feasible for the researcher to collect information from all people within a population, usually referred to as a census. It is important to have a plan on how to select a 'sample' of individuals who could be tapped for data collection. The major decisions to be made for a 'sampling plan' are:

- defining the population and sampling units;
- identifying the sampling frame;
- estimating the sample size;
- determining the sampling methodology; and
- choosing a sampling technique

This chapter will examine all these topics in detail.

STEP 1: Defining the population and sampling units

The population is the aggregate or collection of units (e.g., individuals, households, schools, hospitals, businesses) about which the survey will be conducted. The target population is also known as the *scope* of the survey. It is the 'population' that the survey is aimed at.

A critical component of sampling is to accurately define the population that the researcher is interested in surveying. This means making sure that the definition includes key characteristics of the population units, which would make it easier to identify the exact group of individuals to target.

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STEP 2: Identifying the sampling frame

The frame refers to the list of units (eg, persons, households, businesses, etc) in the survey population. Since the selection of the sample is directly based on this list, the frame is one of the most important tools in the design of a survey. It determines how well a target population is covered and affects the choice of the data collection method. It is also desirable that the frame contains auxiliary information on the units so that a more efficient sample plan can be developed. The frame should contain contact points for each of the units listed so that it can be used to access the population. This means that for postal surveys the frame should contain postal addresses; for interviewer-based surveys, the frame should contain street addresses, and for telephone surveys, the frame should contain telephone numbers.

A good frame is up-to-date, does not have any missing units, contains only relevant units, does not include duplicates, is accessible to frame users, and contains sufficient information to uniquely identify and contact each unit.

A List of Customers - Example of a Sampling Frame

STEP 3: Sample size determination

An important aspect of sample design is deciding upon the sample size given the objectives and constraints that exist. Since every survey is different there are no fixed rules for determining sample size. However, factors to be considered include

- the population size and variability within the population;
- resources (time, money, and personnel);
- level of accuracy required of the results;
- level of detail required in the results;
- the likely level of non-response; and
- the relative importance of the variables of interest

Once these issues have been addressed, you are in a better position to decide on the size of the sample.

Variability

The more variable the population is, the larger the sample required to achieve specific levels of accuracy. However, actual population variability is generally not known in advance; information from a previous survey or a pilot test may be used to give an indication of the variability of the population.

When the characteristic being measured is comparatively rare, larger sample size will be required to ensure that sufficient units having that characteristic are included in the sample.

Population Size

An aspect that affects the sample size required is the population size. When the population size is small, it needs to be considered carefully in determining the sample size, but when the population size is large it has little effect on the sample size. Gains in precision from increasing the sample size are by no means proportional to population size.

Resources and Accuracy

As discussed earlier, the estimates are obtained from a sample rather than a census, therefore the estimates are different from the true population value. A measure of the accuracy of the estimate is the standard error. A large sample is more likely to have a smaller standard error or greater accuracy than a small sample.

When planning a survey, you might wish to minimize the size of the standard error to maximize the accuracy of the estimates. This can be done by choosing as large a sample as resources permit. Alternatively, you might specify the size of the standard error to be achieved and choose a sample size designed to achieve that. In some cases, it will cost too much to take the sample size required to achieve a certain level of accuracy. Decisions then need to be made on whether to relax the accuracy levels, reduce data requirements, increase the budget or reduce the cost of other areas in the survey process.

Level of Detail Required

If we divide the population into subgroups (strata) and we are choosing a sample from each of these strata then a sufficient sample size is required in each of the subgroups to ensure reliable estimates at this level. The overall sample size would be equal to the sum of the sample sizes for the subgroups. A good approach is to draw a blank table that shows all characteristics to be cross-classified. The more cells there are in the table, the larger the sample size needed to ensure reliable estimates.

Likely level of Non-response

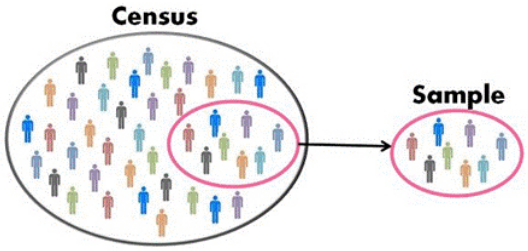
Non-response can cause problems for the researcher in two ways. The higher the non-response the larger the standard errors will be for a fixed initial sample size. This can be compensated for by assigning a larger sample size based on an expected response rate, or by using quota sampling.

The second problem with non-respondents is that the characteristics of non-respondents may differ markedly from those of respondents. The survey results will still be biased even with an increase in

sample size (ie. increasing the sample size will have no effect on the non-response bias). The lower the response rate, the less representative the final sample will be of the total population, and the bigger the bias of sample estimates. Non-response bias can sometimes be reduced by post-stratification as well as through intensive follow-up of non-respondents, particularly in strata with poor response rates.

The relative importance of the variables of interest

Generally, surveys are used to collect a range of data on a number of variables of interest. A sample size that will result in insufficiently precise information for one variable may not result in sufficiently precise information for another variable. It is not normally feasible to select a sample that is large enough to cover all variables to the desired level of precision. In practice, therefore, the relative importance of the variables of interest are considered, priorities are set and the appropriate sample size is determined accordingly.



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STEP 4: Sampling methodology : Probability and non-probability

A probability sample is one in which every unit of the population has a known non-zero probability of selection and is randomly selected. A probability sample allows inferences about the target population to be made. By knowing the selection probability for each unit, objective selections can then be made which should produce a more representative sample. Known probabilities also allow the measurement of the precision of the survey estimates in terms of standard errors and confidence intervals.

If the probability of selection for each unit is unknown, or cannot be calculated, the sample is called a non-probability sample. Non-probability samples are often less expensive, easier to run, and don't require a frame. However, it is **not** possible to accurately evaluate the precision (ie. closeness of estimates under repeated sampling of the same size) of estimates from non-probability samples since there is no control over the representativeness of the sample. If a non-probability sample is carried out carefully, then the bias in the results can be reduced.

Choosing Between Probability and Non-Probability Samples

The choice between using a probability or a non-probability approach to sampling depends on a variety of factors:

- the objectives and scope of the survey;
- the method of data collection suitable to those objectives;
- the precision required of the results and whether that precision needs to be able to be measured;
- the availability of a sampling frame;
- the resources required to maintain the frame; and
- the availability of extra information about the units in the population.

Probability sampling is normally preferred when conducting major surveys, especially when a population frame is available ensuring that we are able to select and contact each unit in the (frame) population. However, where time and financial constraints make probability sampling infeasible, or where knowing the level of accuracy in the results is not an important consideration, non-probability samples do have a role to play since they are inexpensive, easy to run and no frame is required. For this reason, when conducting qualitative (investigative), rather than quantitative research, non-probability samples & techniques such as case studies are generally superior to probability samples & quantitative estimation. Non-probability sampling can also be useful when piloting surveys.

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STEP 5: Sampling techniques – Non-Probability Samples

Different types of non-probability samples are discussed below. In a non-probability sample, all members of a population do not have an equal chance of being selected for a sample. However, if a non-probability sample is carried out carefully, then the bias in the results can be reduced.

Quota Sampling

To select a quota sample, the interviewers select respondents until a pre-determined number of respondents in certain categories are surveyed (eg. the interviewers might select the sample to achieve a certain age/sex breakdown reflective of the target population).

This is the method of sampling commonly used by market researchers and political pollsters as it can produce fairly good estimates if it is properly conducted. When top-up units are selected randomly to fill

a quota, and no element of judgment is used by the researcher for unit selection, it is very similar to a probability sample. However, when non-response is significant (which is almost always the case for voluntary surveys), quota sampling can under-represent those portions of the population that are unwilling to respond or hard to contact.

Convenience and Haphazard Sampling

Street corner interviews, magazine and newspaper questionnaires, and phone-in polls are all examples of convenience or haphazard samples. These types of surveys are subject to biased or unrepresentative samples as only persons who feel strongly about the topic will respond. These surveys also have a tendency to ask questions that are loaded or have biased wording.

Street corner interviews can be biased depending on the timing and the placement of the interviewer. There is no control over selecting the sample of respondents in any of these methods, however, they are very cheap and easy to administer.

Judgment or Purposive Sampling

Judgment sampling is where a 'representative' sample is chosen by an expert in the field of study. Judgment sampling is subject to unknown biases but may be justified for very small samples. This form of sampling can be used to choose a sample for a pilot test of a probability survey but inferences about the population should not be made from judgment samples. Judgment sampling is also known as purposive sampling.

Snowball Sampling (or Chain Referral Sampling)

According to this type of sampling technique, the researcher seeks assistance from research participants to help identify and recruit other participants for the study. This can be particularly useful in a situation where the target population is hard to find. Examples include minority groups, people with a medical condition, or people with a particular ideology.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://westernsydney.pressbooks.pub/customerinsights/?p=149#oembed-1

Source: Whats up dude
Whats up dude 2019, *What are the types of sampling techniques in statistics - random, stratified, cluster, systematic, 31 December*, online video, viewed 4 April 2022, <https://www.youtube.com/watch?v=z4YIrykEL8M>.

SAMPLING TECHNIQUES – Probability Samples

Simple Random Sampling

Simple random sampling (SRS) is a probability selection scheme where each unit in the population is given an equal probability of selection, and thus every possible sample of a given size has the same probability of being selected. One possible method of selecting a simple random sample is to number each unit on the sampling frame sequentially and make the selections by generating "selection numbers" from a random number table or, from some form of random number generator.

Table: Advantages and Disadvantages – Simple Random Sampling

Advantages	Disadvantages
Simple; Easy to use	Requires a complete list of all population units
Absolute random selection so no bias	Expensive; not feasible to implement

In practice, simple random sampling is rarely used because there is almost always a more efficient method of designing the sample (in terms of producing accurate results for a given cost). Nevertheless, simple random sampling forms the basis of a number of the more complex methods of sample design, and is used as a benchmark to which other designs are compared.

To participate in a focus group discussion, a teacher could use a computer to randomly generate the names of five students from a complete class list of twenty students.

Systematic Sampling

Systematic sampling provides a simple method of selecting the sample when the sampling frame exists in the form of an explicit list. Where the frame contains auxiliary information then the units in the frame are ordered with respect to that auxiliary data (eg employment size of a business). A fixed interval (referred to as the skip) is then used to select units from the sampling frame. Systematic sampling is best explained by describing how the sample selections are made.

Advantages	Disadvantages
Ease of use	Requires a complete list of all population units
More accurate results	Periodicity Bias: daily sales in a supermarket are expected to peak

on weekends. If the skip is calculated as 7, a bias is introduced yielding samples which are not representative of the population.

Surveying every fifth household on a street

Stratified Sampling

Stratified sampling is a technique that uses auxiliary information which is referred to as *stratification variables* to increase the efficiency of a sample design. Stratification variables may be geographical (eg. state, rural/urban) or non-geographical (eg. age, sex, number of employees).

Stratified sampling involves

- the division or stratification of the population into homogeneous (similar) groups called strata; and
- selecting the sample using SRS or systematic sampling within each stratum and independent of the other strata.

Stratification almost always improves the accuracy of estimates. This is because the population variability can be thought of as having components within strata and between strata. By independently sampling within each stratum we ensure each stratum is appropriately reflected in the sample, so between stratum variability is eliminated and we are left only with the within stratum component. With this factor in mind we see that the most efficient way to stratify is to have strata which are as different from each other as possible (to maximise the variance which is being eliminated) while being internally as homogeneous as possible (to minimise the variance remaining).

Practical Considerations

When planning a stratified sample, a number of practical considerations should be kept in mind:

- the strata should be designed so that they collectively include all members of the target population;
- each member must appear in only one stratum, ie strata should be non overlapping; and
- the definitions of boundaries of the strata should be precise and unambiguous.

As an example of stratification, if we were interested in the educational background of members of a Science faculty at a University, we could select a sample from the faculty as a whole or select samples independently from each of the departments within the faculty, such as mathematics, physics, chemistry etc. This latter method would ensure that each department was adequately represented (which would not

necessarily happen otherwise), and should increase the precision of the overall estimate.

If on the other hand, we were interested in the level of education (PhD, Masters, Bachelor) rather than the background we should stratify the faculty by level (Professor, Senior Lecturer, Lecturer) rather than by the department. Using this stratification we are more likely to find uniformity of educational standards within a level rather than an area of work, and we are also more likely to separate the better qualified from the less qualified.

Table: Advantages and Disadvantages of Stratified Sampling

Advantages	Disadvantages
Minority groups are included	Increase in costs
More accurate results	A danger of stratifying too finely
Analysis across different groups	

Number of Stratas

There is no rule as to how many strata the population should be divided into. This depends on the population size and homogeneity and the format in which the output is required. If output is required for some sub-groups of the population these subgroups must be considered as separate strata.

ABS Surveys

All surveys conducted by the Australian Bureau of Statistics employ stratification. Household surveys (such as the Monthly Population Survey and the Household Expenditure Survey) use geographic strata. Business surveys use variables such as state and industry strata and use some measure of size (eg employment) to form size strata.

Cluster and Multi-stage sampling

So far we have considered a number of ways which a sample of population units can be selected and population characteristics estimated on the basis of this sample. In this section consideration is given to a sampling scheme where the selection of population units is made by selecting particular groups (or clusters) of such units and then selecting all or some of the population units within selected groups for inclusion in the sample.

Cluster Sampling

Cluster sampling involves selecting a sample in a number of stages (usually two). The units in the population are grouped into convenient, usually naturally occurring clusters. These clusters are non-overlapping, well-defined groups which usually represent geographic areas. At the first stage of selection, a number of clusters are selected. At the second stage, all the units in the chosen clusters are selected to form the sample.

Practical Considerations

- The clusters should be designed so that they collectively include all members of the target population;
- each member must appear in one and only one cluster; and
- the definitions or boundaries of the clusters should be precise and unambiguous; in the case of geographical clusters natural and man-made boundaries such as rivers and roads are often used to delimit the cluster boundaries.

TABLE: Advantages and Disadvantages of Cluster Sampling

Advantages	Disadvantages
Costs can be low as not all units of the population included	Less accurate than other techniques

Example

If we take a simple random sample of 10,000 households across the whole of Australia then we are more likely to cover the population more evenly, but it is more expensive than sampling 50 clusters of 200 households.

Multi-stage Sampling

Multi-stage sampling involves selecting a sample in at least two stages. At the first stage, large groups or clusters of population units are selected. These clusters are designed to contain more units than are required for a final sample.

At the second stage, units are sampled from the selected clusters to derive the final sample. If more than two stages are used, the process of selecting “sub-clusters” within clusters continues until the final sample is achieved.

The same practical considerations apply to multi-stage sampling as to cluster sampling.

Example: A Three-Stage Sample

The following is an example of the stages of selection that may be used in a three-stage household survey.

- Stage 1. Electoral Subdivisions
  Electoral subdivisions (clusters) are sampled from a city or state.
- Stage 2. Blocks
  Blocks of houses are selected from within the electoral subdivisions.
- Stage 3. Houses
  Houses are selected from within the selected blocks.

Uses of Multi-stage Sampling

Multi-stage sampling is generally used when it is costly or impossible to form a list of all the units in the target population. Typically, a multi-stage sample gives less precise estimates than a simple random sample of the same size. However, a multi-stage sample is often more precise than a simple random sample **of the same cost**, and it is for this reason that the method is employed.

Advantages and Disadvantages

The advantages and disadvantages of multi-stage sampling are similar to those for cluster sampling. However, to compensate for the lower accuracy, either the number of clusters selected in the first stage should be relatively large (but this increases the cost of the survey) or the sampling fraction for later stages should be high (i.e. a large percentage of each cluster should be selected).

River Sampling and Panel Sampling

This section is derived from the Lehdonvirta, Oksanen, Rasanen and Blank 2020
Lehdonvirta, V, Oksanen, A, Rasanen, P and Blank, G 2020 , 'Social media, web and panel surveys; using non-probability samples in social and policy research', *Policy and Internet journal,* vol. 13, no. 1, pp. 134 - 155, viewed 4 April 2022, <https://onlinelibrary.wiley.com/doi/full/10.1002/poi3.238>.

There are two common approaches used in non-probability online surveys. The simplest non-probability approach to recruiting respondents online is “river” sampling, also known as intercept sampling or real-time sampling (Olivier, 2011; Walsh et al., 1992; Yun & Trumbo, 2000, cited in Lehdonvirta, Oksanen, Rasanen and Blank 2020). The second approach is referred to as panel sampling.

River sampling means recruiting respondents by inviting them to follow a link to a survey placed on a web page, email, or somewhere else where it is likely to be noticed by members of the target population. The name refers to the idea of researchers dipping into the traffic flow of a website, catching some of the users floating by. This method is similar to the convenience or haphazard sampling method described above. A basic problem with river sampling is the coverage bias. Coverage bias occurs because not every subpopulation is represented proportionately or indeed at all in digital media (Räsänen, 2006, cited in Lehdonvirta, Oksanen, Rasanen and Blank 2020).

Panel sampling refers to the recruitment of survey respondents usually with the help of commercial non-probability online panel providers. There are many such providers today, ranging from new startup companies to established media and research outfits such as Ipsos Mori, Qualtrics, and Survey Sampling International (SSI) (Callegaro et al., 2014a, cited in Lehdonvirta, Oksanen, Rasanen and Blank 2020). In contrast to probability-based online panels, typical recruitment strategies of non-probability online panels include placing ads on websites or social media and distributing invitations to newsgroups and mailing lists. Interested users opt in to become panel members, and users from multiple sources are often blended into a single panel (Lorch, Cavallaro, & van Ossenbruggen, 2014, cited in Lehdonvirta, Oksanen, Rasanen and Blank 2020). A key difference to river sampling is that the panel providers undertake to manage the demographic compositions of their respondent pools, trying to correct the biases stemming from digital medias' uneven coverage so that the panels would be demographically similar to national populations. Online panel surveys are widely used by social scientists as well as policy consultants and think tanks. However, previous work suggests that panel surveys still systematically over-represent some groups and under-represent others (Willems et al., 2006, cited in Lehdonvirta, Oksanen, Rasanen and Blank 2020). For instance, U.S. online panel surveys over-represent white, better educated, active Internet users (Chang & Krosnick, 2009; Dever, Rafferty, & Valliant, 2008; Malhotra & Krosnick, 2007, cited in Lehdonvirta, Oksanen, Rasanen and Blank 2020).

12

Errors in Research

This chapter is derived from the Australian Bureau of Statistics
Australian Bureau of Statistics n.d., *Errors in statistical data*, viewed 31 March 2022, <https://www.abs.gov.au/websitedbs/d3310114.nsf/home/Basic+Survey+Design+-+Sample+Design>.

Learning Objectives

By the end of this chapter, students must be able to:

- explain sampling errors and non-sampling errors in research
- understand the sources leading to such errors
- demonstrate an understanding of strategies to reduce such errors

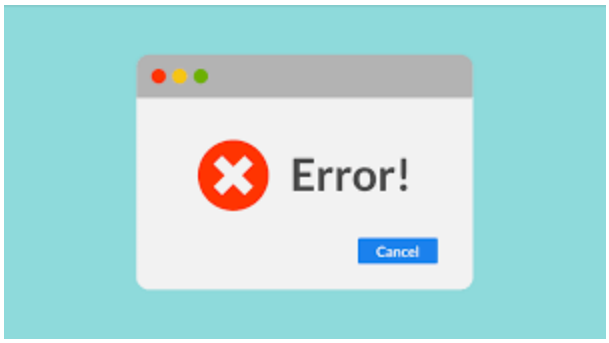

Image: Error from istockphoto under an unrestricted licence.

Introduction

The accuracy of a survey estimate refers to the closeness of the estimate to the true population value. Where there is a discrepancy between the value of the survey estimate and the true population value, the difference between the two is referred to as the error of the survey estimate. The total error of the survey estimate results from two types of error:

- sampling error, which arises when only a part of the population is used to represent the whole population. Sampling error can be measured mathematically
- a non-sampling error can occur at any stage of a sample survey

It is important for a researcher to be aware of these errors, in particular non-sampling errors, so that they can be either minimised or eliminated from the survey. An introduction to sampling error and non-sampling error is provided in the following sections.

Sampling Error

Sampling error reflects the difference between an estimate (e.g., average) derived from a sample survey and the “true value” (i.e., actual population average) that would be obtained if the whole survey population was enumerated. It can be measured from the population values, but as these are unknown (or very difficult to calculate), it can also be estimated from the sample data. It is important to consider sampling error when publishing survey results as it gives an indication of the accuracy of the estimate and therefore reflects the importance that can be placed on interpretations. If sampling principles are applied carefully within the constraints of available resources, sampling error can be accurately measured and kept to a minimum.

Factors Affecting Sampling Error

Sampling error is affected by a number of factors including sample size, sample design, the sampling fraction, and the variability within the population. In general, larger sample sizes decrease the sampling error, however, this decrease is not directly proportional. As a rough rule of thumb, you need to increase the sample size fourfold to halve the sampling error. Of much lesser influence is the sampling fraction (the fraction of the population size in the sample), but as the sample size increases as a fraction of the population, the sampling error should decrease.

The population variability also affects the sampling error. More variable populations give rise to larger errors as the samples or the estimates calculated from different samples are more likely to have greater variation. The effect of the variability within the population can be reduced by increasing the sample size to make it more representative of the survey population. Various sample design options also affect the size of the sampling error. For example, stratification reduces sampling error whereas cluster sampling tends to increase it. A sampling error can be estimated statistically and is used while interpreting statistical results.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://westernsydney.pressbooks.pub/customerinsights/?p=151#oembed-1

Source: Frances Chumney
Chumney, 2016, *Introduction to error sources in survey research: sampling error*, 14 August, online video, viewed 4 April 2022, <https://www.youtube.com/watch?v=XE7QDfdaQ68>.

Non-sampling error

Non-sampling error is comprised of all other errors in the estimate (e.g., a sample average). These include all errors which occur due to reasons other than sample plan or sample size. Some examples of causes of non-sampling error are a low response rate to the questionnaire, a badly designed questionnaire, respondent bias, and processing errors. Non-sampling errors can occur at any stage of the process. These errors can be found in censuses and sample surveys.

Sources of non-sampling errors are discussed below.

Non-Response Bias

Non-response refers to the situation when respondents either do not respond to any of the survey questions (i.e., total non-response) or do not respond to some survey questions owing to sensitive questions, recall problems, inability to answer, etc. (partial non-response). To improve response rates, care should be taken in designing the questionnaires, training interviewers, assuring the respondent of confidentiality, and calling back at different times if having difficulties contacting the respondent. “Call-backs” are successful in reducing non-response but can be expensive for personal interviews. A gentle

email reminder for online surveys is also used as a tool to improve survey response rates.

Questionnaire problems

The content and wording of the questionnaire may be misleading and the layout of the questionnaire may make it difficult to accurately record responses. Questions should not be loaded, double-barrelled, misleading, or ambiguous, and should be directly relevant to the objectives of the survey.

It is essential that questionnaires are tested on a sample of respondents before they are finalised to identify questionnaire flow and question-wording problems and allow sufficient time for improvements to be made to the questionnaire. The questionnaire should then be re-tested to ensure changes made do not introduce other problems.

Respondent Bias

At times, respondents may provide inaccurate information as they believe they are protecting their personal interests and integrity. Careful questionnaire design and effective questionnaire testing can overcome these problems to some extent. Given below are two types of situations that can be avoided through better design and implementation of surveys.

- Sensitivity
  If respondents are faced with a question that they find embarrassing, they may refuse to answer, or choose a response that prevents them from having to continue with the questions. For example, if asked the question: “Are you taking any oral contraceptive pills for any reason?”, and knowing that if they say “Yes” they will be asked for more details, respondents who are embarrassed by the question are likely to answer “No”, even if this is incorrect.
- Fatigue
  Fatigue can be a problem in surveys that require a high level of commitment from respondents. For example, diary surveys where respondents have to record all expenses made in a two-week period. In these types of surveys, the level of accuracy and detail supplied may decrease as respondents become tired of recording all expenditures.

Processing Errors

There are four stages in the processing of the data where errors may occur: data grooming, data capture, editing, and estimation. Data grooming involves preliminary checking before entering the data onto the processing system in the capture stage. Inadequate checking and quality management at this stage can introduce data loss (where data is not entered into the system) and data duplication (where the same data is entered into the system more than once). Inappropriate edit checks and inaccurate weights in the estimation procedure can also introduce errors to the data. To minimise these errors, processing staff should be given adequate training and realistic workloads.

Misinterpretation of Results

This can occur if the researcher is not aware of certain factors that influence the characteristics under investigation. A researcher or any other user not involved in the collection stage of the data gathering may be unaware of trends built into the data due to the nature of the collection, such as its scope. (eg. a survey which collected income as a data item with the survey coverage and scope of all adult persons (ie. 18 years or older), would expect to produce a different estimate than that produced by the ABS Survey of Average Weekly Earnings (AWE) simply because AWE includes persons of age 16 and 17 years as part of its scope). Researchers should carefully investigate the methodology used in any given survey.

Time Period Bias

This occurs when a survey is conducted during an unrepresentative time period. For example, if a survey aims to collect details on ice-cream sales, but only collects a week's worth of data during the hottest part of summer, it is unlikely to represent the average weekly sales of ice cream for the year.

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Source: Frances Chumney
Chumney, 2016, *Introduction to error sources in survey research: measurement errors*, 14 August, online video, viewed 4 April 2022, <https://www.youtube.com/watch?v=zF37RvnNHnk>.

Minimising non-sampling error

Non-sampling error can be difficult to measure accurately, but it can be minimised by

- careful selection of the time the survey is conducted,
- using an up-to-date and accurate sampling frame,
- planning for follow up of non-respondents,
- careful questionnaire design,
- providing thorough training for interviewers and processing staff and
- being aware of all the factors affecting the topic under consideration.

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Since many surveys suffer from poor response rates, we have especially discussed ways of reducing non-response from the potential respondents.

Minimising Non-Response

Response rates can be improved through good survey design via short, simple questions, good forms design techniques and explaining survey purposes and uses. Assurances of confidentiality are very important as many respondents are unwilling to respond due to a fear of lack of privacy. Targeted follow-ups on non-contacts or those initially unable to reply can increase response rates significantly. Following are some hints on how to minimise refusals in a personal or phone contact:

- Find out the reasons for refusal and try to talk through them
- Use positive language
- State how and what you plan to do to help with the questionnaire
- Stress the importance of the survey
- Explain the importance of their response as a representative of other units
- Emphasise the benefits from the survey results, explain how they can obtain results
- Give assurance of the confidentiality of the responses

Other measures that can improve respondent cooperation and maximise response include:

- Public awareness activities include discussions with key organisations and interest groups, news releases, media interviews, and articles. This is aimed at informing the community about the survey, identifying issues of concern, and addressing them.
- Advice to selected units by letter, giving them advance notice and explaining the purposes of the survey and how the survey is going to be conducted.

In the case of a mail survey, most of the points above can be stated in an introductory letter or through a publicity campaign.

Allowing for Non-Response

Where response rates are still low after all reasonable attempts of follow-up are undertaken, you can reduce bias by using population benchmarks to post-stratify the sample, intensive follow-up of a subsample of the non-respondents, or imputation for item non-response (non-response to a particular question).

The main aim of imputation is to produce consistent data without going back to the respondent for the correct values thus reducing both respondent burden and costs associated with the survey. Broadly speaking the imputation methods fall into three groups:

- the imputed value is derived from other information supplied by the unit;
- values by other units can be used to derive a value for the non-respondent (e.g., average);
- an exact value of another unit (called the donor) is used as a value for the non-respondent (called recipient);

When deciding on the method of imputation it is desirable to know what effect will imputation have on the final estimates. If a large amount of imputation is performed the results can be misleading, particularly if the imputation used distorts the distribution of data.

If at the planning stage it is believed that there is likely to be a high non-response rate, then the sample size could be increased to allow for this. However, the non-response bias will not be overcome by just increasing the sample size, particularly if the non-responding units have different characteristics from the responding units. Post-stratification and imputation also fail to totally eliminate non-response bias from the results.

Example: Effect of Non-Response

Suppose a postal survey of 3421 fruit growers was run to estimate the average number of fruit trees on a farm. There was an initial period for response and following low response rates, two series of follow-up reminders were sent out. The response and results were as follows:

	Response	Ave. no. of Trees
Initial Response	300	456
Added after 1 follow up reminder	543	382
Added after 2 follow up reminders	434	340
Total Response	1277	

After two follow-up reminders, there was still only a 37% response rate. From other information, it was known that the overall average was 329. The result based on this survey would have been:

	Cumulative Response	Combined Average
Initial Response	300	456
Added after 1 follow up reminder	843	408
Added after 2 follow up reminders	1277	385

If results had been published without any follow-up then the average number of trees would have been too high as farms with a greater number of trees appeared to have responded more readily. With follow-up, smaller farms sent back survey forms and the estimate became closer to the true value.

13

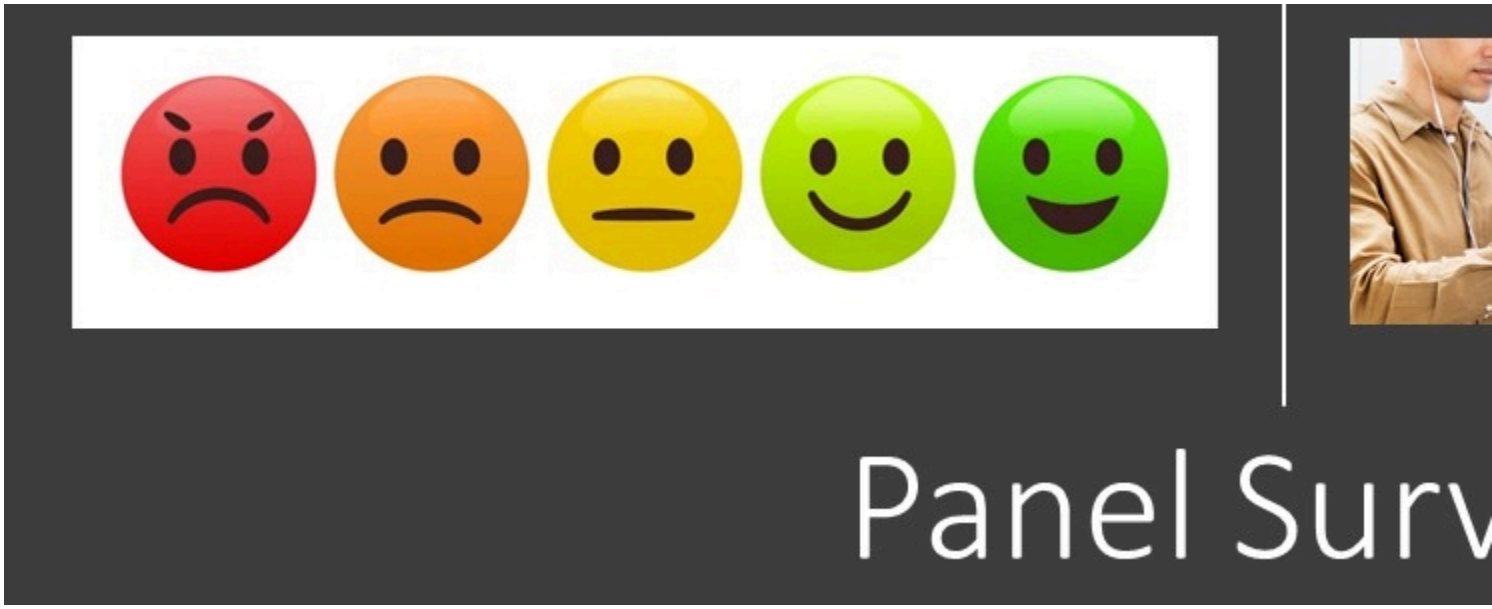
Research Panels

Learning Objectives

By the end of this chapter, students must be able to:

- understand the concept of a research panel

- acknowledge criticisms faced with the use of research panels
- explain the process involved in the management of research panels



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What is a research panel?

A research panel is a group of people who have agreed to participate in future research studies after having been pre-screened and pre-profiled, then given clear expectations about the types of research to be conducted, the frequency, and the types and amounts of compensation or incentives to be offered. These days most of the research panels are based online. “Proprietary panels” refers to those research panels which are owned by a panel provider. This organisation is responsible for building and maintaining the panel. The panel owner is responsible for the ‘quality’ of the panel, ensuring that the panel is regularly validated and ‘refreshed’.

The main benefit of using a research panel is the ease and speed of accessing potential survey respondents. The overall per head cost of surveying people can be low in comparison to other methods. Moreover, researchers have the ability to recruit potential respondents from all across the world. This can be especially useful when marketers are planning to operate in new regions. Finally, online panels offer greater privacy and confidentiality to respondents. Therefore, it is easier to discuss sensitive topics (e.g., a medical condition) or recruit hidden populations (such as members of the LGBTQ+ community). Greenbook directory 2022, 75 *Top online research panel companies: what is a proprietary panel?,* viewed 11 April 2022, <https://www.greenbook.org/market-research-firms/proprietary-panels>.

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://westernsydney.pressbooks.pub/customerinsights/?p=146#h5p-33

Challenges in using research panels

Porter, COLH, Outlaw, R, Gale, JP & Cho, TS 2018, 'The use of online panel data in management research: a review and recommendations', *Journal of Management,* vol. 45, no. 1, pp. 319-344, viewed 11 April 2022, SAGE Journal database, DOI 10.1177/0149206318811569.

There are four main issues that have been identified by researchers and practitioners in using research panels.

The first one refers to 'professional survey-takers' who intentionally participate in surveys frequently. Such survey-takers are bound to respond differently to survey questions than other respondent groups. Panel providers are encouraged to participation-rates in their panel. Similarly, the reimbursement rate (such as a movie ticket or $10 or donation to favourite charity) to panel members needs to be made available so clients can evaluate the incentive behind respondent participation.

The second issue relates to the **'representativeness'** of an online panel. While this used to be an issue during the early days of the internet, it is useful to still give it some consideration. With widespread access to online data, the digital divide is becoming smaller. In Australia, 99% of adults have access to the internet

Australian Communications and Media Authority 2021, *Communications and media in Australia: how we use the internet,* viewed 11 May 2022, <https://www.acma.gov.au/publications/2021-12/report/communications-and-media-australia-how-we-use-internet#:~:text=Nearly%20all%20Australian%20adults%20(99,prior%20to%20COVID%2D19%20lockdowns>. Researchers are now more confident of finding greater representation of the overall population in online panels since internet access is no longer bound by age, education, income or cultural/linguistic background. However, researchers may still want to examine whether an online panel has sufficient representation of a specific population. For example, if a study requires the recruitment of *"housewives living in Sydney AND who were born in Sudan"* may need to be discussed with the panel provider.

The next point relates to the **'health'** of the online panel As with all databases, it is not enough to simply have a list of people willing to respond to surveys and interview questions. A constant review and monitoring of the panel is required. If this is not done, then there is a risk of possessing a panel with outdated member information. Panel members' profiles change all the time. People move away, switch jobs, get married, have children, develop new opinions, and alter previously held beliefs. Unless there is a mechanism to refresh and update information about panel members, there is a greater chance of 'non-response', as the panel will not *fit* with the required respondent profile. There are some practitioners who feel regular recruiting of new panel members may solve the problem. While increasing the panel size is a good selling point, it is more cost-effective to update the information of existing members than recruit new ones

Data Decisions Group 2022, *Keeping your custom online research panel refreshed*, viewed 11 April 2022, <https://www.datadecisionsgroup.com/blog/keeping-your-online-research-panel-refreshed-and-your-survey-results-refreshingly-useful>

.

Finally, there is a concern about the **'quality of data'** generated from online panels as recruited panel members may not fully engage with the survey content, not make an effort in thinking about survey questions or have a general lack of inattentiveness. While this is an important issue, it is also easy to identify such errant survey takers. Panel providers can discuss criteria with clients and delete responses from 'speeders' (i.e., those respondents who complete a survey in an impossibly quick time) and 'straight-liners' (i.e., those respondents who repetitively select the same option for all survey questions. This is especially common for a survey with a Likert-scale type of questions. Any buyers of online panels want to be assured that the integrity of the panel is maintained by removing any members who are found to display such behaviour repeatedly.

Management of Online Research Panels

The four stages of the panel-management process are
Khan, AM 2012, The influence of corporate sponsorship on the sponsor's employees, thesis, viewed 29 March 2022, <https://researchdirect.westernsydney.edu.au/islandora/object/uws%3A13885>.
:

- Recruitment of panellists
- Selection of a sample
- Panel monitoring and maintenance
- Panel engagement

Recruitment of panellists:

The main recruitment method used to build a panel is referred to as the 'opt-in method' (Goritz 2007, as cited in Kahn 2012). With 'opt-in' or 'volunteer' panels there is usually no restriction on who can participate. Ideally, a panel should be constructed by using a range of methods (both online and offline) used to recruit participants. Usually, interested individuals are directed toward the panel organisation's website where panel-related terms and conditions can be found. Potential respondents are asked to fill in a registration form that automatically generates a socio-demographic database. By applying different recruitment methods, perhaps with collaboration with diverse affiliate partners, the resulting panel is bound to be more diverse and representative than the one based on a limited source of member recruitment.

Selection of a sample:

A sample is selected as per the requirements of the research project. It is always useful to discuss the respondent profile with the panel provider beforehand. For instance, if the researcher specifically wants

to survey “Sydney-based Indonesian-born mothers with school-going children”, not all online panels might comprise this population group.

Quota sampling is often undertaken while selecting an online panel sample. The researcher may decide that he/she wants an equal split between males and females. Even if more female panel members are available to respond to a survey, they will not be included in case the quota limit has been reached.

Panel monitoring and maintenance:

One of the signs of a good panel provider is its strategies regarding the monitoring and maintenance of its online panel. To ensure the quality of the panel, it needs to be ensured that members are ‘active’. Moreover, any members found to be ‘speeders’ or ‘straight liners’ are given warnings and removed from the panel, if such behavior continues. The panel provider must also have policies to prevent ‘over-use’ of panel members. For instance, no respondent should be attempting a survey more than once a month. Similarly, if a panel is already responding to a survey they should not be asked to do another survey simultaneously.

Over a period of time, panel members may become inactive because of a loss of interest, a lack of appreciation for the amount of work involved, or a change in household circumstances. Other reasons like natural mortality, invalid email addresses, and member concerns with data security may also contribute to members’ inactivity. It is useful for the service provider to monitor the panel for any such signs and to explore options for keeping the panel alive and healthy.

Panel engagement:

Similar to the way companies engage with their employees, engaging with panel members is also important. While the respondents are often provided with a (financial or other) incentive, it is recognised that strong respondent cooperation needed for data quality is something that cannot be paid for. Online panel providers need to manage their panels by building trust and commitment through multi-channel levels of communication such as via personal contact, newsletters and telephone calls. This is also an opportunity to ‘train’ the respondents in good practice by clearly communicating the researcher’s expectations and the importance of generating good quality data.

ESOMAR Guidelines for Research Panels

ESOMAR (European Society for Opinion and Marketing Research) is a not-for-profit membership organisation, established in 1948. ESOMAR is headquartered in Amsterdam, the Netherlands, and is present in over 130 countries. ESOMAR members form a community due to their interest in data

analytics, research, and insights to help improve the lives of individuals in societies and organisations. Being a lead organisation representing researchers worldwide, ESOMAR has published a guide on how to recruit online samples by using panels. The guide is available at Esomar.org.

Video: Example of a Consumer Panel

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://westernsydney.pressbooks.pub/customerinsights/?p=146#oembed-1

Source: Camden BRI
Camden BRI, 2011, *Consumer panel information*, 20 April, online video, viewed 4 April 2022, <https://www.youtube.com/watch?v=XE7QDfdaQ68>.

14

Survey Distribution Methods

Learning Objectives

By the end of this chapter, students must be able to:

- differentiate between the different methods available to collect survey data
- understand the pros and cons of each survey distribution method

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://westernsydney.pressbooks.pub/customerinsights/?p=143#oembed-1

Source: Elon University Poll
Elon University Poll, 2014, *Methods of collecting survey data,*27 Sep, online video, viewed 4 April 2022, <https://www.youtube.com/watch?v=9cuOyAR-Y9I>.

Survey Distribution for Data Collection

There can be a number of ways surveys can be distributed for collecting data. The table below lists the most commonly used methods.

Table: Various Modes of Data Collection

METHOD	DESCRIPTION	ADVANTAGES	DISADVANTAGES
Online surveys:	A range of methods are used to collect data online, via the use of the internet or mobile data	• An increasing	• A secure data

Email Social Media Digital Workspace (e.g. MS Teams) SMS App QR Code Website popups		number of respondents are now available online • Building and launching an online survey is much easier • Ease and speed in collecting data • Per head cost is low • Automatic recording of data; no separate data entry required • Use of audio-visual resources possible	storage system must be ensured • Many people are seeking information online so there could be a perception of 'clutter' • Technical glitches could ruin the experience
Telephone	Information is collected over a phone call, with many functions undertaken with computer technology	Can be useful for a highly relevant topic for respondents (e.g., opinions about a child's school)	Increasing non-cooperation by respondents due to telemarketing related perceptions
Mall-intercept	Potential respondents are approached to respond to a survey while they are at a mall shopping/browsing or just hanging out	Easy and quick access to specific groups of respondents (e.g., shoppers who purchase fresh fruit)	• Shoppers may have limited time • It may give the impression of being 'intrusive' • It may become expensive as some shopping malls charge researchers for setting up a desk or a display
In-home/In-office	Face to face data collection is undertaken when the respondent is in-office or at home	Most appropriate method when conducting 'executive interviews' Extremely useful when seeking specific information about household products (e.g.,	• Could be inappropriate for certain population groups (e.g., collecting data with housewives

		Unilever conducts in-home surveys in Pakistan to determine housewives' satisfaction with their laundry detergents)	in Saudi Arabia) • Has become obsolete with an increased number of women, not at home • May have to manage gatekeepers in offices
Mail	Data is collected by mailing the surveys to potential respondents and expecting them to return the completed forms via mail	Could be useful in regions with limited online/phone infrastructure It may still be used for certain age groups (e.g., over 70-year-olds undertaking a health survey)	• Snail mail (slow and old mode) • High non-response rate
Hybrid/ Mixed mode	Survey data is collected via triangulation or by using multiple methods	A logical approach for some surveys, such as to 'screen' respondents. For example, a sample of GPs could be screened via phone ("do you mostly see migrant patients?"). A medical rep could then carry out an in-office survey with selected GPs	It may become complicated, especially when different modes may require re-phrasing/ re-formatting

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://westernsydney.pressbooks.pub/customerinsights/?p=143#h5p-34

Choosing a Data Collection Method

A number of factors may play a role in selecting the most appropriate data collection method(s). These are discussed below:

Time:

Organisations have tight deadlines to meet. Researchers are under pressure to provide information. This often means that only those methods (such as an online survey or a telephone interview) can be used for data collection which has a quick turnaround. More traditional methods, such as in-home surveys are not appropriate at this stage.

Cost:

The researcher has to keep in mind the funds available. In case there is a big budget for research, then it is quite feasible to employ field workers who collect data in malls, offices, or homes. If there is a limited budget, then the researcher may have to rely on survey distribution modes that are cost-efficient, such as hosting the survey on the company's social media platform.

Access to Population Groups:

The quickest and most cost-effective data collection method becomes useless if the right population group cannot be reached. This is one of the key points which needs to be considered while selecting a method to distribute a survey questionnaire. A group of university students in Iran could be accessible using in-person methods, while in Australia alternative strategies may need to be employed.

Suitability (for Research Aim):

If a survey is designed so respondents can view certain images, then a telephone interview may not be an appropriate method. Similarly, if a questionnaire expects respondents to access a link or a website, it is important that the right data collection methods are employed.

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://westernsydney.pressbooks.pub/customerinsights/?p=143#h5p-35

15

Descriptive Statistics

Descriptive Statistics

This chapter is derived from Chapter 12.1 Describing Single Variables in University of Minnesota Libraries 2010.
University of Minnesota Libraries 2010, 'Describing single variables' in *Research Methods in Psychology*, University of Minnesota Libraries Publishing, <https://open.lib.umn.edu/psychologyresearchmethods/chapter/12-1-describing-single-variables/>.

Learning Objectives

By the end of this chapter, students must be able to:

- explain what is meant by descriptive statistics
- understand the type of measures used to statistically describe a sample
- compute and interpret measures of central tendency

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://westernsydney.pressbooks.pub/customerinsights/?p=154#oembed-1

Source: Amour Learning
Amour Learning, 2019, *What are descriptive and inferential statistics?*, 28 Jan, online video, viewed 1 May 2022, <https://www.youtube.com/watch?v=MUyUaouisZE/>.

Descriptive statistics refers to a set of techniques for summarizing and displaying data (of a sample). Let us assume here that the data are quantitative and consist of scores on one or more variables for each of several study participants. We begin by looking at some of the most common techniques for describing single variables.

The Distribution of a Variable

Every variable has a distribution, which is the way the scores are distributed across the levels of that variable. For example, in a sample of 100 college students, the distribution of the variable "number of siblings" might be such that 10 of them have no siblings, 30 have one sibling, 40 have two siblings, and so on. In the same sample, the distribution of the variable "sex" might be such that 44 have a score of "male" and 56 have a score of "female."

Frequency Tables

One way to display the distribution of a variable is in a frequency table. Table 12.1 "Frequency Table Showing a Hypothetical Distribution of Scores on the Rosenberg Self-Esteem Scale", for example, is a frequency table showing a hypothetical distribution of scores on the Rosenberg Self-Esteem Scale for a sample of 40 college students. The first column lists the values of the variable—the possible scores on the Rosenberg scale—and the second column lists the frequency of each score. This table shows that there were three students who had self-esteem scores of 24, five who had self-esteem scores of 23, and so on. From a frequency table like this, one can quickly see several important aspects of distribution, including the range of scores (from 15 to 24), the most and least common scores (22 and 17, respectively), and any extreme scores that stand out from the rest.

Table 12.1 Frequency Table Showing a Hypothetical Distribution of Scores on the Rosenberg Self-Esteem Scale

Self-esteem	Frequency
24	3

Self-esteem	Frequency
23	5
22	10
21	8
20	5
19	3
18	3
17	0
16	2
15	1

There are a few other points worth noting about frequency tables. First, the levels listed in the first column usually go from the highest at the top to the lowest at the bottom, and they usually do not extend beyond the highest and lowest scores in the data. For example, although scores on the Rosenberg scale can vary from a high of 30 to a low of 0, Table 12.1 “Frequency Table Showing a Hypothetical Distribution of Scores on the Rosenberg Self-Esteem Scale” only includes levels from 24 to 15 because that range includes all the scores in this particular data set. Second, when there are many different scores across a wide range of values, it is often better to create a grouped frequency table, in which the first column lists ranges of values and the second column lists the frequency of scores in each range. Table 12.2 “A Grouped Frequency Table Showing a Hypothetical Distribution of Reaction Times”, for example, is a grouped frequency table showing a hypothetical distribution of simple reaction times for a sample of 20 participants. In a grouped frequency table, the ranges must all be of equal width, and there are usually between five and 15 of them. Finally, frequency tables can also be used for categorical variables, in which case the levels are category labels. The order of the category labels is somewhat arbitrary, but they are often listed from the most frequent at the top to the least frequent at the bottom.

Table 12.2 A Grouped Frequency Table Showing a Hypothetical Distribution of Reaction Times

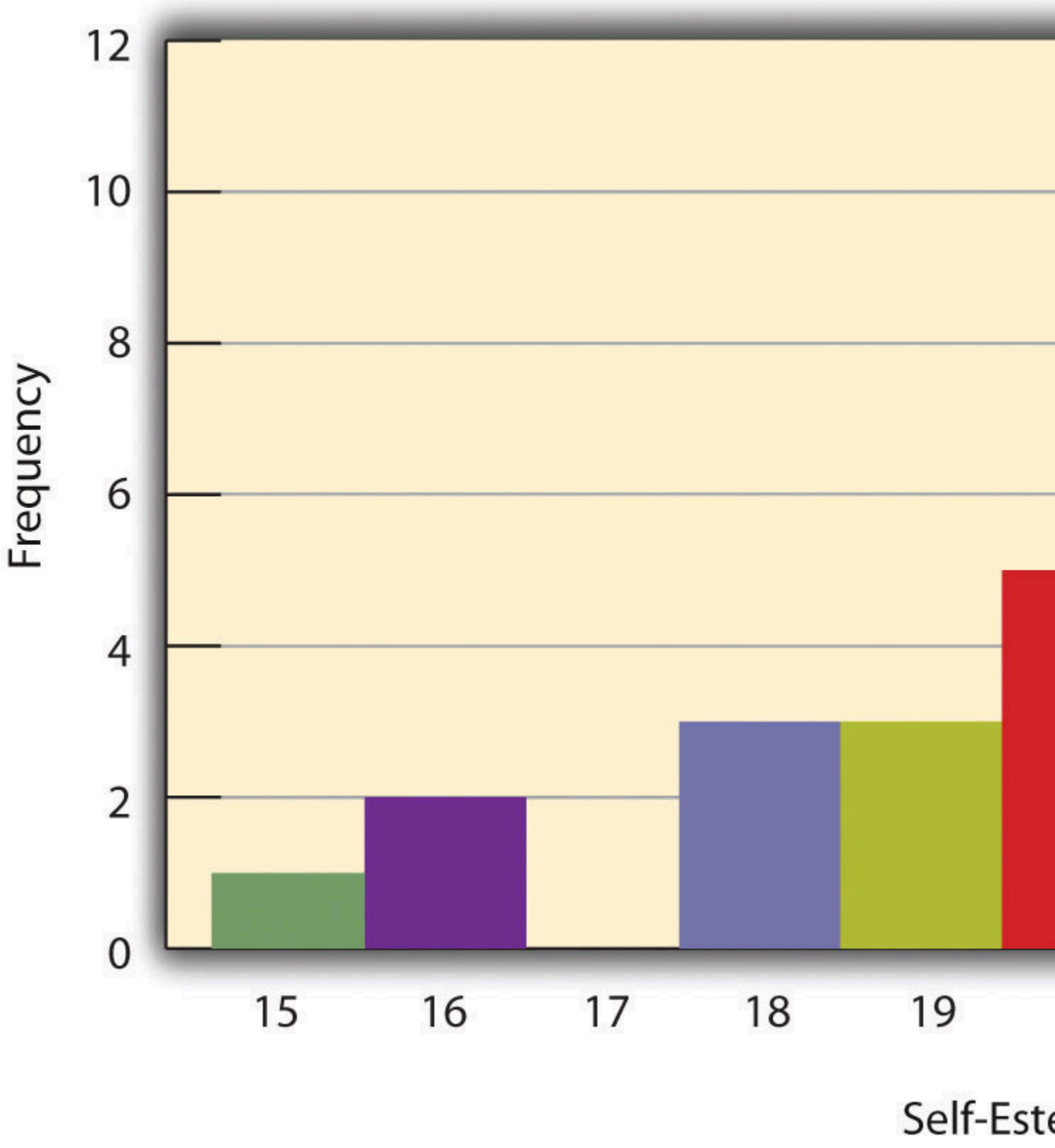
Reaction time (ms)	Frequency
241–260	1
221–240	2
201–220	2
181–200	9
161–180	4
141–160	2

Histograms

A histogram is a graphical display of a distribution. It presents the same information as a frequency table but in a way that is even quicker and easier to grasp. The histogram in Figure 12.1 “Histogram Showing the Distribution of Self-Esteem Scores Presented in “ presents the distribution of self-esteem scores in Table 12.1 “Frequency Table Showing a Hypothetical Distribution of Scores on the Rosenberg Self-Esteem Scale”. The *x*-axis of the histogram represents the variable and the *y*-axis represents frequency.

Above each level of the variable on the *x*-axis is a vertical bar that represents the number of individuals with that score. When the variable is quantitative, as in this example, there is usually no gap between the bars. When the variable is categorical, however, there is usually a small gap between them. (The gap at 17 in this histogram reflects the fact that there were no scores of 17 in this data set).

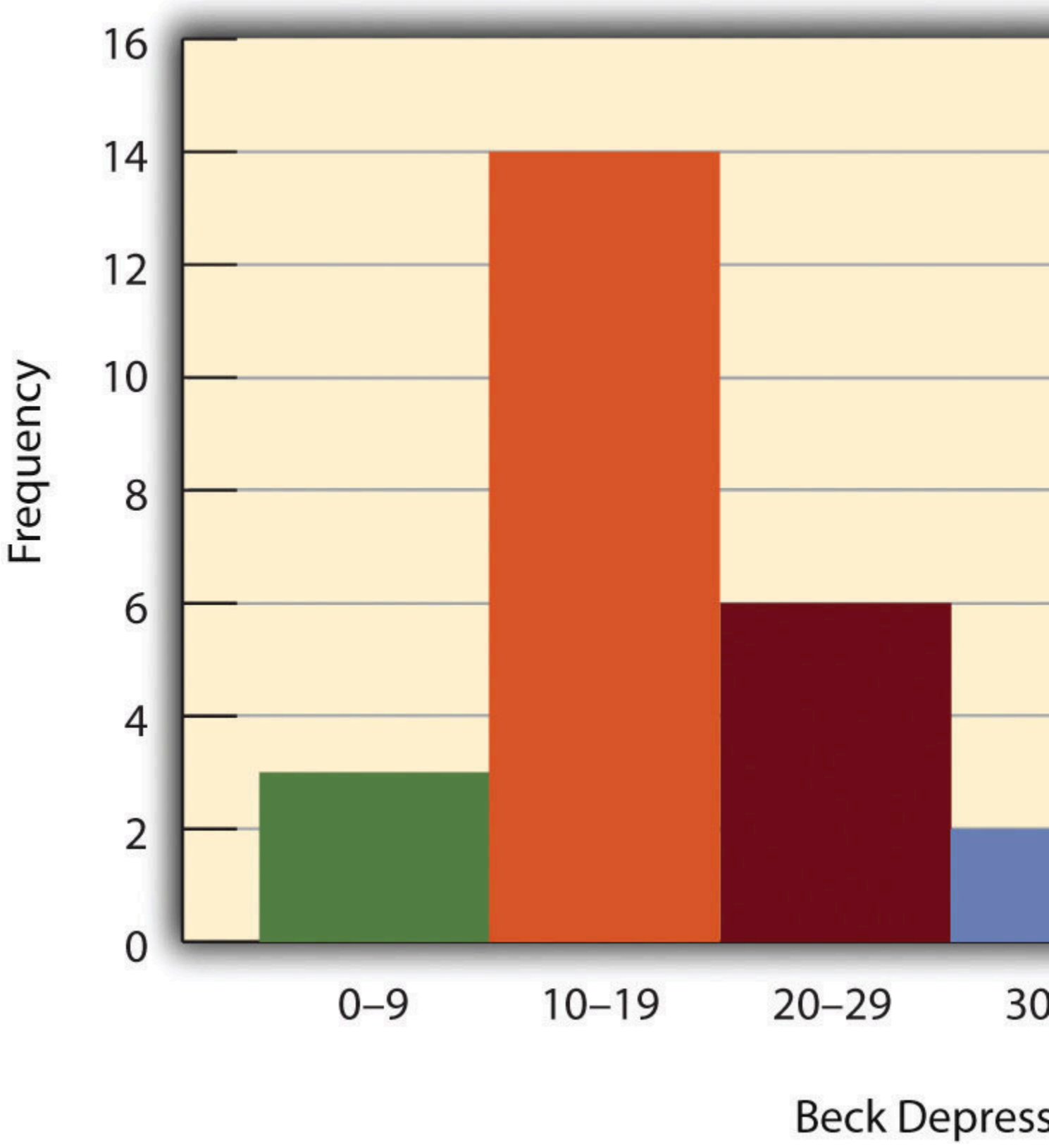
Figure 12.1 Histogram Showing the Distribution of Self-Esteem Scores Presented in Table 12.1 "Frequency Table Showing a Hypothetical Distribution of Scores on the Rosenberg Self-Esteem Scale"



Distribution Shapes

When the distribution of a quantitative variable is displayed in a histogram, it has a shape. The shape of the distribution of self-esteem scores in Figure 12.1 “Histogram Showing the Distribution of Self-Esteem Scores Presented in “ is typical. There is a peak somewhere near the middle of the distribution and “tails” that taper in either direction from the peak. The distribution of Figure 12.1 “Histogram Showing the Distribution of Self-Esteem Scores Presented in “ is unimodal, meaning it has one distinct peak, but distributions can also be bimodal, meaning they have two distinct peaks. Figure 12.2 “Histogram Showing a Hypothetical Bimodal Distribution of Scores on the Beck Depression Inventory”, for example, shows a hypothetical bimodal distribution of scores on the Beck Depression Inventory. Distributions can also have more than two distinct peaks, but these are relatively rare in psychological research.

Figure 12.2 Histogram Showing a Hypothetical Bimodal Distribution of Scores on the Beck Depression Inventory



Another characteristic of the shape of a distribution is whether it is symmetrical or skewed. The distribution in the center of Figure 12.3 “Histograms Showing Negatively Skewed, Symmetrical, and Positively Skewed Distributions” is symmetrical. Its left and right halves are mirror images of each other. The distribution on the left is negatively skewed, with its peak shifted toward the upper end of its range and a relatively long negative tail. The distribution on the right is positively skewed, with its peak toward the lower end of its range and a relatively long positive tail.

Figure 12.3 Histograms Showing Negatively Skewed, Symmetrical, and Positively Skewed Distributions

An outlier is an extreme score that is much higher or lower than the rest of the scores in the distribution. Sometimes outliers represent truly extreme scores on the variable of interest. For example, on the Beck Depression Inventory, a single clinically depressed person might be an outlier in a sample of otherwise happy and high-functioning peers. However, outliers can also represent errors or misunderstandings on the part of the researcher or participant, equipment malfunctions, or similar problems. We will say more about how to interpret outliers and what to do about them later in this chapter.

Measures of Central Tendency and Variability

It is also useful to be able to describe the characteristics of distribution more precisely. Here we look at how to do this in terms of two important characteristics: their central tendency and their variability.

Central Tendency

The central tendency of a distribution is its middle—the point around which the scores in the distribution tend to cluster. (Another term for central tendency is *average*.) Looking back at Figure 12.1 “Histogram Showing the Distribution of Self-Esteem Scores Presented in “, for example, we can see that the self-esteem scores tend to cluster around the values of 20 to 22. Here we will consider the three most common measures of central tendency: the mean, the median, and the mode.

The mean of a distribution (symbolized *M*) is the sum of the scores divided by the number of scores. As a formula, it looks like this:

M=ΣXN.

In this formula, the symbol Σ (the Greek letter sigma) is the summation sign and means to sum across the values of the variable *X*. *N* represents the number of scores. The mean is by far the most common measure of central tendency, and there are some good reasons for this. It usually provides a good indication of the central tendency of a distribution, and it is easily understood by most people. In addition, the mean has statistical properties that make it especially useful in doing inferential statistics.

An alternative to the mean is the median. The median is the middle score in the sense that half the scores in the distribution are less than it and half are greater than it. The simplest way to find the median is to organize the scores from lowest to highest and locate the score in the middle. Consider, for example, the following set of seven scores:

8 4 12 14 3 2 3

To find the median, simply rearrange the scores from lowest to highest and locate the one in the middle.

2 3 3 **4** 8 12 14

In this case, the median is 4 because there are three scores lower than 4 and three scores higher than 4. When there is an even number of scores, there are two scores in the middle of the distribution, in which case the median is the value halfway between them. For example, if we were to add a score of 15 to the preceding data set, there would be two scores (both 4 and 8) in the middle of the distribution, and the median would be halfway between them (6).

One final measure of central tendency is the mode. The mode is the most frequent score in a distribution. In the self-esteem distribution presented in Table 12.1 “Frequency Table Showing a Hypothetical Distribution of Scores on the Rosenberg Self-Esteem Scale” and Figure 12.1 “Histogram Showing the Distribution of Self-Esteem Scores Presented in “, for example, the mode is 22. More students had that score than any other. The mode is the only measure of central tendency that can also be used for categorical variables.

In a distribution that is both unimodal and symmetrical, the mean, median, and mode will be very close to each other at the peak of the distribution. In a bimodal or asymmetrical distribution, the mean,

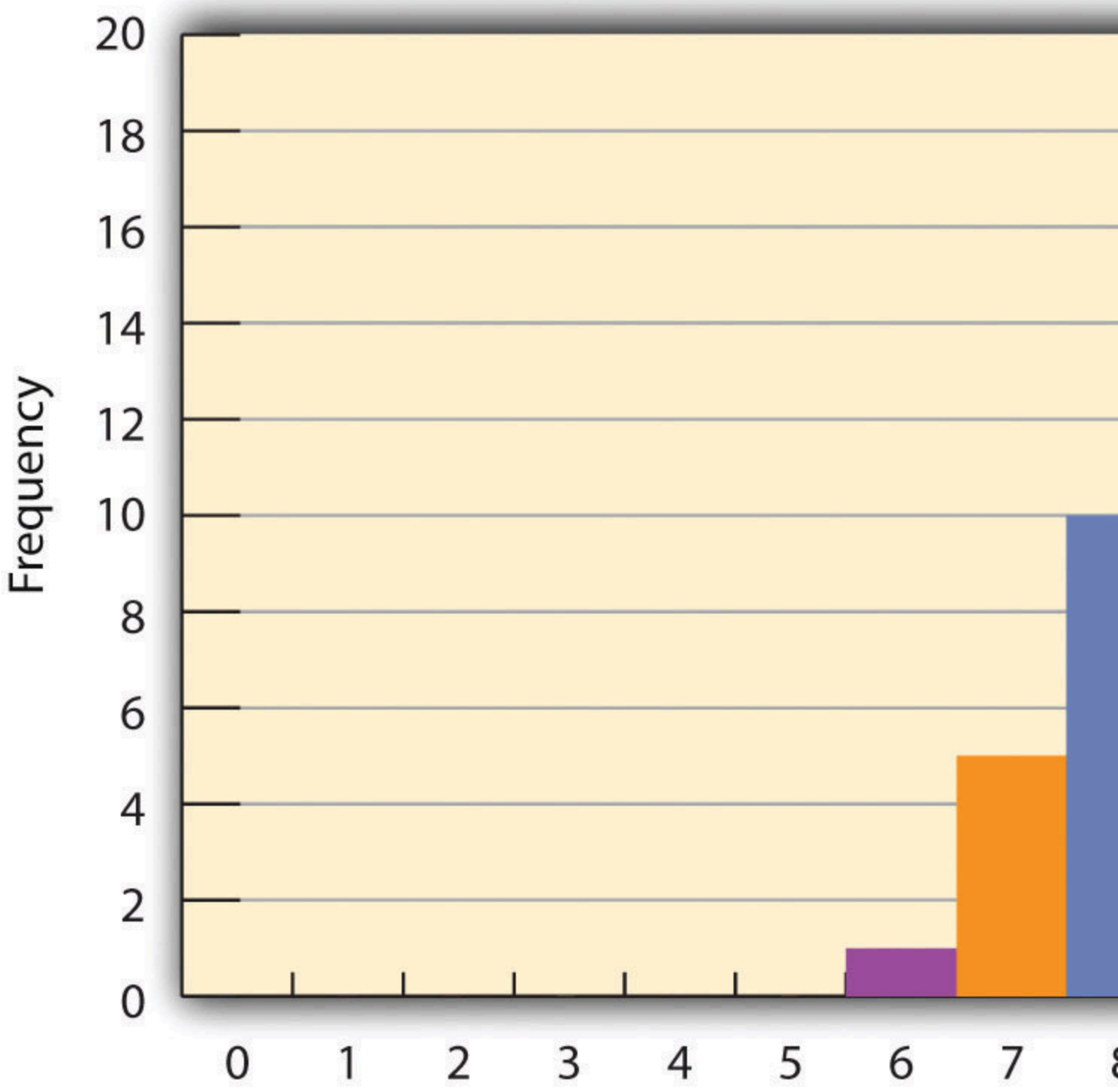
median, and mode can be quite different. In a bimodal distribution, the mean and median will tend to be between the peaks, while the mode will be at the tallest peak. In a skewed distribution, the mean will differ from the median in the direction of the skew (i.e., the direction of the longer tail). For highly skewed distributions, the mean can be pulled so far in the direction of the skew that it is no longer a good measure of the central tendency of that distribution. Imagine, for example, a set of four simple reaction times of 200, 250, 280, and 250 milliseconds (ms). The mean is 245 ms. But the addition of one more score of 5,000 ms—perhaps because the participant was not paying attention—would raise the mean to 1,445 ms. Not only is this measure of central tendency greater than 80% of the scores in the distribution, but it also does not seem to represent the behavior of anyone in the distribution very well. This is why researchers often prefer the median for highly skewed distributions (such as distributions of reaction times).

Keep in mind, though, that you are not required to choose a single measure of central tendency in analyzing your data. Each one provides slightly different information, and all of them can be useful.

Measures of Variability

The variability of a distribution is the extent to which the scores vary around their central tendency. Consider the two distributions in Figure 12.4 “Histograms Showing Hypothetical Distributions With the Same Mean, Median, and Mode (10) but With Low Variability (Top) and High Variability (Bottom)”, both of which have the same central tendency. The mean, median, and mode of each distribution are 10. Notice, however, that the two distributions differ in terms of their variability. The top one has relatively low variability, with all the scores relatively close to the center. The bottom one has relatively high variability, with the scores being spread across a much greater range.

Figure 12.4 Histograms Showing Hypothetical Distributions With the Same Mean, Median, and Mode (10) but With Low Variability (Top) and High Variability (Bottom)


Frequency
20
18
16
14
12
10
8
6
4
2
0
0
1
2
3
4
5
6
7

One simple measure of variability is the range, which is simply the difference between the highest and lowest scores in the distribution. The range of the self-esteem scores in Table 12.1 “Frequency Table Showing a Hypothetical Distribution of Scores on the Rosenberg Self-Esteem Scale”, for example, is the difference between the highest score (24) and the lowest score (15). That is, the range is 24 − 15 = 9. Although the range is easy to compute and understand, it can be misleading when there are outliers. Imagine, for example, an exam on which all the students scored between 90 and 100. It has a range of 10. But if there was a single student who scored 20, the range would increase to 80—giving the impression that the scores were quite variable when in fact only one student differed substantially from the rest.

By far the most common measure of variability is the standard deviation. The standard deviation of a distribution is, roughly speaking, the average distance between the scores and the mean. For example, the standard deviations of the distributions in Figure 12.4 “Histograms Showing Hypothetical Distributions With the Same Mean, Median, and Mode (10) but With Low Variability (Top) and High Variability (Bottom)” are 1.69 for the top distribution and 4.30 for the bottom one. That is, while the scores in the top distribution differ from the mean by about 1.69 units on average, the scores in the bottom distribution differ from the mean by about 4.30 units on average.

The computations for the standard deviation are illustrated for a small set of data in Table 12.3 “Computations for the Standard Deviation”. The first column is a set of eight scores that has a mean of 5. The second column is the difference between each score and the mean. The third column is the square of each of these differences. Notice that although the differences can be negative, the squared differences are always positive—meaning that the standard deviation is always positive. At the bottom of the third column is the mean of the squared differences, which is also called the variance (symbolized SD^2). Although the variance is itself a measure of variability, it generally plays a larger role in inferential statistics than in descriptive statistics. Finally, below the variance is the square root of the variance, which is the standard deviation.

Table 12.3 Computations for the Standard Deviation

X	$X - M$	$(X - M)^2$
3	−2	4
5	0	0
4	−1	1
2	−3	9
7	2	4
6	1	1
5	0	0
8	3	9
$M = 5$		SD2=288=3.50
		SD=3.50=1.87

Association between Variables

Association Between Variables

This following material is derived from SPSS eTutor by Dee Britton
Brtton, D 2020, *SPSS eTutor*, Suny Empire State College, viewed 2 May 2022, <https://subjectguides.esc.edu/SPSS>.

Learning Objectives

By the end of this chapter, students must be able to:

- understand the concept of association (or relationship) between variables
- differentiate between tests for the association between categorical variables and continuous variables
- interpret the findings from the statistical tests

While analysing data, researchers are interested in finding out the association (or relationship) between different types of variables. Two types of association are of particular interest:

- Association between categorical/nominal/ordinal variables
- Association between interval/continuous variables

Association between categorical variables

Sometimes a researcher wants to understand the relationship between categorical variables, which are also referred to as nominal or ordinal variables. Examples of such variables include gender, age categories, occupation, and brand preferences. Such associations can are explored via:

a) cross-tabulation and/or,

b) the chi-square test

a) Cross-tabulation

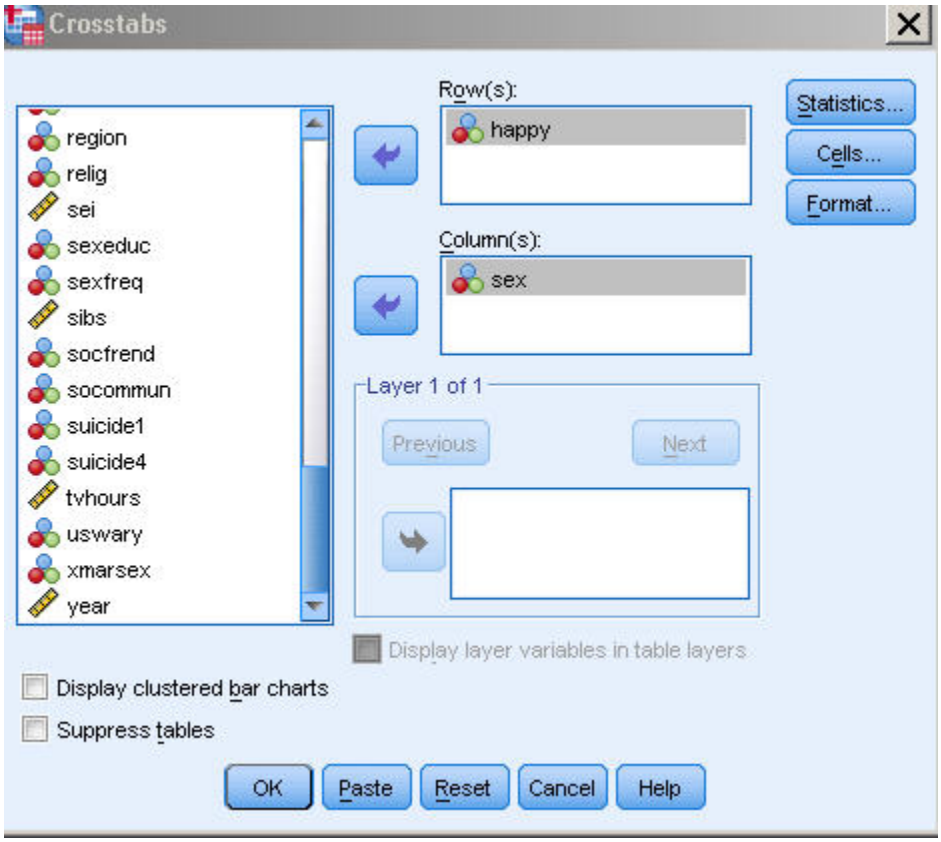
A cross-tabulation table is simply a frequency distribution for two variables together. A crosstab is a matrix that shows the distribution of one variable for each category of a second variable.
Britton, D 2020, SPSS eTutor: cross tabulations, Suny Empire State College, viewed 2 May 2022, <https://subjectguides.esc.edu/c.php?g=659059&p=4626940>.

To run a crosstab on SPSS, go to: Analyze, Descriptive Statistics, Crosstabs

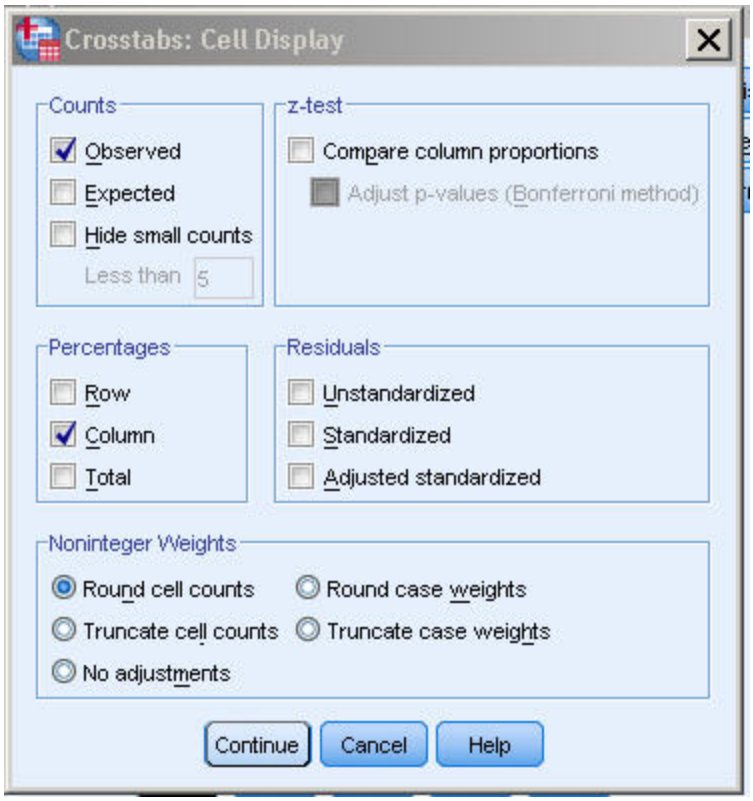
Highlight your dependent variable name, click on arrow pointing toward Row box

Highlight your independent variable name, click on arrow pointing toward Column box.

Your screen should look like this:



Click on Cells and then click the Column percentage box:



Click Continue, then OK. Your output should look like this:

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
GENERAL HAPPINESS * RESPONDENTS SEX	1495	99.7%	5	.3%	1500	100.0%

GENERAL HAPPINESS * RESPONDENTS SEX Crosstabulation

			RESPONDENTS SEX		
			MALE	FEMALE	Total
GENERAL HAPPINESS	VERY HAPPY	Count	198	237	435
		% within RESPONDENTS SEX	28.7%	29.4%	29.1%
	PRETTY HAPPY	Count	384	439	823
		% within RESPONDENTS SEX	55.7%	54.5%	55.1%
	NOT TOO HAPPY	Count	107	130	237
		% within RESPONDENTS SEX	15.5%	16.1%	15.9%
Total		Count	689	806	1495
		% within RESPONDENTS SEX	100.0%	100.0%	100.0%

What does this crosstab mean? This is relatively easy to interpret. 28.7% of males and 29.4% of females claimed that they are very happy. But what about a crosstab that has many attributes? For example, what if you wanted to analyze the relationship between the number of children that you have and your general happiness? This is the output of that analysis:

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
GENERAL HAPPINESS * NUMBER OF CHILDREN	1493	99.5%	7	.5%	1500	100.0%

GENERAL HAPPINESS * NUMBER OF CHILDREN Crosstabulation

			NUMBER OF CHILDREN					
			0	1	2	3	4	5
GENERAL HAPPINESS	VERY HAPPY	Count	97	69	108	84	44	18
		% of Total	6.5%	4.6%	7.2%	5.6%	2.9%	1.2%
	PRETTY HAPPY	Count	230	140	232	116	55	22
		% of Total	15.4%	9.4%	15.5%	7.8%	3.7%	1.5%
	NOT TOO HAPPY	Count	65	38	49	44	17	12
		% of Total	4.4%	2.5%	3.3%	2.9%	1.1%	.8%
Total		Count	392	247	389	244	116	52
		% of Total	26.3%	16.5%	26.1%	16.3%	7.8%	3.5%

b) Chi-square test

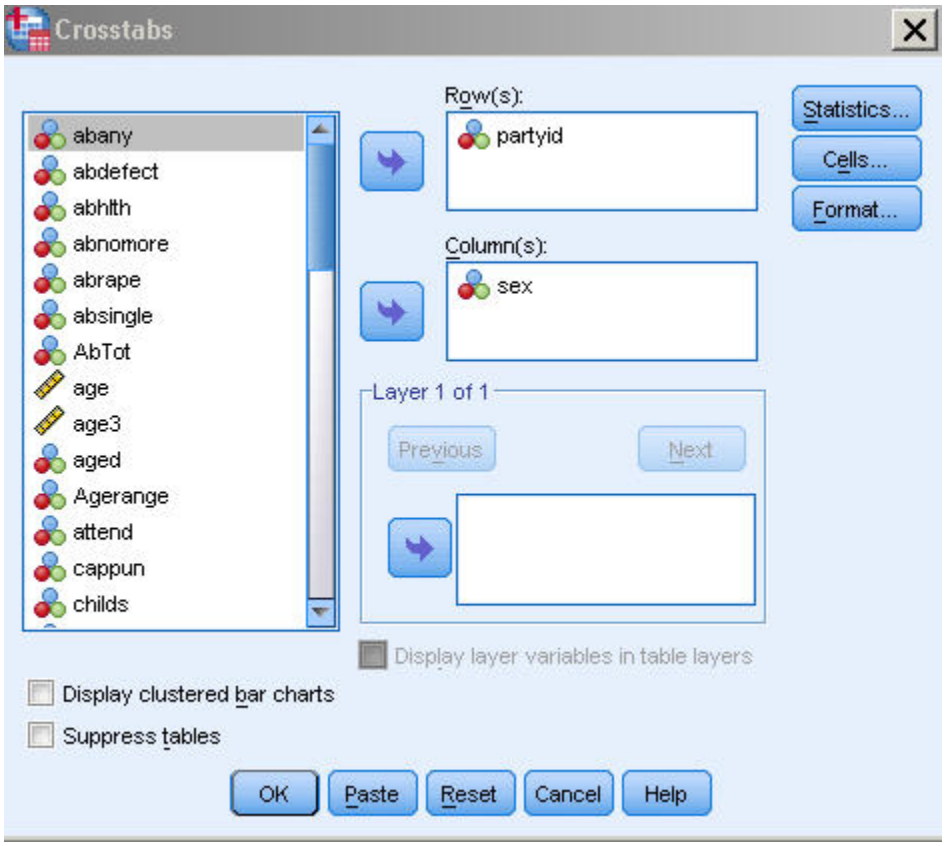
While cross-tabulation is simply a frequency/percentage table for two variables, the Chi-Square test is undertaken to examine if the results of the cross-tabulation are statistically significant. The Chi-square test is a non-parametric test used to determine whether there is a statistically significant association between two categorical variables.
Britton, D 2020, SPSS eTutor: chi-square test of independence, Suny Empire State College, viewed 2 May 2022, <https://subjectguides.esc.edu/c.php?g=659059&p=4626968>.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://westernsydney.pressbooks.pub/customerinsights/?p=159#oembed-1

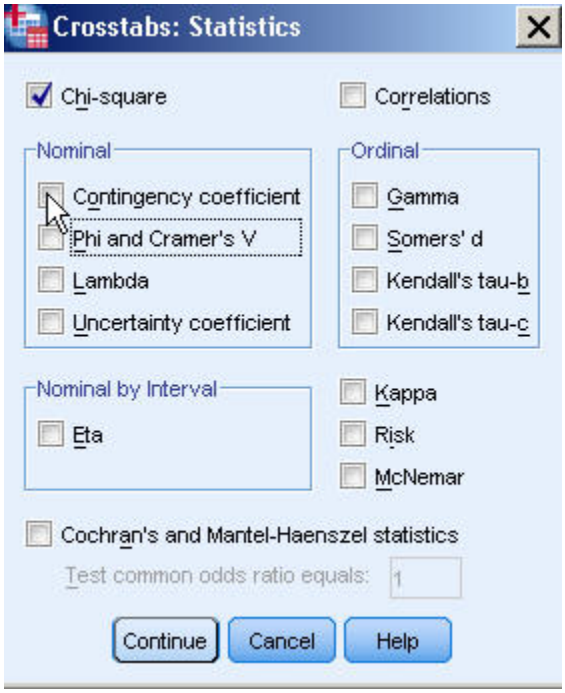
Source: EZPSS
EXPSS, 2019, Easy SPSS tutorial: chi-square test in SPSS, including interpretation, 29 Apr, online video, viewed 1 May 2022, <https://www.youtube.com/watch?v=MUyUaouisZE/>.

Click Analyze, Descriptive Statistics, Crosstabs. Click on your dependent variable name and place it in the "row" box and then select your independent variable and place it in the "column" box. For this example, our independent variable is SEX and dependent variable is PARTYID.

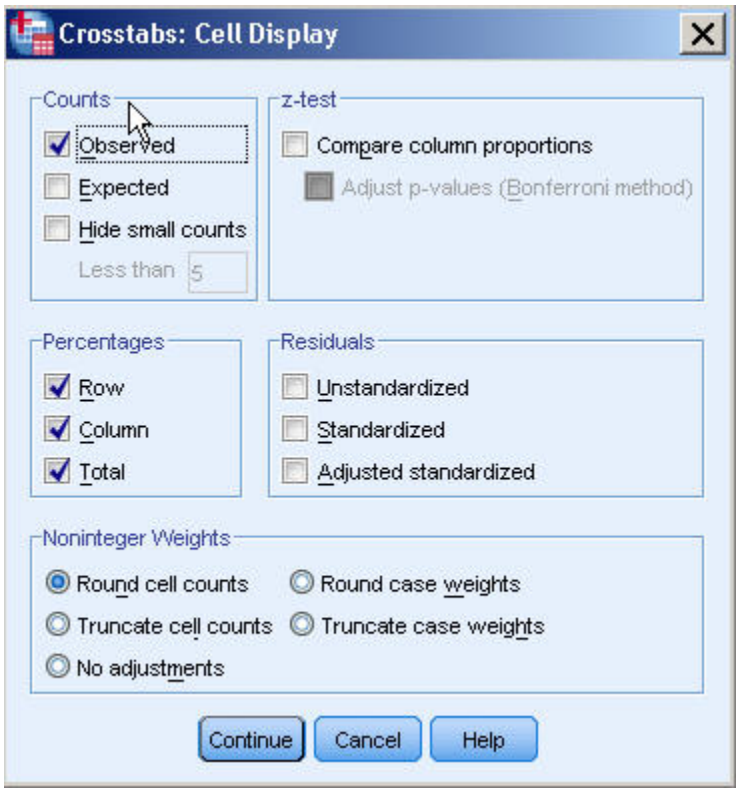
Your screen should look like this:



Now click the Statistics button and select Chi-Square.



Click OK. Then click Cells. Check to ensure that Observed is in the "count" box and that Row, Column and Total boxes are all checked in the "percentage" box.



Click OK. Your output should look like this:

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
POLITICAL PARTY AFFILIATION * RESPONDENTS SEX	1488	99.2%	12	.8%	1500	100.0%

			RESPONDENTS SEX		
			MALE	FEMALE	Total
POLITICAL PARTY AFFILIATION	DEMOCRAT	Count	225	311	536
		% within POLITICAL PARTY AFFILIATION	42.0%	58.0%	100.0%
		% within RESPONDENTS SEX	32.6%	39.0%	36.0%
		% of Total	15.1%	20.9%	36.0%
	INDEPENDENT	Count	270	277	547
		% within POLITICAL PARTY AFFILIATION	49.4%	50.6%	100.0%
		% within RESPONDENTS SEX	39.1%	34.7%	36.8%
		% of Total	18.1%	18.6%	36.8%
	REPUBLICAN	Count	177	205	382
		% within POLITICAL PARTY AFFILIATION	46.3%	53.7%	100.0%
		% within RESPONDENTS SEX	25.7%	25.7%	25.7%
		% of Total	11.9%	13.8%	25.7%
	OTHER PARTY	Count	18	5	23
		% within POLITICAL PARTY AFFILIATION	78.3%	21.7%	100.0%
		% within RESPONDENTS SEX	2.6%	.6%	1.5%
		% of Total	1.2%	.3%	1.5%
Total		Count	690	798	1488
		% within POLITICAL PARTY AFFILIATION	46.4%	53.6%	100.0%
		% within RESPONDENTS SEX	100.0%	100.0%	100.0%
		% of Total	46.4%	53.6%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.531[a]	3	.001
Likelihood Ratio	15.956	3	.001
Linear-by-Linear Association	5.815	1	.016
N of Valid Cases	1488		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.67.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.102	.001
	Cramer's V	.102	.001
N of Valid Cases		1488	

Interpreting Chi-square test for independence

One of the requirements for Chi-Square is that each and every cell has a frequency of 5 or greater. You first need to check to see if the data in your table meet this requirement. Look for footnote underneath the Chi-square Tests box. Our output includes this information in footnote 'a'; none of our cells have a frequency less than 5 and therefore we have not violated this chi-square assumption.

Now look at the "Pearson Chi-Square Asymp. Sig (2 sided)"*. Since Chi-Square is testing the null hypothesis, the Sig value must be .05 or less for there to be a significant statistical for the relationship between the variables. In this example, the Sig. is .001, so there is very strong statical significance for the relationship between gender and political party identification.

Association between interval/continuous variables

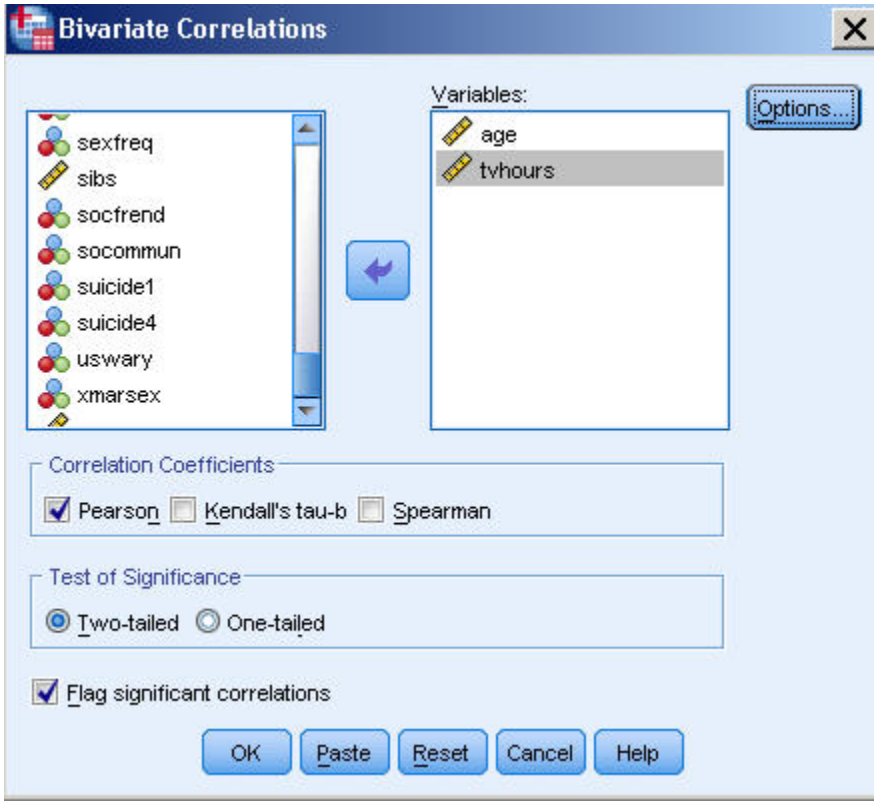
When the aim is to explore the relationship between two variables which are measured on an interval/ ratio scale, then researchers use the correlation test.

Pearson's correlation

A hypothesis test of **Pearson's correlation coefficient** is used to determine whether there is a statistically significant linear correlation between two continuous variables (for example, dollars spent on groceries and a consumer's age – in years).

Britton, D 2020, SPSS eTutor: descriptive statistics, Suny Empire State College, viewed 2 May 2022, <https://subjectguides.esc.edu/c.php?g=659059&p=4626896>.

To calculate Pearson's r, go to Analyze, Correlate, Bivariate. Enter your two variables. For example, we can examine the correlation between two continuous variables, "Age" and "TVhours" (the number of tv viewing hours per day). Your screen should look like this:



Click OK. Look in your output for the following:

Correlations

		AGE OF RESPONDENT	HOURS PER DAY WATCHING TV
AGE OF RESPONDENT	Pearson Correlation	1	.139**
	Sig. (2-tailed)		.000
	N	1491	966
HOURS PER DAY WATCHING TV	Pearson Correlation	.139**	1
	Sig. (2-tailed)	.000	
	N	966	973

**. Correlation is significant at the 0.01 level (2-tailed).

Note that the Pearson's r value for comparing age to age is 1, suggesting perfect correlation. If you think about this, that makes logical sense. What you are truly interested in examining is the Pearson's r value of the 2 different variables (in this case, the value is .139). This suggests that someone ages, they watch more television.

Here are guidelines for interpreting the strength of association for Lambda, Gamma, and Pearson's r (remember, lambda can only have a positive value):

Strength of Association	Value of Lambda, Gamma, Pearson's r
None	0.00
Weak association	+ .01- .09
Moderate Association	+ .10 – .29
Evident of strong association	+ .30 – .99
Perfect association, strongest possible	+ 1.00

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://westernsydney.pressbooks.pub/customerinsights/?p=159#oembed-2

Source: How2stats
How2stats 2011, *Pearson Correlation - SPSS EXPSS*, 1 Sep, online video, viewed 1 May 2022, <https://www.youtube.com/watch?v=VOI5llHfZVE&t=4s>.

Differences between Respondent Groups

Learning Objectives

By the end of this chapter, students must be able to:

- understand the difference between an independent samples t-test and ANOVA
- interpret the output from these tests

The following material is derived from " data-url="http://">Curtin University
Curtin University 2021, *Inferential statistics,* viewed 11 May 2022, <https://libguides.library.curtin.edu.au/uniskills/numeracy-skills/statistics/inferential#s-lg-box-wrapper-25242003>

One sample t-test

A **one-sample t-test** is used to test whether the sample mean of a continuous variable is significantly different to a 'test value' (some hypothesised value). For example, you would use it if you had a sample of student final marks and you wanted to test whether they came from a population where the mean final mark was equal to a previous year's mean of 70. In this case, the hypotheses would be:

H0: The sample comes from a population with a mean final mark of 70 ($\mu_{\text{final mark}}=70$)
HA: The sample does not come from a population with a mean final mark of 70 ($\mu_{\text{final mark}}\neq 70$)

Before conducting a one-sample t-test you need to check that the following assumptions are valid:

Assumption 1: The sample is a random sample that is representative of the population.

Assumption 2: The observations are independent, i.e. measurements for one subject have no bearing on any other subject's measurements.

Assumption 3: The variable is normally distributed, or the sample size is large enough to ensure normality of the sampling distribution.

If the last assumption of normality is violated, or if you have an ordinal variable rather than a continuous one (such as final grades of F, 5, 6, 7, 8, 9, 10), the **one-sample Wilcoxon signed-rank test** should be used instead.

Assuming the assumptions for the one-sample t-test are met though, and the test is conducted using statistical software (e.g. SPSS as in this example), the results should look something like the following:

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Final_mark	40	73.1250	8.76528	1.38591

One-Sample Test

Test Value = 70

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Final_mark	2.255	39	.030	3.12500	.3217	5.9283

Note that the first of these tables displays the descriptive statistics, which you should observe first in order to get an idea of what is happening in the sample. For example, the sample mean is 73.125 as compared to the test value of 70, giving a difference of 3.125 (this value can be calculated, or it is also displayed in the second table). To test whether or not this difference is statistically significant requires the second table though and in particular the p-value (which in this table is listed as 'Sig. (2-tailed)') and the confidence interval for the difference. In terms of the p-value:

- If p<.05 we reject H0, meaning the sample has come from a population with a mean significantly different to the test value.
- If p>.05 we do not reject H0, meaning the sample has come from a population with a mean that is not significantly different to the test value.

In this case, our p-value of .03 shows that the difference is statistically significant.

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This is confirmed by the confidence interval of (.3217, 5.9283), for the difference between the population mean and our test value (70). Because this confidence interval does not contain zero, it again shows that the difference is statistically significant. In fact, we are 95% confident that the true population mean is between .3217 and 5.9283 points higher than our test value.

Note that while the test statistic (t) and degrees of freedom (df) should both generally be reported as part of your results, you do not need to interpret these when assessing the significance of the difference.

If you would like to practise interpreting the results of a one sample t-test for statistical significance, have a go at one or both of the following activities:

Activity 1:

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://westernsydney.pressbooks.pub/customerinsights/?p=157#h5p-37

Independent samples t-test

An **independent samples t-test** is used to test whether there is a significant difference in sample means for a continuous variable for two independent groups. For example, you would use it if you collected data on hours spent watching TV each week, and you wanted to test if there was a significant difference in the mean hours for males and females. In this case, the hypotheses would be:

H0: There is no significant difference in TV hours per week for males and females ($\mu_{males}=\mu_{females}$, or $\mu_{males}-\mu_{females}=0$)
HA: There is a significant difference in TV hours per week for males and females ($\mu_{males}\neq\mu_{females}$, or $\mu_{males}-\mu_{females}\neq0$)

Before conducting an independent samples t-test you need to check that the following assumptions are valid:

Assumption 1: The sample is a random sample that is representative of the population.

Assumption 2: The observations are independent, i.e. measurements for one subject have no bearing on any other subject's measurements.

Assumption 3: The variable is normally distributed for both groups, or the sample size is large enough to ensure the normality of the sampling distribution.

If the last assumption of normality is violated, or if you have an ordinal variable rather than a continuous one (such as hours recorded in ranges), the **Mann-Whitney U test** should be used instead.

Assuming the assumptions for the independent samples t-test are met though, and the test is conducted using statistical software (e.g. SPSS as in this example), the results should look something like the following:

Note that the first of these tables displays the descriptive statistics, which you should observe first in order to get an idea of what is happening in the sample. For example, the difference between the sample means for males and females is 1.70833 (this value can be calculated from the means in the first table, and is also displayed in the second table – the fact that it is negative is simply because females watched more TV than males).

Next, note that there are actually three p values (and two confidence intervals) in the second table; one is used in the situation where the variances for the two groups are approximately equal (the one in the 'Sig. (2-tailed)' column in the top row of the table), one is used in the situation where the variances for the two groups are not approximately equal (the one in the 'Sig. (2-tailed)' column in the bottom row of the table), and the other one (the first one in the table, in the 'Sig.' column) is used to determine which situation we have.

We need to interpret the latter first; this p-value is for Levene's Test for Equality of Variances, for which the null hypothesis is that there are equal variances. Hence, if p<.05 it is evidence to reject this null hypothesis and assume unequal variances, while if p>.05 it is evidence to fail to reject this null hypothesis and assume equal variances. Depending on which is which, determines which of the other p values (and confidence intervals) you should interpret. In this case, the p-value of .966 means we can assume equal variances and should interpret the p-value in the top row of the remainder of the table. Again, the interpretation of this p-value is that:

- If p<.05 we reject H0, meaning the means of the two groups are significantly different.
- If p>.05 we do not reject H0, meaning the means of the two groups are not significantly different.

In this case, our p-value of .564 (in the top row of the remainder of the table) shows that the difference between the means is not statistically significant.

This is confirmed by the confidence interval of (−7.654, 4.238) for the difference between the means. Because this confidence interval contains zero it again means the difference is not statistically significant. We are 95% confident that the difference in mean hours spent watching TV each week for

males and females is between −7.654 and 4.238 hours.

Note that while the test statistic (t) and degrees of freedom (df) should both generally be reported as part of your results, you do not need to interpret these when assessing the significance of the difference.

If you would like to practise interpreting the results of an independent samples t-test for statistical significance, have a go at one or both of the following activities:

Activity 1:

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Activity 2:

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://westernsydney.pressbooks.pub/customerinsights/?p=157#h5p-39

One-way ANOVA

One-way ANOVA is similar to the independent samples t-test but is used when three or more groups are compared. For example, comparing the mean weights of people who do no exercise, who do moderate exercise and who do lots of exercises.

The null hypothesis for a one-way ANOVA states that all the population means are equal, while the alternative hypothesis states that at least one of them is different.

Before conducting a one-way ANOVA you need to check that the following assumptions are valid:

Assumption 1: The sample is a random sample that is representative of the population.

Assumption 2: The observations are independent, i.e. measurements for one subject have no bearing on any other subject's measurements.

Assumption 3: The variable is normally distributed for each of the groups, or the sample size is large enough to ensure normality of the sampling distribution.

Assumption 4: The populations being compared have equal variances.

If a one-way ANOVA is conducted and it turns out that at least one of the means is different, you will need to investigate further to determine where the difference lies using **post hoc tests**, for example Tukey's HSD.

For now though, to practise determining when the one-way ANOVA is suitable to use have a go at the following question:

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18

Sentiment Analysis

Learning Objectives

By the end of this chapter, students must be able to:

- Understand the concept of sentiment analysis
- Identify the advantages and limitations of sentiment analysis
- Different steps in undertaking sentiment analysis

What is sentiment analysis?

Sentiment analysis in marketing is the process of determining people's opinions about a product or a company by analysing public's comments on various online platforms. Besides leaving comments on an organisation's own website, online users may also provide feedback and engage in discussions, and conversations on a variety of different platforms. Examples of such platforms include social media websites (e.g., Instagram), knowledge platforms (such as Quora), media sharing platforms (e.g., YouTube, Vimeo, Spotify), service-providing platforms (e.g., Uber, Airbnb), and several shopping websites (e.g., Amazon). In the olden times, this concept was known as 'product reviews'. However, now with the amount of information being generated, analysts are able to 'crawl' the web and mine relevant data. Online statements or customer comments are turned into categorical data (like "positive", "negative" or "neutral"), and summarised to give a manager a bird's eye view of how the general public is responding to their brand or product.

While sentiments may also be revealed in customer conversations with an organisation's call center, much of the research in this area has focused on analysing people's written comments online.

Advantages in Using Sentiment Analysis

Gauging public sentiment has never been easier, quicker, cheaper, and less biased. Sophisticated tools have made sentiment analysis accessible to many businesses. Marketers are able to make swift changes to their campaigns (e.g., changing the music being played in an ad by Expedia) in view of the 'sentiment' being expressed. In comparison, using traditional tools of research would be prohibitively expensive and time-consuming. Moreover, the results would also be prone to a degree of human error.

Sentiment analysis can help reveal 'influencers' for a brand or a product. While many companies are able to 'recruit' social media influencers to market their brands, it is quite possible that a brand already has a cohort of loyal supporters. These are the people who are a brand's advocates and are able to influence others through their comments. While social media influencers are often viewed as people with a huge following, there is now a realisation that 'micro-influencers' are also important. The number of followers for micro-influencers may be relatively small, yet their bond with their followers is strong. This could be critical when people are seeking sincere advice on matters which are important to them.

Similar to the above point, it is equally important to be able to identify hate speech online, especially when it involves the brand or any of its key values. Brand hate is different from other negative sentiments such as mere disappointment, dissatisfaction, or frustration. There could be different levels of brand hate with the most extreme one leading to brand bullying. People who display such a strong negative sentiment are also likely to indulge in negative online word of mouth, online public complaining, and driving boycott campaigns. Sentiment analysis is useful in highlighting such a trend, even if it is only limited to a certain group. Strategies to navigate through such consumer negativity in the digital world is critical.

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Steps in sentiment analysis

Below is a simple process through which sentiment analysis could be undertaken:

1. **Detecting sentiment**
   This is the most basic level of conducting sentiment analysis. It simply provides a quick overview of the overall opinion of customers. This means growing through online comments and extracting opinionated data (such as "I love this!"). In comparison, there could be other types of data such as objective data (like "the restaurant is located downtown"), which may not display any consumer sentiment at all

2. Categorising sentiment and identifying the intensity

This step involves detecting whether the sentiment is positive, negative, or neutral. Depending on the type of software being used, managers may also add weighting to these categories, e.g.,

- very positive
- somewhat positive
- neutral
- somewhat negative
- very negative

These categories demonstrate the intensity of the sentiment

3. Mixed Connotation
Sometimes, the text contains mixed or ambivalent opinions, for example, "staff was very friendly but we waited too long to be served". One would need to separately interpret such statements which might be difficult for a simple machine-based program to code and analyse

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://westernsydney.pressbooks.pub/customerinsights/?p=88#oembed-1

Source: Fun Robotics
Fun Robotics, 2021, *What is sentiment analysis?, 1* Apr, online video, viewed 10 May 2022, <https://www.youtube.com/watch?v=MUyUaouisZE/>.

Limitations of sentiment analysis

Below are a few, key limitations of sentiment analysis tools as recognized in the industry:

- Machine-dependent sentiment analysis is based on the way people use language to express their opinions. A word's meaning in the dictionary could be very different from the way people use it in everyday conversations. Sentiment analysis may run into issues when online users utter phrases to display sarcasm
- It is still felt that sentiment analysis is most effective when it is used with large and numerous data sets. Small businesses may find that there is not much data available for their products/ services which can be effectively analysed
- Moreover, sentiment analysis is not a one-off activity. It has to be integrated into a firm's information-gathering strategy. To get real value out of sentiment analysis tools, one needs to analyse large quantities of textual data on a regular basis

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://westernsydney.pressbooks.pub/customerinsights/?p=88#h5p-16

Table 2: Examples of different types of emotions, classified into positive and negative sentiments

Types of Emotions	Exemplar Statements
Joy	"It was so relaxing dining at this restaurant"
Frustration	"This is the third time I am trying to call you to get an appointment"
Trust	"I'd only go to Ecco for my shoes"
Anger	"These)(#$_)#@U*%() not only sent me a wrong invoice but slapped with a penalty for late payment"
Fear	"I don't think I will shop at Westfield after all the COVID cases yesterday"
Sadness	"McCain's no longer make their vege lasagne 😕 "
Surprise	"I didn't realise Coles would bake fresh bread!"

19

Artificial Intelligence and Information

Learning Objectives

By the end of this chapter, students must be able to:

- Describe the role of Artificial Intelligence in Marketing Research
- Understand the benefits of Artificial Intelligence in Research
- Explain the limitations of Artificial Intelligence technology

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://westernsydney.pressbooks.pub/customerinsights/?p=170#oembed-1

Source: Digital Marketing Made Easy

Digital Marketing Made Easy 2021, *Artificial intelligence explained in 3 minutes: 3 applications in marketing,* 14 May, online video, viewed 10 May 2022, <https://www.youtube.com/watch?v=jBaH_g4QKAc>.

The following material is derived from Huang and Rust
Huang, MH & Rust, RT 2020, 'A strategic framework for artificial intelligence in marketing', *Journal of the Academy of Marketing Science,* vol. 49, pp. 30-50, viewed 11 May 2022, <https://link.springer.com/article/10.1007/s11747-020-00749-9>

Artificial intelligence (AI) in marketing is currently gaining importance, due to increasing computing power, lower computing costs, the availability of big data, and the advance of machine learning algorithms and models. We see wide applications of AI in various areas of marketing. For example, Amazon.com's Prime Air uses drones to automate shipping and delivery. Domino's pizza is experimenting with autonomous cars and delivery robots to deliver pizza to the customer's door.

Artificial intelligence (AI) refers to intelligence demonstrated by machines, as opposed to the natural intelligence displayed by humans and animals. Artificial Intelligence is, machines behaving intelligently and undertaking problem-solving or completing tasks. It is a very broad subject that involves computer science, cognitive science, mathematics, philosophy, neuroscience, linguistics, etc.

Artificial Intelligence (AI) and Marketing Research

AI can be used in three different ways in marketing research: a) data collection; b) market analysis; and c) understanding the customer and developing key insights.

AI and Data Collection:

AI can automate data collection about the market, the environment, the firm, the competitors, and the customers. In the digitally connected world, market data can be easily tracked and monitored. Data sensing, tracking, and collection are routine, repetitive tasks that can be easily automated via AI. Existing studies have shown various ways of using AI for data collection. For example:

- customer intelligence, including data about consumers, their activities, and their environments, can be collected if they use connected devices (e.g., wearable devices, smart fridges, and digital assistants such as Siri)
- product usage and consumption experience can be visualized with Internet of Things (IoT)
- various advanced technologies and analytics can capture unstructured marketing activity data
- in-car sensors can track driving behavior for determining insurance premiums
- retail technologies, such as heat maps, video surveillance, and beacons, can be used for profiling and recognizing retail shoppers

Previous studies show that, given the repetitive, routine, but high-volume nature of market data, AI can collect data efficiently at scale. The data collection capability of AI is not limited to observable behavioral data; it can also be used to facilitate survey or experimental data collection to capture consumer psychographics, opinions, and attitudes. For example, human administration and supervision of ongoing surveys are no longer required and can be automated. SurveyMonkey and SurveyCake are two commercial survey platforms that automate survey design and data collection. By incorporating the principles of gaming and AI better quality data is being collected online. Online surveys have become more fun and engaging. Survey participants are also more likely to complete such surveys and recommend them to others. In fact, by using AI technology, researchers believe that in the next few years, nearly 1 in 4 surveys will be spoken to a digital assistant (Qualtrics 2022).

AI and Data Analysis:

AI can be used to analyse information. Here are a few examples of how researchers have used AI to undertake analysis:

- Automated text analysis is applied to gain insights into consumers' behaviour (e.g., by analysing customer reviews on a website)
- Machine learning algorithms and lexicon-based text classification is used to analyse various social media datasets
- Big data marketing analytics is a mainstream approach for generating marketing insights. Specific applications include mapping market structures for large retail assortments using a neural network language model, by analyzing the co-occurrences of products in shopping baskets, detecting copycat mobile apps using a machine learning copycat-detection method, and aiding social media content engineering by employing natural language processing algorithms that discover the associations between social media marketing content and user engagement

AI and Improved Understanding of the Customer:

AI can be used to understand existing and potential customer needs and wants, for example, who they are, what they want, and what their current solutions are. The major distinction between market analysis and customer understanding is that the latter often involves emotional data about customer sentiments, feelings, preferences, and attitudes. Thus, AI does not only churn out quick numbers, it also has the capability of analyzing emotional data. For example, Affectiva partnered with Ford to create AutoEmotive sentiment analysis, to try to figure out drivers' emotional states.

For potential customers, marketers can use feeling AI to understand what they want and why they are happy with competitors or outside options. Some marketers may feel that potential customers' needs and wants are more difficult to predict as their emotional data is less available. However, Unilever has proved otherwise. With the help of AI data centers, Unilever synthesized insights through social listening and CRM, and discovered a link between ice cream and breakfast. Unilever discovered that

there were at least 50 songs with ‘ice cream for breakfast’ in their lyrics (which people were listening to), as well as Dunkin Donuts selling ice cream during the morning part. With this insight, Unilever developed a new brand Ben & Jerry’s with a range of cereal-flavored ice-creams for breakfast.

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://westernsydney.pressbooks.pub/customerinsights/?p=170#h5p-9

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://westernsydney.pressbooks.pub/customerinsights/?p=170#h5p-11

Limitations of Artificial Intelligence

Financial and Human Resource Cost:

Using AI requires financial and human resources. The initial cost of setting up an AI infrastructure is always resource-intensive. Thus, it may not be feasible for all organisations. Investing in AI can mean heavy expenditures on data acquisition, computing, and storage equipment, as well as spending on recruiting relevant personnel and training them. As with all investments, the returns may not be immediate. It may take a while to realise the benefits of using AI.

AI systems should not be seen as a replacement for human capital. In fact, AI systems only work best

when it is best integrated with the expertise of the organisation. It is not advisable to leave customers or suppliers at the mercy of a 'digital assistant'. There are numerous case studies that demonstrate the limitation of such an approach.

Unrealistic Expectations from AI/Threatened by AI:

At times, managers can have unrealistic expectations from AI technologies. Not all aspects of AI will add value to all business operations. Managers need to analyse what is feasible for achieving specific objectives. The author of this book has worked in the area of social robotics. Deploying a social robot within a business environment often posed challenges. Either the expectations of the business managers were too high for the social robot (e.g., "will it be able to answer the phone?") or – in some cases – it did not help with their overall communication objectives. In another few cases, employees were threatened with the arrival of a social robot as they feared job losses. In many instances, the overall evaluation of the technology was undertaken by individuals who may have had a bias towards the use of the machine.

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://westernsydney.pressbooks.pub/customerinsights/?p=170#h5p-10

20

Social Media Analytics

Learning Objectives

By the end of this chapter, students must be able to:

- Identify different types of social media analytics and their functions
- List the steps in undertaking a review of a company's social media performance, using analytics

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://westernsydney.pressbooks.pub/customerinsights/?p=93#oembed-1

Source: Netbase Quid
Netbase Quid 2016, *The importance of social media analytics for business*, 28 Jun, online video, viewed 1 May 2022, <https://www.youtube.com/watch?v=ocK8o9ROkhE>.

The following material is derived from Brosius and Cless
Brosius, L & Cless, A 2019, *Utilizing social media analytics to demonstrate program impact,* viewed 11 May 2022, <https://evalu-ate.org/blog/brosius_cless_nov2019/>

The application of social media within programs has grown exponentially over the past decade and has become a popular way for programs to engage and reach their stakeholders and inform engagement efforts. Consequently, organizations are utilizing data analytics from social media platforms as a way to measure impact. These data can help managers understand how program objectives, progress, and outcomes are disseminated and used (e.g., through discussions, viewing of content, following program social media pages). Social media allows programs to:

- Reach broad and diverse audiences
- Promote open communication and collaboration
- Gain instantaneous feedback
- Predict future impacts – *"Forecasting based on social media has already proven surprisingly effective in diverse areas including predicting stock prices, election results and movie box-office returns." (*Priem 2014).
  Priem, J 2014, 'Altmetrics', in B. Cronin & C. R. Sugimoto (Eds.), *Beyond bibliometrics: harnessing multidimensional indicators of scholarly impact,* The MIT Press, Cambridge, pp. 263-288.

Social Virtual Reality (or Social VR) has seen an increase in users recently. Photograph: Sally Tsoutas

What Is Social Media Analytics?

Social media analytics is the ability to gather and find meaning in data gathered from social channels to support business decisions — and measure the performance of actions based on those decisions through social media. Social media analytics is broader than metrics such as likes, follows, retweets, previews, clicks, and impressions gathered from individual channels. Social media analytics uses specifically designed software platforms (e.g. Twitonomy) that work similarly to web search tools. Data about keywords or topics are retrieved through search queries or web 'crawlers' that span channels. Fragments of text are returned, loaded into a database, categorized, and analyzed to derive meaningful insights.

Should social media analysis be conducted?

Metrics available for social media are extensive and not all are useful for determining the impact of a program's social media efforts. As Sterne (2010)
Sterne, J 2010, *Social media metrics: how to measure and optimize your marketing investment,* John Wiley, Hoboken NJ.
explains, there needs to be *meaning* with social media metrics because *"measuring for measurement's sake is a fool's errand"; "without context, your measurements are meaningless";* and *"without specific business goals, your metrics are meaningless."* Therefore, it is important to consider specific program objectives and which metrics (key performance indicators [KPIs]) are central to assessing the progress and success of these objectives.

Additionally, it is also worthwhile to recognize that popular social media platforms are always changing, categorizing various social media platforms is difficult, and metrics used by different platforms vary.

In order to provide more meaning to the social media analyses of a program, it may be helpful to consider using a framework to provide a structure for aligning social media metrics to the program's objectives and assist with demonstrating progress and success towards those objectives.

Knowing when and if to conduct a social media analysis is an important concept to consider. Just because a social media analysis can be conducted doesn't mean one should be conducted. Therefore, before beginning one it is important to take the time to determine a few things:

1. What are the specific goals that will be answered through social media?
2. How will these goals be measured using social media?
3. Which platforms will be most valuable/useful in reaching the targeted audience?

Social Media Metrics across different platforms

Below framework taken from the literature, which has been developed by Neiger et al. (2012)
Neiger, BL, Thackeray, R, Van Wagenen, SA, Hanson, CL, West, JH, Barnes, MD & Fagen, MC 2012, 'Use of social media in health promotion: purposes, key performance indicators, and evaluation metrics' *Health Promotion Practice,* vol. 13, no. 2, pp.159-164.
. It has been used to classify and measure various social media metrics and platforms in health care.

Table: Social Media Metrics and Associated Objectives

Social Media Metric (Indicator)	Performance Indicator	Marketing/Communication Objective
Number and frequency of	Social Media presence	Basic presence on Facebook, Twitter, Instagram,

posts Number of visits Number of comments Number of clickthroughs Video views Pageviews Number of ratings Number of followers/fans Number of 'likes'	Exposure	YouTube etc. The number of times content is viewed on social media
Number of people participating in discussions Number of 'unsubscribed' followers Demographics of followers	Reach	The number of people reached by social media content
Number of 'shares' or 'retweets' Number of 'downloads' Number of 'mentions' or 'tags' Amount of discussion generated Content leads to other content-generation Number of interactive features used such as #, @, etc.	Engagement	The number of people who 'engage' with the content by sharing and using it or participating in generating discussion around the topic

After compiling and cleaning data from the social media platforms utilized by a company or its brand, it is important to then consider the brand's goals and audience, in order to format a report and/or visual that, will best communicate the results of the social media data. The results from the analysis can be organised to include the following information:

- The extent to which the company's content was viewed
- The type of audience viewing/engaging with the content
- The engagement and preferences with the content being posted on various social media platforms by stakeholders
- Potential areas of focus for the company's future social media efforts

How to track social media performance with social media analytics tools

Below is a systematic process to track a company's social media performance

1. Define the goals for a company's social media campaign (e.g., to gain 10,000 followers)

2. Choose social media platforms to use

3. Choose relevant metrics which would measure performance against each goal

4. Set benchmarks/ growth rates for each metric to demonstrate progress

5. Generate a social media analytics report (identify emerging trends/insights into customer behaviour)

6. Take action to improve your social media performance (e.g., making it easy for customers to send a query on FB)

7. Revise and revisit (social media metrics) regularly

21

Communicating Insights

Learning Objectives

By the end of this chapter, students must be able to:

- be familiar with the different ways of presenting research results
- be able to apply different graphs to present results

This chapter is derived from the Australian Bureau of Statistics
Australian Bureau of Statistics n.d., *Presentation of results,* viewed 31 March 2022, <https://www.abs.gov.au/websitedbs/d3310114.nsf/home/Basic+Survey+Design+-+Presentation+of+Results>.

Presenting the results in a clear and logical format to the client is one of the most important tasks for the person managing the survey. When presenting results, the format of the presentation should be tailored to address the aims and objectives of the survey and to satisfy the potential users of the results. Consideration should be given to the level of statistical understanding of the clients and users, particularly in regard to statistical terminology. The presentation needs to be effective, easy to understand and convey the main features of the data.

Written Reports

When presenting the data, some form of a written report is essential. The report should convey the main features clearly and follow a logical progression, use as little jargon as possible, provide insight into the data and make the results as interesting as possible. As the author of the report, you should convey specific messages rather than generalised information. You should also put forward theories to explain

the findings and encourage the users to further explore the data. If appropriate, you may need to include recommendations.

The contents of the report and its balance of words, tables and graphs will naturally depend on the topic, the results and the likely readers. Graphs and tables convey complex information clearly and can be used to add variety. At all times it should be remembered that the report is written to be read, and so needs to make sense and be understandable.

A survey report generally covers:

Introduction

The introduction states the purpose and aims of the survey and the aims of the report; gives the background to the research; defines terms and concepts; and states whether the survey is testing an hypothesis or is exploratory.

Methodology

The methodology describes the method of sampling and information on the survey population, as well as how the data was analysed and the statistical procedures which were used.

Findings and Analysis

The findings and analysis section is the main part of the report which deals with details of the sample numbers, response rates, results and interpretation of tabulations etc. and discusses possible courses of action.

Conclusions and Recommendations

The conclusions summarise the major findings of the report and answers questions posed in the introduction. The recommendations outline what actions are indicated on the basis of the conclusions.

Appendices and References

The appendices consist of items which may be useful to the reader (e.g. the questionnaire) but not essential to the report. References list the books, journals and papers referred to in the study.

Remembering that the report is likely to serve as a basis for discussion, some other important considerations are the title, use of headings and sub-headings, the colour and design of the cover and the overall appearance of the report – it should stimulate the reader's interest.

Statistical Representation

The manner in which the results are presented will depend on the data and the types of descriptive statistics required. Tables and graphs are the most common form of presentation but other types are available. In general, tables are more detailed – showing the actual values, whereas graphs are more useful in showing relationships – concentrating on the form, shape and movement of the data. Graphs are particularly useful in representing the change in the value of a data item over a period of time. Usually, either a graph or a table will be sufficient to represent a set of data.

Tables

Tables are the most common form of statistical presentation. Tables present additional information which cannot be shown in general text. A good table is one in which patterns and exceptions stand out when looking at the table, followed by a small paragraph commenting on the table. Tables are usually only used to present a few values as they become difficult to comprehend if they involve too many numbers.

Tables should have clear headings. Some other useful guidelines are:

- to round data to 4 or 5 significant figures which makes the data easier to see and manipulate;
- reading down is easier than reading across a row, especially for a large number of items;
- row and column averages or percentages may help the reader interpret the data – widely spaced columns are difficult to compare and should be avoided, and
- totalling rows and/or columns is usually helpful

Graphs

We can also use a sequence of simple graphs to tell a story about the data and to give insight into findings. This can be supported by an explanatory paragraph.

Graphs are a visually attractive way of presenting data. They maintain the interest of the readers and encourage them to think about the data. Although the amount of information which can be presented is limited, graphs often reveal or highlight “hidden” facts in complex data. Trends and relationships are more clearly grasped from a graph rather than a table or text and are therefore better remembered by the reader. However, graphs are not always necessary and should only be used where it is appropriate. Keep in mind that the reader may not be familiar with the data and therefore you need to include sufficient information on the graph to explain the data.

Constructing Graphs

- Titles: A title is essential and is best placed at the top. It should indicate the “what, where and when” of the graph as concisely as possible and should be larger than the lettering on the graph itself
- Scales: the horizontal scale usually measures the time unit where a graph is over a period of time, and the vertical scale measures the variable under consideration. Where possible the vertical scale should begin at zero
- shading and colouring can be added to create visual emphasis;
- both axes should be marked and named with scales and units;

- all parameters and variables should be defined as concisely as possible;
- a legend may be necessary, particularly for detailed graphs with shading and/or colouring;
- labels should be used if more than one variable is plotted on the same graph; and
- footnotes may be used to explain unusual features such as breaks in the series.

Types of Graphs

The decision as to which type of graph to use depends on the type of data being presented. The following are some of the types of graphs that could be used:

- Line or Curve Graphs

These graphs are used when emphasis on the movement rather than the size of the data item or when several series are being compared. These types of graphs show variations in the data plotted over a period of time.

- Bar or Column Graph

This type of graph depicts numerical values over a given variable. The value is represented by the height of the column. This type of graph is especially effective for showing large changes from one period to the next.

- Grouped Columns/Bars

These graphs compare different categories on the same graph. Groups of columns, with each column in the group representing a different category, are plotted on the same axis.

- Pie Chart

These charts are used for comparison (in percentage terms) of components. The components can be compared with each other and the contribution they make with the whole. These graphs are best used when there is a small number of categories.

- Map

A map is used to show the boundaries of areas. Various shadings for different regions can show how the value of variable changes between locations.

- Other Graphs

Some other graphs which are available include Index, Pictogram, Surface Chart, Cumulative Curve, Deviation Line, Sliding Bar Chart, Dot Chart, Population Pyramid, Map Chart, Stacked Bar and Scatter Diagram.

Other Forms of Presentation

Oral Presentations

Depending on the circumstances (users, type of data, results), a written report may be inadequate or may need to be supplemented. Oral presentation of the results of a survey is often neglected as an important means of conveying information. Whereas a written report provides great detail with a wide range of results, an oral session can only emphasise a few major points. However, this can often be most suitable depending on the audience. As with a written report, the poor presentation may cause the survey results to be rejected. The spoken word and visual aids can have a great impact on an audience. The presenter therefore should be aware of who the presentation is aimed at and know what survey results may be contrary to existing ideas.

Posters

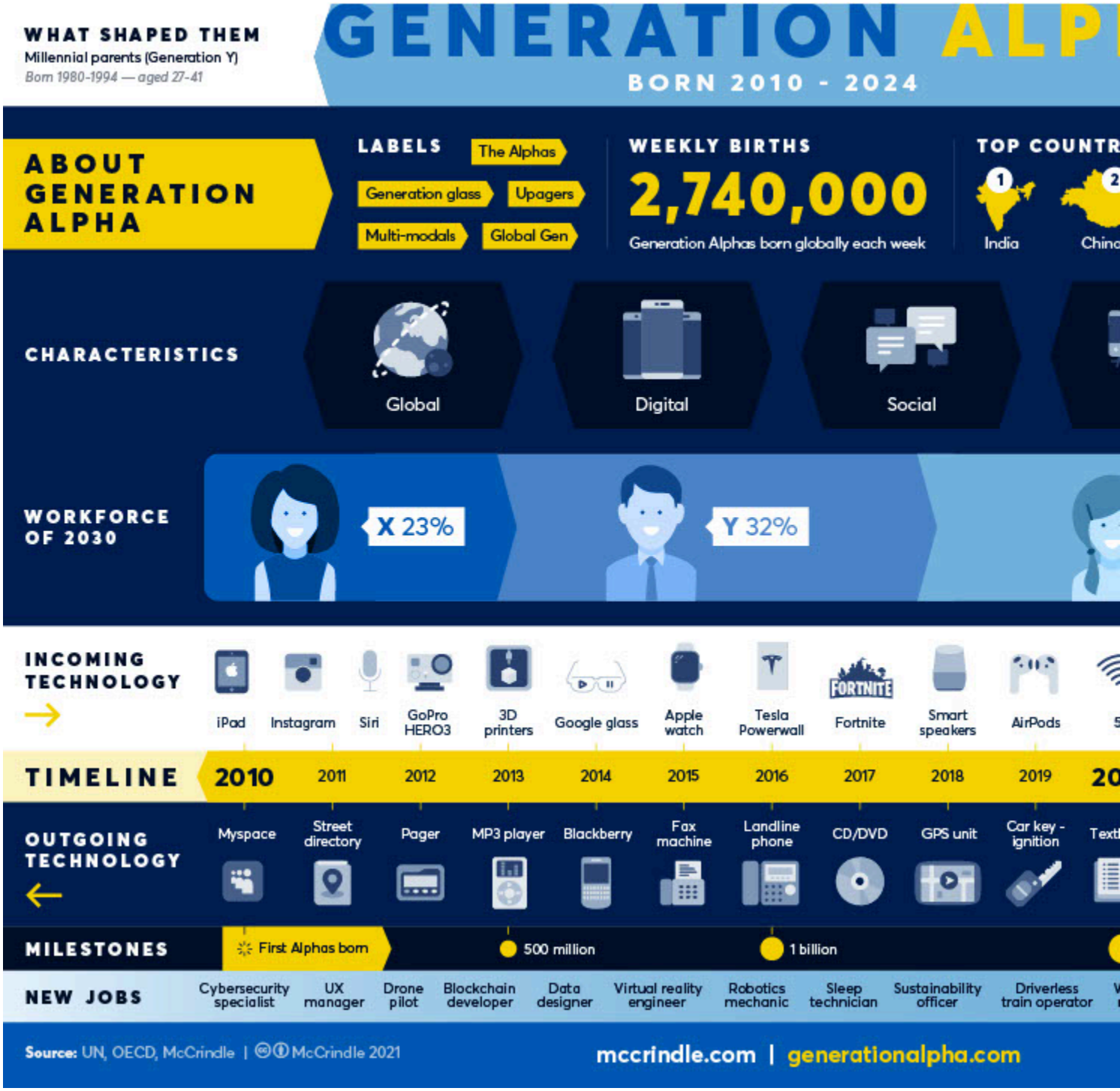
A poster is one way to attract attention but only one direct statement should be made. The message must be noticeable at a glance and the poster itself must be attractive to encourage possible users to inspect it.

Panel Exhibits

A panel exhibit is an extension of the poster presentation. This type of presentation gives more details and expands several main ideas. Again it is important that the panels be colourful and attractive.

Charts (often referred to as an infographic)

A chart may be appropriate depending on the data. A chart is an outline map that can contain photographs, words, figures, graphs, diagrams, maps, symbols, illustrations, etc (eg. a weather chart).



Videos

The use of videos and television can provide an additional means of communication of the survey results.

Conclusion

It is important to present data well. If we have gone to the effort, time and expense of undertaking a study, then we have to ensure that we present the data in a clear, logical way. We must consider the use of text, tables and diagrams to construct a document that is useful and understandable. The ultimate aim of any presentation is to inform the user of the results of the research in a way that can be used to promote informed decision making.

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Infographics

Learning Objectives

By the end of this chapter, students must be able to:

- understand the importance of using infographics
- be familiar with the key elements of an effective infographic

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://westernsydney.pressbooks.pub/customerinsights/?p=164#oembed-1

Source: Visme
Visme 2019, *The 14 dos and don'ts to design beautiful and effective infographics*, 8 Oct, online video, viewed 30 May 2022, <https://www.youtube.com/watch?v=uBBmbdPbfhw>.

What is an infographic?

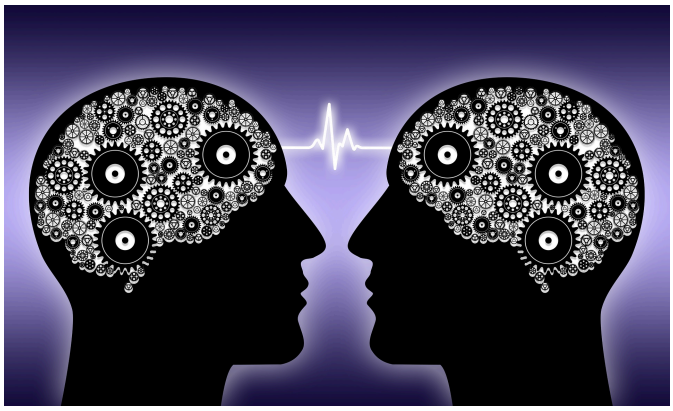
Infographics visually communicate complex data and information in a graphic format that is easy to read and understand. They often combine illustrations, icons, and data visualisations to engage the reader. They are used very effectively in online settings to convey information whilst using minimal text.

Infographics are an important tool due to the reasons explained below:

Processing Information

According to the theory of the picture superiority effect, humans are able to decipher visual information 60,000 times faster than text. The human brain is wired in such a way that handling visual information is easier for it. As a result, images are more likely to be remembered than words.

Information Overload

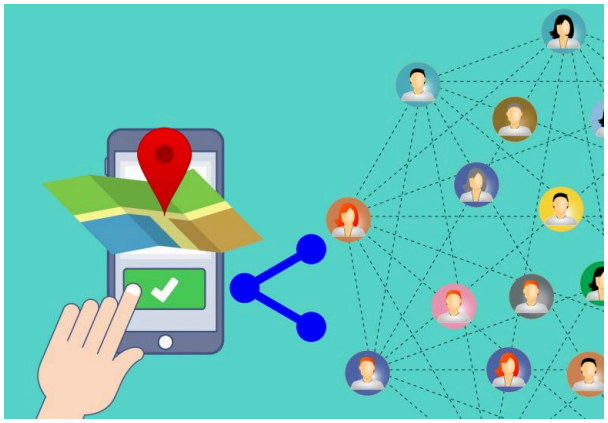


In today's era of information overload, a marketer's message needs to stand out in the competitive landscape. It needs to be memorable. It is an information jungle out there, and coming across an easy-to-follow graphic is a relief (as narrated in a TedTalk by David McCandless)

Communicating with the Digital Natives

Millennials and similar age groups have grown up with technology. They prefer communication that involves brief, instantaneous messages. They shift their focus to other sources of information very quickly. Lengthy oral lectures or huge written texts may not work well with a generation that has a low tolerance for boredom.

Easily Shareable

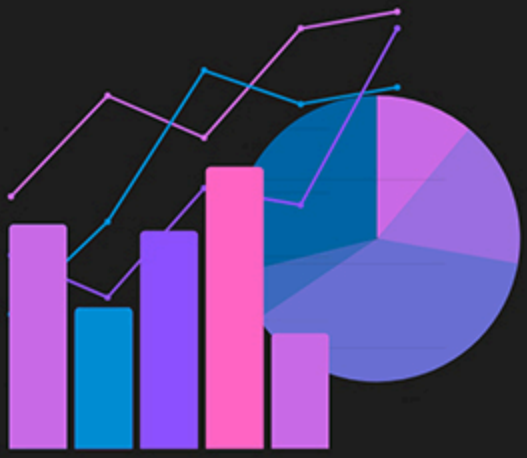


Infographics are easier to share on social media and other platforms. It is far more likely that your key message in an infographic will reach a larger audience than in a lengthy article.

Elements of an Infographic

The following material is derived from Curtin University
Curtin University 2020, *Visual communication*, viewed 11 May 2022,
<https://libguides.library.curtin.edu.au/23things/visual-communication>
and is used under a Creative Commons Attribution ShareAlike 4.0 Licence.

Elements of Infograp



Data Visualisations

Use as an accessible way to show people patterns and trends in data.

Images and Symbols

Images should be engaging and grab the attention of the viewers. They should also relate to the topic of the infographic.

Small Amounts of Text

Try not to overwhelm the viewer with too much text. Instead try to make your point with as few words as possible.

Colour

Colour can be used to draw attention to particular sections of the infographic as well as draw attention to the infographic as a whole.

Creating an Infographic

The following steps are taken in the creation of an infographic:

Step 1 – Preparation:

What is the main aim behind making the infographic? What is the key message which needs to be communicated?

Step 2 – Planning:

This involves preparing an outline for the infographic. Deciding on the key content which should be included. This content must address the aims/objectives articulated in Step 1

Step 3 – Development:

Using the most appropriate software to develop the infographic

Step 4 – Evaluation:

Some key criteria are discussed in the section below. It would be useful to also benchmark the infographic with another one in the industry

Step 5 – Publication/Dissemination:

An infographic is useful if it reaches the intended audience. Ensuring that it can be easily shared may also help in disseminating the message

Evaluating an Infographic:

The following material is derived from University of Guelph 2022
University of Guelph 2022, *Infographics,* viewed 11 May 2022, <https://libguides.library.curtin.edu.au/23things/visual-communication>

When evaluating an infographic, use the following criteria:

- Criteria 1: Does it tell a story?
- Criteria 2: Does it use good/useful data/information?
- Criteria 3: Does the visual style help/hinder understanding the story?

Appendix: Hypothesis Testing

What is Hypothesis Testing?

A **statistical hypothesis** is an assumption about a population parameter. This assumption may or may not be true. **Hypothesis testing** refers to the formal procedures used by statisticians to reject or not reject statistical hypotheses.

Statistical Hypotheses

The best way to determine whether a statistical hypothesis is true would be to examine the entire population. Since that is often impractical, researchers typically examine a random sample from the population. If sample data are not consistent with the statistical hypothesis, the hypothesis is rejected.

There are two types of statistical hypotheses.

- **Null hypothesis**. The null hypothesis, denoted by H_0, is usually the hypothesis that sample observations result purely from chance.
- **Alternative hypothesis**. The alternative hypothesis, denoted by H_1 or H_a, is the hypothesis that sample observations are influenced by some non-random cause.

Steps in Hypothesis Tests

Statisticians follow a formal process to determine whether to reject a null hypothesis, based on sample data. This process, called **hypothesis testing**, consists of four steps.

Step 1: State the hypotheses. This involves stating the null and alternative hypotheses. The hypotheses are stated in such a way that they are mutually exclusive. That is, if one is true, the other must be false.

Example:

Null Hypothesis (H_0): There is no association between gender and brand preferences

Alternative Hypothesis (H_1): There is an association between gender and brand preferences

Step 2: State the alpha value and the decision rule

For example: the alpha value is usually set at 0.05;

Example: if the p-value is less than 0.05, then reject H_0

Step 3: Choose the appropriate statistical test

Examples: Chi-square, Correlation, One-sample t-test, Independent samples t-test, ANOVA

Step 4: Interpret results. Discuss implications for managers